NCHRP

REPORT 561

NATIONAL
COOPERATIVE
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PROGRAM

Best-Value Procurement Methods for Highway Construction Projects

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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Best-Value Procurement Methods for Highway Construction Projects

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TRANSPORTATION RESEARCH BOARD

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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FOREWORD

By Timothy G. Hess
Staff Officer
Transportation Research Board

This report contains tools for use in awarding best-value highway construction contracts. This report will be of immediate interest to professionals involved in the procurement of highway construction contracts.

Legislative requirements in most states require that highway construction contracts be awarded using a low-bid system. Under a low-bid system, contractors submit bids based on plans and specifications prepared by the highway agency or a private engineering firm hired by the agency, and, except under extraordinary circumstances, the contractor submitting the lowest bid is awarded the construction contract. In all but a few cases, experience levels of the contractor, quality issues, and other criteria are not taken into consideration in awarding these contracts.

Best-value procurement methods allow various elements to be considered in selecting a contractor on the basis of performance. Objective elements include contractor experience with similar projects, completion within schedule, compliance with material and workmanship requirements, timeliness and accuracy of submittals, and record of safety. Subjective elements include effective management of subcontractors, proactive measures to mitigate impacts to adjacent properties and businesses, training and employee development programs, corporate commitment to achieving customer satisfaction, and client relations. These elements not only affect the ultimate performance and overall cost of the completed facility, but also contribute to the efficient execution of the work. Efficiency is very important to contracting authorities that are interested in a high level of public acceptance. It is also recognized that, because of constrained staffing and budgets, it is not possible for state agencies to "inspect" quality into the work. Therefore, a procurement process is needed that considers value-related elements in awarding contracts.

Under a "best-value" selection process, the low-bid concept can be modified by adding quality issues to the bid evaluation process. The low-bid concept is still a part of this selection process, but it is weighted with other elements to determine a best value that reflects quality, as well as cost issues. Several governmental organizations, including the Army Corps of Engineers, have used the best-value concept to award construction contracts. Public-sector organizations using the low-bid procurement process face constant pressure for improved quality, faster turnaround, and reduced overhead costs associated with project delivery. At the same time, private-sector organizations are recognizing the need for improved quality in their products to remain competitive. A best-value bid award system can provide a means for both public- and private-sector organizations to achieve common objectives and to include quality in the competitive procurement process. These provisions would be of interest to all organizations in the highway industry that are committed to providing a quality product.

Under NCHRP Project 10-61, "Best-Value Procurement Methods for Highway Construction Projects," Trauner Consulting Services, Inc., developed procurement methods, award algorithms, and rating systems for use in awarding best-value highway construction contracts. Screening criteria for selecting projects for application of best-value procurement, implementation strategies, and a model best-value specification were also developed. The research results, documented in *NCHRP Report 561,* will significantly enhance the capabilities of highway agencies in using best-value procurement methods in awarding highway construction contracts.

CONTENTS

AUTHOR ACKNOWLEDGMENTS

This research was performed under NCHRP Project 10-61 by Trauner Consulting Services, Inc., the prime contractor, in association with the University of Colorado (CU), University of Oklahoma (OU), and Nossaman Guthner Knox Elliott LLP. Sidney Scott III, P.E. (Trauner) was the principal investigator, with co-principal investigators Dr. Keith R. Molenaar (CU) and Dr. Douglas D. Gransberg (OU); Nancy C. Smith, Esq. (Nossaman) was the legal advisor.

This work could not have been accomplished without assistance and feedback from our research advisory panel: Robert Burns, Oregon DOT; Jeffery Carpenter, Alternate Project Delivery Manager, Washington DOT; David Cox, Division Administrator, FHWA; Ron Williams, State Construction Engineer (retired), Arizona DOT; Ernest Drott, Chief of Construction Operations, USCOE; Frank Gee, formerly of Virginia DOT; Len Sanderson, State Highway Administrator, NCDOT; Gary Whited, Deputy Administrator, Wisconsin DOT; Gregory Henk, formerly of Flatiron Structures Company, LLC, and currently with Carter Burgess; Steve Vance, President, Broce Construction; Jon Wight, Past Chairman, ARTBA; Ralph Ellis, Associate Professor, University of Florida, and James Ernzen, Associate Professor, Arizona State University. Additionally, Alfonso Bastias and Sangjoo Lee, graduate research assistants at CU, and James E. Brown, graduate research assistant at OU, contributed to this research effort.

FHWA's International Programs contributed funds to incorporate findings from the 2004 Construction Management Scan and additional international data collections. The authors wish to acknowledge the efforts of the Construction Management Scan team and the international agencies that contributed to this effort. The authors also wish to express their appreciation to all those who responded to questionnaires and provided feedback and case study information. We understand that their time was valuable, and we could not have accomplished this work without their input.

Finally, we would like to thank the NCHRP technical panel and Senior Program Officer, Mr. Timothy G. Hess, for their timely input, excellent comments, and helpful suggestions as this research project proceeded.

SUMMARY

Best-Value Procurement Methods for Highway Construction Projects

The majority of public sector highway construction contracts are awarded strictly on a low-bid basis. Except under extraordinary circumstances, the contractor submitting the lowest responsive bid is awarded the construction contract. While the low-bid procurement system has a long-standing legal precedence and has promoted open competition, a concern expressed by owners and some of their industry partners is that a system based strictly on the lowest price provides contractors with an incentive to concentrate on cutting bid prices to the maximum extent possible, even when a higher cost product would be in the owner's best interest. As a result, the low-bid system may not result in the best value for dollars expended or the best performance during and after construction.

In today's construction climate, public sector owners are finding themselves under increasing pressure to improve project performance, complete projects faster, and reduce the cost of administering their construction programs. In response to these pressures, the industry has experimented with alternative procurement and contracting methods. More construction owners are implementing one of these alternatives, best-value procurement, to improve project quality and enhance performance. In essence, best-value procurement incorporates factors other than just price into the selection process to improve performance or achieve other specific project goals.

Scope of Research

NCHRP Project 10-61, Best-Value Procurement Methods for Highway Construction Projects, is designed to investigate best-value concepts currently in use in the construction industry, evaluate their relative effectiveness, and recommend a best-value system or systems that may be used in conjunction with a traditional design-bid-build delivery system for highway construction. This report documents the results of the research effort. It presents the objectives and scope of the research, suggested definitions for best-value procurement, and expected results from implementing the method. Products of the research, as presented in this report, include the following:

- A common definition and a conceptual framework for using best-value procurement methods for highway construction projects.
- A best-value procurement system that allows for flexibility in the choice of parameters and award methods.
- An implementation plan that includes a project screening system for selecting candidate projects, and a step-by-step process for selecting appropriate parameters, criteria, and award algorithms once the project is selected.
- Strategies to overcome legal and procurement-related barriers to implementation of best-value methods.
- Recommendations regarding model legislation and a sample best-value guide specification.
- A compendium of case studies for best-value procurement in the highway construction industry.
- A training tool to assist agencies with implementation.

Findings: Current State of Practice and Industry Trends

As part of the initial phase of the research, the research team identified best-value procurement methods that have been considered, developed, or used for awarding construction in the United States and internationally. A comprehensive literature review focusing on foreign and domestic practices for a wide variety of construction sectors was completed. The literature included articles, reports, case studies, and proposal or bidding documents addressing a wide spectrum of best-value procurement concepts. Case studies from more than 60 best-value procurement documents were reviewed, 20 of which are presented as examples in Appendix D. Additionally, a national transportation agency survey was conducted to help define the state of best-value practice on highway construction projects. Finally, to benefit from the vast international experience with best-value procurement, results from the 2004 FHWA/AASHTO International Construction Management Scan research project were incorporated into this report.

The findings show a trend in public sector construction toward the increased use of various best-value procurement methods, highlight some of the issues associated with the traditional low-bid system, and provide examples of how best-value procurement is implemented. The national transportation survey revealed that 66% of the 44 highway agencies responding to the survey have some type of experience with best-value selection, but it was very limited and primarily in the area of design-build project delivery. However, the research revealed that certain sectors of public construction, for example the federal sector, have moved aggressively toward the use of best-value procurement and have attempted to measure its relative success. Additional findings of the literature review are provided as follows:

- The Federal Acquisitions Regulations (FAR) include commentary regarding how the low-bid method fails to serve the public interest because the lowest offer may not result in the lowest overall cost to the public (FAR 2004).
- A recent Navy study comparing best-value procurement with traditional methods points to a reduction in cost growth from 5.7% to 2.5% and a reduction in claims and litigation of 86% (NAVFAC 1996).
- The General Services Administration Public Building Services procures 100% of its new buildings and renovations through best-value procurement (GSA 2003).
- A 1997 National Science Foundation study concluded that design-build contracts procured using the two-step best-value procurement procedure had the best cost and schedule growth performance, albeit representing a very small average improvement over the other procurement methods (Molenaar et.al. 1999).
- The 2003 Fall Meeting of the ABA Forum on the Construction Industry addressed Value-Based Contracting at both the federal and state levels. The central thesis of the program was that best-value procurement was emerging as a viable alternative to the traditional low-bid method in public sector construction, and practitioners need to be prepared for this emerging trend (Vacura and Bante 2003).
- A baseline of projects and performance results was compared with performance outcomes for best-value highway projects. The results indicated that the use of best-value procurement in a variety of different forms resulted in cost or time improvements or both.
- Legislation and regulations for public sector construction at the federal and state levels are moving toward greater use of contracting approaches to achieve the best value for dollars expended.

Many federal and state agencies have implemented various source selection methods and have developed instructions or procedures for development and implementation of these methods.

At the federal level, the U.S. Postal Service, the Army, the Navy, the Department of Veterans Affairs, and the Federal Bureau of Prisons have developed procedures and guidelines for source selection contracting applicable to their construction programs (U.S. Postal Service Handbook 2000, Army 2001). Though federal legislation has not explicitly directed the use of best-value procurement for highway construction, for many years the FHWA has allowed alternative procurements using best-value concepts embedded in trial or experimental contracting methods for selected highway projects through its Special Experimental Project (SEP-14) initiative. The lessons learned from this program have added to the body of knowledge for best-value procurement in the highway sector (FHWA 1998).

NCHRP Report 451, "Guidelines for Warranty, Multi-Parameter, and Best Value Contracting," provided an introductory framework for best-value procurement in highway construction (Anderson and Russell 2001). The initial framework set forth in that document has been incorporated into the comprehensive study within this report.

The ABA's Model Procurement Code (referred to herein as the Model Code) allows for incorporation of best-value concepts into the procurement process (Model Procurement Code 2000). Refer to Appendix B for a copy of Article 3 of the Model Code. The "competitive sealed bidding" process described in the Model Code would allow for consideration of "objectively measurable" criteria (such as life-cycle costs) in the selection decision in addition to price. The competitive sealed bidding process can include multiple steps under certain circumstances, with the invitation for bids limited to those bidders whose initial submittals were determined to meet the owner's criteria. The Model Code also provides for a "competitive sealed proposal process" if owners determine competitive sealed bidding to be impracticable or not advantageous. Under the competitive sealed proposal process, award is made to the proposer whose final proposal is most advantageous to the owner. The Model Code allows for discussions with proposers who have submitted proposals that have a reasonable chance of being selected for award, followed by an opportunity to submit final proposals that will be the basis for selection.

Various states and local agencies have adopted legislation, in some cases based on the Model Code, allowing best-value concepts to be considered in the selection decision. Statutes addressing best value in the context of competitive bidding are of particular interest for this research. Several DOTs have procurement authority derived from the Model Code. In some states, the Procurement Code does not apply to the DOT. One example of a local enabling authority allowing best-value concepts to be included into the selection decision can be found in the Los Angeles City Charter provision that was the basis for the Alameda Corridor design-build project, requiring award to be made to the offeror providing the "lowest ultimate cost" to the awarding agency.

To summarize these trends, legislation at the federal, state, and local levels is moving toward allowing the use of best-value procurement strategies that include price and other factors when these are deemed to be in the best interests of the agency. The best-value concepts, analysis, and recommendations presented in this report were developed with reference to the framework of current federal and state legislation to enhance the likelihood of implementation.

Interpretation, Application, and Implementation

The next step in the research was to use the literature review, case studies, and survey results to develop best-value definitions and categorize various concepts found in best-value procurement. A definition of best-value procurement and the four primary best-value concepts were used as the framework for this research.

The term best value has many competing definitions in the industry. The research team decided that a broad definition of best-value procurement for highway construction would be more practical from the perspective of a traditional procurement process.

Best-Value Procurement—a procurement process where price and other key factors are considered in the evaluation and selection process to minimize impacts and enhance the long-term performance and value of construction.

Four primary concepts can be used to describe the nature of the best-value procurement process. These primary concepts are

- Parameters,
- Evaluation criteria,
- Rating systems, and
- Award algorithms.

The various parameters, evaluation criteria, rating systems, and award algorithms were also identified and defined. Five best-value parameters and 27 evaluation criteria were initially identified in the literature and case studies. Four rating systems and seven award algorithms were also identified and defined.

To assess the state of practice in the highway industry, these definitions, concepts, and relationships were further tested and confirmed through an industry survey. The survey assessed the state of practice regarding use of best-value procurement by highway agencies in the United States and Canada. Of the 44 responses, a majority (66%) had some experience with best-value procurement. For those using best-value procurement, there was significant variation in selection strategies, criteria for selection, method of combining factors for award, and relative weightings of price and technical factors.

The research team evaluated the advantages and disadvantages of each of the various best-value concepts and procurement strategies. The findings from this evaluation indicated that a best-value procurement that is simple to implement and flexible in the selection of parameters and award algorithms will be the most effective approach in the context of a traditional bidding system. The final system should be driven by the individual needs of each project while promoting consistency and transparency in the process. The team interviewed its research advisory panel to obtain their views regarding various best-value criteria and systems. The responses from the panel validated the finding that best-value selection and award will be most successful when owners can customize the process to meet the needs of the specific project.

Based on the analysis of the literature, case studies, survey, and interview results, the research team has been able to categorize and present best-value procurement as a flexible, multi-parameter system in which the selection of parameters is dependent on the owner's project objectives. The best-value parameters identified from case studies involve aspects of cost, schedule, qualifications, quality, and design as follows:

Best Value* = A.x + B.x + P.x + Q.x + D.x

Where: x = weighting
A = Cost
B = Time
P = Performance and Qualifications
Q = Quality Management
D = Design Alternates

*Note: The decision-making process is shown as a multi-parameter algorithm for purposes of simplifying the discussion. This does not mean that the process itself needs to be reduced to the weighted formula shown. For example, a qualitative cost-technical tradeoff using an adjectival rating system would not combine cost and non-cost elements using a numerical calculation.

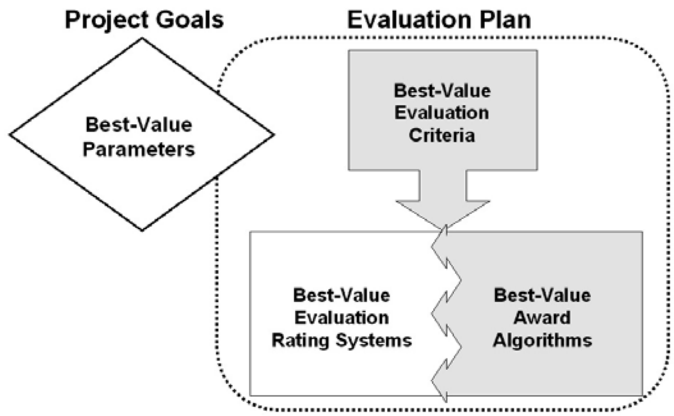


Figure S.1. Best-value procurement concepts.

To complete the system, the evaluation criteria, identified from the literature, surveys, and case studies, were mapped to these best-value parameters. The evaluation criteria were then associated with rating systems using satisficing (go/no-go), modified satisficing, adjectival, and direct scoring systems. Award algorithms ranged from a low bid that meets technical criteria through much more qualitative cost-technical tradeoff techniques. The system is graphically depicted as shown in Figure S.1.

The research team supplemented its existing project performance database from approximately 500 projects to more than 1,100 projects, comparing metrics for award growth, cost growth, construction placement, and average contract value among the various project delivery methods. The existing data indicate that the use of best-value procurement in a variety of different forms resulted in cost or time improvements.

The second phase of the research critically evaluated the results of the first phase to address any shortcomings to the methods identified in phase one and recommended a preferred best-value procurement system for use within the context of a traditional procurement process. The research team then focused on refining the evaluation criteria and selection processes, and developing screening criteria to select appropriate projects for best-value procurement. The list of potential evaluation criteria was ultimately distilled to 14 based on relative frequency of use, potential for adding value to the process, and likelihood that use of a criterion would result in successful implementation. To be recommended, a criterion must have appeared in more than 50% of the sample population or have a high potential for successful implementation based on survey results (see Table S.1).

Similarly, seven award algorithms were identified in the case study population and survey results. Table S.2 displays these algorithms in three categories based on their similarities in application, frequency of use, and their likelihood of being successfully implemented within the transportation industry as follows:

The possible combinations for a best-value system, including evaluation criteria, rating systems, and algorithms are presented in Table S.3. This matrix summarizes a proposed flexible best-value framework resulting from the research. Three award algorithms are matched with compatible rating systems. Evaluation criteria were selected for each rating and award system based on their frequency of use in the case study population and appropriateness for the type of algorithm and rating system. For example, the Meets Technical Criteria-Low Bid algorithm is aligned with a satisficing (go/no-go) rating system because the evaluation decisions will be based on a pass/fail element or with reference to a minimum standard.

The second phase of the research also included the development of practical screening criteria for implementation of best-value procurement and the selection of appropriate

Table S.1. Summary of evaluation criteria as identified with best-value parameter from total case study project population.

Evaluation Criteria	Interim Report Best-Value Parameter Designation	Number of Contracts Using Evaluation Criteria (Total = 50)
Price Evaluation	A.0	42
Project Schedule Evaluation	B.0	19
Owner Cost Evaluation	C.0	1
Financial & Bonding Requirements	P.0	35
Past Experience/Performance Evaluation	P.1	44
Safety Record (or Plan)	P.1	25
Key Personnel & Qualifications	P.2	41
Utilization of Small Business	P.3	30
Subcontractor Evaluation	P.3	29
Management/Organization Plan	P.4	31
Quality Management	Q.4	27
Proposed Design Alternate	D.0	26
Technical Proposal Responsiveness	D.1	37
Environmental Considerations	D.1	25

projects. The primary objective for best-value procurement project selection can be summarized as follows:

> Select projects with characteristics that suggest significant benefit will arise from using an alternative form of procurement. Once identified, develop the evaluation plan and project scope to confirm that the benefits are real, the negative impacts are minimal, and the risks are manageable.

The screening and selection tool is divided into two parts. The first part addresses programmatic barriers for best-value procurement and strategies to address these barriers. Answers to the following questions determine what steps will be needed to initiate and implement best-value procurement at the programmatic level.

1. Is the agency's experience level with best-value procurement adequate?
2. Is the industry's experience level with best-value procurement adequate?
3. Is the process permitted by applicable law?
4. Is a process in place to measure best-value program effectiveness?

Table S.2. Case study best-value award algorithms.

Case Study Population Best-Value Award Algorithms	Final Best-Value Award Algorithm Categories	Remarks
Meets Technical Criteria-Low Bid	Meets Technical Criteria-Low Bid or Low Cost	Non-criteria evaluated using satisficing (go/no-go) system.
Adjusted Bid	Value Unit Price	Non-cost criteria evaluated using a direct point scoring system and calculation of a numerical or dollar value for non-cost criteria.
Adjusted Score		
Weighted Criteria		
Fixed Price-Best Proposal		
Quantitative Cost-Technical Tradeoff		
Qualitative Cost-Technical Tradeoff	Qualitative Cost-Technical Tradeoff	Non-cost criteria evaluated using an adjectival or modified satisficing rating system.

Note: Low Cost is characterized in the Model Code for a competitive sealed bidding process as the total cost inclusive of life-cycle costs.

Table S.3. Summary of best-value procurement framework.

Best-Value Parameter and Evaluation Criteria / Award Algorithm	Meets Technical Criteria—Low Bid or Low Cost	Cost-Technical Tradeoff (Qualitative)	Value Unit Price
Cost			
Cost: A.0	X	X	X
Time			
Schedule: B.0	X	X	X
Qualifications			
Prequalification: P.0	X		
Past Project Performance: P.1		X	X
Key Personnel Experience: P.2		X	X
Subcontractor Information: P.3		X	X
Project Management Plans: P.4		X	X
Safety Record/Plan: P.5	X	X	X
Quality			
Quality Management: Q.0	X	X	X
Design Alternates			
Design with Proposed Alternate: D.0		X	X
Technical Proposal Responsiveness: D.1	X		
Environmental Considerations: D.2		X	X
Rating System			
	Satisficing	Adjectival or Modified Satisficing	Direct Point Scoring

The second part of the selection process addresses project barriers, provides a project selection questionnaire using a scoring model to assess the relative benefit of using the best-value procurement, and identifies the major benefits that can be translated into selection parameters and evaluation criteria. The screening system is designed to be an optional step. It is most beneficial for an agency implementing best-value procurement for the first time and is most effective when the agency evaluates a pool of potential projects and selects projects having the highest relative ranking. For a single project, the owner may elect to forego the screening system and simply answer key questions for implementing best-value procurement in qualitative terms, identifying the most important perceived benefit for best-value procurement. The following are examples of possible questions:

1. Qualifications benefits—How important is high quality performance to the project's success?
2. Quality enhancement benefits—How important are higher quality standards to the project's success?
3. Cost savings benefits—How important is reducing costs to the project's success?
4. Schedule benefits—How important is schedule acceleration to the project's success?

While four possible objectives are listed, all four need not be present to make a good best-value candidate. It is possible that a project will be appropriate for best-value procurement if it has just one objective that aligns well with the procurement system.

To summarize, the process to select and implement the appropriate best-value system for a project involves several key decision steps. As a first step, the owner may use the screening tool as an option to select a candidate project and identify the key benefits of using best-value procurement. If it is determined that adding parameters to the procurement process will add value to the project, the owner must then select from the framework of best-value parameters and evaluation criteria to develop the best-value evaluation plan. Based on the plan, the owner can select a one- or two-step best-value approach depending on the criteria selected and the benefit of using a competitive screening system.

This process is graphically illustrated in Figure S.2.

As noted in the research plan, to successfully implement best-value procurement, particularly in the context of traditional low-bid contracting, the best-value system must address the concerns of owner organizations, offer advantages for owners and bidders, and promote industry "buy-in." The last task in this research project addressed barriers to implementation

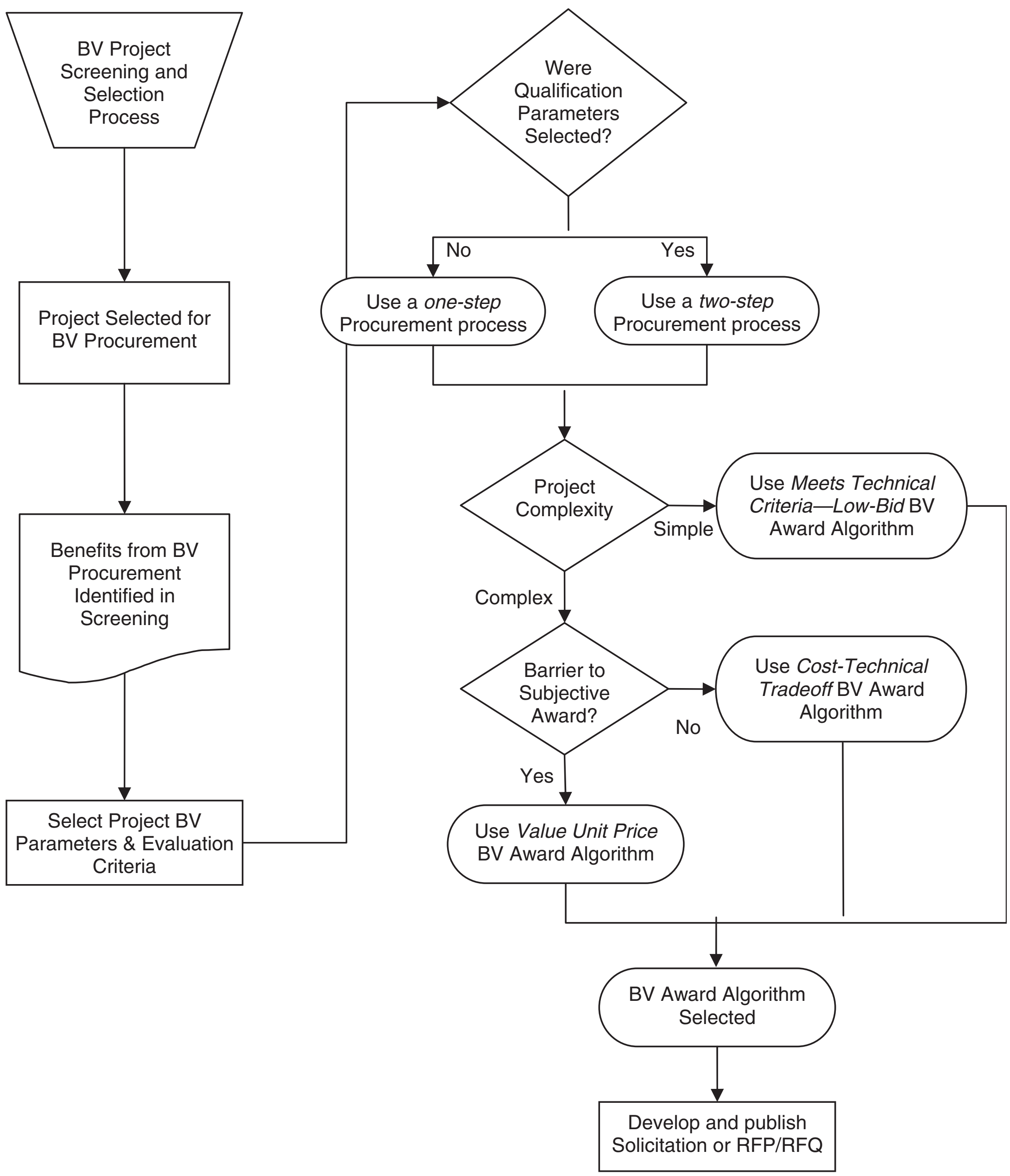


Figure S.2. Best-value (BV) procurement process flowchart.

and examined strategies to overcome these barriers and promote the use of best-value procurement in a rational way.

To address implementation, the research team first identified and explored issues and barriers to implementation. Based on the literature, case studies, and survey responses, the barriers to implementation of best-value procurement appear to be consistent with the concerns expressed by the industry for any new contracting process that changes the way that projects are developed, sold, or administered. Apart from statutory restrictions, many owners and contractors are concerned that best-value selection may be administratively burdensome, time consuming, and costly. It may also introduce greater subjectivity into the selection process, possibly increasing the risk that awards will be challenged, and may favor larger contractors with more resources, thereby reducing participation by smaller or Disadvantaged Business Enterprise contractors. Overarching these perceived barriers is an inherent resistance within owner and industry organizations to change and a desire to maintain the status quo.

To promote widespread implementation, strategies are needed to overcome legal, cultural/institutional, and educational barriers, and to set forth a systematic and practical approach or blueprint for users to introduce, implement, and "sell" best-value procurement. Some of these strategies have been generally recommended for the implementation of any new product or process. Others are more specific to best-value procurement. Recommended steps include the following:

Step 1—Clearly communicate the results of the research and advantages of implementing best-value procurement, and enlist champions to promote its use and test its effectiveness

The relative advantages of best-value procurement must be communicated to members of the implementing organizations and to the industry as a whole. This summary provides the background information needed for stakeholders to appreciate the advantages of best-value procurement, the challenges and concerns raised by industry related to its use, strategies to address these concerns, and a decision framework for selectively implementing best-value concepts.

The research findings as a whole have shown that best-value procurement has resulted in improved performance, and that negative industry perceptions are unfounded. In fact, based on the experience of the most experienced practitioners, the likelihood of a successful protest is reduced when a best-value procurement process is used because of the reluctance of the courts to overturn agency decisions regarding the relative advantages of one proposal over another, unless it is apparent from the facts that the decision was arbitrary or capricious, or the agency failed to follow its own procurement practices. When examining the total process including contract administration, the total burden on staff may actually be less when a best-value process is used.

The research has provided a flexible framework that can be tailored to a traditional procurement process or to a range of different procurement regulations. In this sense, best-value procurement is not designed to replace a low-bid system; a strict low-bid process will undoubtedly remain the norm, but agencies will have the option to incorporate additional factors in the selection process if deemed advisable—in some cases using a competitive sealed bidding process that is essentially the same as low bid, and in other cases using a competitive sealed proposal process that offers a greater degree of flexibility to project owners to decide which proposal offers the greatest advantages.

Though the support of senior management is essential to implement changes in procurement approaches, senior managers come and go. The long-term success of implementation will depend more on enlisting champions to continue to promote the benefits of enhanced procurement options to a wider audience. Champions may come from the ranks of senior management or may come from the lower level ranks of owner or industry organizations charged with using or testing the new processes. It is important to broadcast successes. Once the early champions have piloted best-value procurement and successes become apparent, it is important that these successes be communicated to the broader industry. Best-value procurement must be viewed as offering both a benefit for owners and a competitive advantage for contractors. This continual promotion will further seed the development of new champions. It will also help develop the momentum necessary to make best-value procurement a viable procurement option for the appropriate projects.

Step 2—Devise solutions to legal barriers

Given that key decision makers recognize potential benefits from implementing best-value procurement, users must identify and analyze laws and rules applicable to public agency procurements that would limit or prevent its use. In some states, agencies already have the legal ability to incorporate best-value concepts into procurements without the need for special legislation. In others, it will be necessary to obtain legislative authorization as the first step to implementation of a best-value procurement process. Any proposed bills will likely face opposition from groups that will exert pressure on the legislature to modify the language to suit their interests. As a result, any agency wishing to obtain authorization should be prepared to mount a significant lobbying effort to ensure that the bill is passed and that the as-adopted bill will meet their needs. The ABA Model Code would be a good starting point for proposed legislation, and the backing of the ABA may be helpful in obtaining the votes needed from the legislators. Refer to Chapter 3 of this report for further discussion regarding the Model Code and the issues likely to arise in the course of seeking new legislation.

Step 3—Collaborate with industry in the implementation process

The successful implementation of best-value procurement practices must include industry participation and comment; thus, it is prudent to reach out to owner and industry members affected by the change, explain the proposed changes, and obtain their insights, concerns, and ideas regarding the process. There are a number of reasons for this. Primary among these is the recognition that there will always be opposition to change. For example, industry opposition to some innovative procurement practices has been significant. If stakeholders are serious about implementing the results of research, then the implementation plan must provide the implementers and champions with the tools they will need to push through change. These tools include collaboration with industry.

The research team consulted with its advisory board, particularly members representing industry organizations, regarding strategies to build industry support. Their feedback included the following recommendations:

1. Identification of common objectives and advantages for best-value procurement,
2. Analysis and allocation of risks in the procurement process,
3. Involvement of an owner and industry task force in the development and review of proposed legislation or proposed best-value procurement procedures, and
4. Involvement of owner and industry team in testing the new approach through a pilot or demonstration project.

Step 4—Training

Training is an essential tool to formally communicate changes in policies to a wider audience. Training ideally should include owner and industry members in the process. It should be relatively concise and able to clearly communicate the new procedures and the relative benefits of their implementation to all stakeholders. Training has the added benefit of recruiting additional champions to further promote and implement the proposed changes. The results of this study have been incorporated into a stand-alone training package in PowerPoint format included in Appendix H. This package can be distributed together with model specifications to agencies to form the basis of a local training program on best-value procurement.

Step 5—Pilot projects

Pilot projects are a proven tool for validating and fine-tuning new practices resulting from research. Using traditional projects as a benchmark, pilot projects or programs have been used extensively to measure the relative success of new procurement and contracting methods. The results of pilot projects, though in some cases difficult to attribute to one specific cause, have served to effectively promote the long-term implementation of new industry practices. It is recommended that an agency champion the use of best-value procurement through a pilot program, partner with industry in testing various best-value systems, and develop criteria to measure the relative success of best-value projects compared with traditional low-bid projects.

The project screening and selection tool developed for the implementation of best-value procurement can be used by state agencies to identify those projects that will make good pilot test beds and will furnish the project performance metrics that can be used to evaluate the results of the local pilot project program against a baseline of traditional projects. It is essential for the agency to maintain a long-term commitment, providing ongoing technical and troubleshooting support, and adjust and revise procedures as appropriate to overcome recognized problems and pave the way for more widespread implementation. Typically, institutionalizing the process through the development of appropriate governmental and private support groups or associations, annual conventions or meetings, websites, and regular periodicals will facilitate long-term support.

Conclusions

Based on the findings and critical evaluation, a best-value system that allows flexibility to the procuring agency in the selection of parameters and criteria, rating systems, and award algorithms will have the greatest likelihood of successful implementation in the context of a traditional low-bid system. For success of implementation, the project screening system will ensure that a best-value system is applied to projects that will have a significant benefit from the use of additional factors in the selection process. The final products of this research include the following:

1. A common definition and a conceptual framework for the use of best-value procurement methods for highway construction projects.
2. A best-value procurement system that allows for flexibility in the choice of parameters and award methods.
3. An implementation plan that includes a project screening system for selecting candidate projects, and a step-by-step process for selecting appropriate parameters, criteria, and award algorithms.
4. Guidelines for legislation and procurement regulations, and sample language for best-value procurement procedures.
5. Recommendations regarding legislation and procurement regulations, and model specifications.
6. A training tool to assist agencies with implementing best-value procurement.

Finally, the research team has recommended, as part of a long-term implementation strategy, that selected agencies champion the use of best-value procurement for pilot projects and use selected performance metrics to evaluate the results compared with similar projects using the traditional low-bid only procurement method.

CHAPTER 1

Introduction and Research Approach

1.1 Background: Problem Statement and Research Objective

Legislation in most states requires that construction contracts for public works projects be procured using a competitive sealed bidding process and awarded to the responsible bidder submitting the lowest bid. The majority of public sector construction contracts continue to be awarded solely based on the lowest price. A long-standing concern expressed by public owners, however, is that low bid, while promoting competition and a fair playing field, may not result in the best value for dollars expended or the best performance during and after construction. As noted in the research problem statement for NCHRP Project 10-61, the low-bid system encourages contractors to implement cost-cutting measures instead of quality enhancing measures, which makes it less likely that contracts will be awarded to the best-performing contractors who will deliver the highest quality projects.

The primary tool available to owners to counteract the cost-cutting incentives inherent in a low-bid system is through the process of determining bidder responsibility. This determination may simply involve an evaluation of pricing and financial ability, but many public owners have broadly interpreted responsibility as encompassing other factors as well. Recent surveys of the highway industry gathered from previous research indicate that prequalification is used widely by state and federal agencies in their construction programs to determine responsibility in conjunction with a traditional sealed bidding process. Prequalification in its simplest form is an assessment of financial responsibility, which often mirrors what sureties look for in making their underwriting decisions relating to issuance of bonds for public works projects. It also may include other factors such as demonstrated ability to perform a certain type of work. Whether by prequalification or other methods, public owners are increasingly exploring ways to include non-price factors, both qualitative and quantitative, in the procurement process to motivate contractors not only to improve their performance during construction, but equally as important, to build value into the end products of construction.

1.2 Best-Value Contracting Definitions

The term best value has many competing definitions from numerous procurement sectors. There are even competing definitions within the highway sector itself. The federal government uses the term best value in reference to the purchasing of almost every piece of merchandise from computers to military weapons, as well as highway and building construction. The *Army Source Selection Guide* (Army 2001) defines best value as "The expected outcome of an acquisition that, in the Government's estimation, provides the greatest overall benefit in response to the requirement." The research team has chosen to use a broad definition of best-value procurement for highway construction as follows:

> A procurement process where price and other key factors are considered in the evaluation and selection process to minimize impacts and enhance the long-term performance and value of construction.

While this definition can be applied to all current best-value procurement systems, it overlaps with other innovative contracting methods. In a broad sense, best value may encompass the concepts from and variations of current highway procurement methods, including prequalification, post-qualification, A+B bidding, multi-parameter bidding, bid alternates, and extended warranties. Best-value procurement methods have been employed under traditional design-bid-build contracting, although on a very limited basis at this date. Additionally, best-value procurement concepts are commonly used in conjunction with design-build contracting, but design-build contracting comprises only a small portion of the U.S. highway industry. Concepts falling within the general definition of best-value procurement found in the highway industry are further described in Chapter 2.

1.3 Scope of Study

Best-value procurement is increasingly being recognized in the highway construction industry as a way to incorporate quality and other important factors in the procurement process and enhance the long-term performance and economic value of the work. The researchers have developed the following products as part of this research project:

- Recommended best-value procurement strategies for use in awarding competitively bid highway construction projects,
- Screening criteria for selecting projects that would be appropriate for best-value procurement, and
- Strategies for overcoming barriers to implementation.

The first phase of this research effort clarified what best-value procurement means for the industry and evaluated the effectiveness of the various approaches used or proposed for use. In the final phase, the research team developed practical, fair, and flexible criteria/procedures to implement the most practical best-value procurement approach in the context of the traditional low-bid system. The findings of this effort are described in detail in Chapters 2 and 3.

1.4 Research Approach

The approach taken for this project, apart from report preparation under Tasks 3 and 8, encompassed six tasks and several subtasks as follows:

Task 1—Identify best-value procurement methods that have been considered, developed, or used for awarding construction contracts. Consider methods in the United States and internationally.

As a first step, the team reviewed its existing database and survey information and conducted a literature review of existing research databases, project-specific bidding and request for proposal (RFP) documents, and other sources of information related to contracting and project delivery approaches that incorporate best-value concepts. To supplement current information regarding best-value procurement, the research team gathered data from other construction industry sectors, and procurement practices from other countries studied during the most recent Contract Administration and Asphalt Pavement Warranties European Study Tours. A rigorous literature review has been conducted specifically for best-value procurement (see Appendix A).

With this information, the research team developed initial definitions of best-value procurement that encompassed the concepts and variations currently used in the industry and any new or innovative approaches considered. Using these definitions and concepts, an electronic survey was developed to gather additional information regarding the state of practice in the highway industry and related industry sectors and as a second phase to obtain additional case study project information.

The next step was to conduct a survey to collect data that was specifically targeted to the objectives of this research. To accomplish this step, the team developed a two-phase survey. The first survey, shown in Appendix C, was essentially a filtering tool to identify those agencies or construction owners that are using or considering the use of a best-value procurement process in the highway sector consistent with the definitions in the survey form. The survey also identified any potentially new best-value concepts that were not reflected in the literature or the existing database.

The second phase consisted of a more focused data collection survey concerning best-value project results. This survey, also included in Appendix C, was targeted to the respondents that have experience with various forms of best-value procurement based on the results of the initial survey. The survey asked respondents for detailed information regarding the evaluation and selection process and the criteria used for screening and selection. Respondents were also asked to provide performance outcomes for projects using best-value procurement, in some cases compared with traditional low-bid selection.

The products of the Task 1 identification of best-value procurement methods included a common definition and conceptual framework for best value; identification of the universe of parameters, evaluation criteria, award algorithms, and rating systems used for best value; and a baseline of projects and compendium of case studies from which to evaluate the effectiveness of the various methods. The best-value procurement definitions and conceptual framework are discussed in Chapter 2. The literature review and case studies can be found in Appendix A and Appendix D, respectively.

Task 2—Critically evaluate the effectiveness of the best-value procurement methods identified in Task 1.

The critical evaluation task initially analyzed concepts that have been used on actual best-value projects to develop the necessary background to recommend a best-value selection methodology. Based on the examination of the literature, case studies, survey, and performance results, the critical analysis addressed the advantages and disadvantages of each major component of best-value procurement and developed a coding structure relating parameters to evaluation criteria. The analysis further assessed the frequency of use of the specific evaluation criteria in the total case study population.

In addition to the completed case studies, the research team collected and analyzed objective performance data from the team's project database. This effort started by separating the projects currently on-hand in the project database into those procured by traditional low bid and those delivered using some other method like multi-parameter bidding or best-value procurement. A series of project performance metrics were created to measure each dataset and allow comparison. The typical metrics were

- Award growth,
- Cost growth,
- Time growth,
- Construction placement, and
- Average contract value.

Next, the non-traditional projects were separated and compared by procurement method type using the same set of metrics. This allowed the research team to quantitatively rank the impact of different best-value elements. For example, the performance of A+B bid projects to low-bid projects would allow a comparison of the effect of including time as a factor in the procurement process and permitting the construction contractor rather than the owner to establish the project schedule. The use of warranty provisions on projects would provide an indication of the effect of including quality criteria in the procurement process on end-product performance.

Lastly, interviews were conducted with the expert advisory panel to validate the results of the initial surveys and provide a "reality check" against these preliminary results. The results of the critical evaluation are presented in Chapter 2.

Task 4—Develop best-value procurement methods for use in awarding highway construction projects.

Task 4 required that the research team further develop best-value procurement method or methods to address the shortcomings of strategies evaluated in Task 2, make final recommendations for development of best-value methods, and if appropriate, explore, develop, and recommend new variations of best value. This task was essentially a continuation of the Task 2 critical evaluation to obtain follow-up information from highway industry users and refine the recommended best-value system. The research team distributed the second survey to obtain quantitative and qualitative information from the highway industry regarding performance outcomes of their best-value projects. The research team also presented preliminary research results at several industry conferences and solicited feedback from participants. Using the combined results of data collection efforts and feedback from stakeholders, the research team completed the critical analysis of those systems currently in use by state agencies, federal agencies, and the international highway construction organizations.

The initial performance results and survey information were not conclusive in terms of ranking the effectiveness of the different best-value procurement methods. In fact, the preliminary results indicated that all of the best-value methods will potentially achieve favorable results in terms of project performance compared with design-bid-build projects, particularly for those performance measures that directly relate to the specific best-value selection parameters. Though the existing meets technical criteria—low bid appears to be the simplest and most compatible with the traditional low-bid, design-bid-build process—the preference for a more flexible approach to combining best-value parameters in an award system required that the team explore variations on the other existing algorithms or potentially new algorithms for award.

Task 4 thus further refined the best-value model, assessing whether it was possible to reduce the number of variables in the best-value procurement system or develop and evaluate a new approach or approaches to a best-value procurement system.

Task 5—Develop practical, objective criteria and processes (including a scoring system) to be used in quantifying best-value elements of a construction bid.

The results of Tasks 2 and 4, project performance benchmarking and the case study project content analysis, were used to develop a proposed best-value procurement framework from which the remainder of the study was completed, and through which the practical, objective criteria and processes (including a scoring system) were developed. The results of the national transportation agency survey were used to validate the proposed framework.

The first step in deriving a proposed best-value procurement framework was to map the final results of the best-value project case study content analysis to the best-value parameters and evaluation criteria. To do this, the research team determined that the best measure of potential success for a given generic evaluation criterion was repetitive use by those agencies that have experimented with best-value procurement. Accordingly, the following standard was developed for selecting a given best-value evaluation criterion to be recommended for use in the proposed framework:

> To be recommended, a criterion must appear in >50% of the sample population solicitations, or, if none are >50%, the single highest occurrence will be used.

With this in mind, the initial population of evaluation criteria was evaluated and revised. Additionally, the same approach used for the evaluation criteria was applied to the problem of distilling the population of best-value award algorithms into a group that is most suitable for highway construction projects. Finally, the use of one- and two-phase procurement processes similar to those portrayed in the case study projects was considered and evaluated for the final best-value system.

Task 6—Develop screening criteria for selecting projects for application of best-value procurement methods.

One of the three primary objectives of the research was to develop screening criteria for selecting projects for application of best-value procurement methods. Recognizing that best-value procurement has its advantages, although it is certainly not appropriate for every project, there are certain project characteristics that correlate to the successful implementation of best-value concepts. In other words, some projects can benefit more from best-value procurement than others.

The research team developed a paper-based best-value project screening tool. The tool involves two steps. Step One is a decision flowchart, and Step Two is a scoring questionnaire. These two items are included in Appendix F. The team has also created an automated web-based decision support system called the "Best-Value Selector" (BVS) Project-Screening Tool, but the final product is not dependent on this computer-based format. Agencies will be able to use either the paper-based or the web-based formats. The University of Colorado is supporting the BVS, which can be found at the following website: http://construction.colorado.edu/best-value.

The model uses critical project characteristics found through performance data and expert knowledge from past projects to predict the success of best-value procurement on new projects. The output from the model will provide agencies with critical information regarding the decision to apply best-value procurement on a given project or series of projects.

Task 7—Develop strategies to overcome institutional, legislative, and industry-related barriers to implementing recommended best-value procurement methods.

As the transportation industry has gained more experience in the use of best-value selection within traditional low-bid, design-build, and negotiated procurements, concerns and questions have been raised by participants, from both owner and industry perspectives that must be addressed before best-value procurement will be widely supported and implemented.

Widespread implementation requires creative and flexible solutions to legal and procurement-related barriers that exist among different states and jurisdictions. Section 3.6 of this report recommends solutions to implementation barriers. These recommendations are based on survey results, the latest trends in state statutes and best-value procurement, and feedback provided by practitioners at industry meetings in response to the research team's presentation of preliminary findings. To facilitate the discussion, a matrix of legal, regulatory, social, and business barriers to best-value procurement has been developed that indicates the level at which each barrier must be addressed, possible solutions to each barrier, and the probability that each barrier can be solved without legislative restructuring. The report also makes recommendations that may be used as a basis to develop model legislation and provides a sample guide specification in Section 3.7 that may be adapted for use by agencies implementing best-value procurement.

Project Extension—Incorporate International Construction Management Scan Findings

An FHWA/AASHTO-sponsored international scanning research project on construction management found a wealth of international knowledge concerning best-value procurement. The results of the 2004 Construction Management Scan became available in summer 2004 as this research project was nearing completion. NCHRP sponsored a project extension to incorporate these international findings; this was the final step in the NCHRP 10-61 research process.

The scan conducted in-depth interviews with agencies from Canada, England, Finland, Germany, The Netherlands, and Scotland. The NCHRP research team used information from this scan and additional information from a subsequent international survey to enhance the results of the data collection previously described. Specifically, the data provided more measurable best-value parameters in the area of qualifications, quality, and design alternates. Six international case studies were added to the research and in-depth analysis was added from Ontario's Registry Appraisal and Quality System (RAQS) and England's Capability Assessment Toolkit (CAT). The results of this analysis are reflected in the report's best-value framework.

1.5 Results and Products

The final products of the research, as presented in this report, include the following:

1. A common definition and a conceptual framework for the use of best-value procurement methods for highway construction projects.

2. A baseline of projects and performance results against which performance outcomes for best-value highway projects will be measured.
3. A best-value procurement system that allows for flexibility in the choice of parameters and award methods.
4. An implementation plan that includes a project screening system for selecting candidate projects, and a step-by-step process for selecting appropriate parameters, criteria, and award algorithms.
5. Recommendations regarding strategies to develop legislation and procurement regulations.
6. A model best-value specification to be used as a template for detailed specifications.
7. A compendium of case studies for best-value procurement in the highway construction industry.

A project website has also been developed to share information, post survey results, and provide access to case studies and literature related to best-value procurement. While this website is not one of the research deliverables, it serves as an additional tool to communicate the results of the research to the industry (http://construction.colorado.edu/Best-Value/Desktop.aspx).

CHAPTER 2

Findings

2.1 State of Practice

This chapter examines and analyzes the state of practice of best-value procurement methods in the construction industry found in the literature, project procurement documents, domestic and international interviews, and survey data. It includes regulatory trends, concepts found in the literature and project data, parameters used in the process, a summary of results from a highway sector survey, a comparison of performance for best-value contracting versus design-bid-build, and case study information to illustrate how best-value procurement has been implemented.

A literature review of procurement methods used in the construction industry within the past 15 years is presented in Appendix A. Many of the findings highlight issues and shortcomings in the traditional low-bid system and address trends in public sector construction toward the increased use of various best-value procurement methods to improve project performance and enhance end-product quality. The literature draws from all facets of the construction industry in the United States, Europe, Canada, and other countries. It includes perspectives from federal and state contracting agencies, vertical and horizontal construction, and analysis of project outcomes correlated to various procurement systems incorporating non-cost factors in the selection process.

The development of best-value procurement concepts in the public sector has to some extent borrowed ideas and approaches used to procure products and services in the private sector. Private sector construction owners have long sought to get the best value for dollars expended. For example, a major U.S. corporation with an annual construction budget of $1.5 billion has often used best-value selection with a negotiated procurement for industrial projects. Contractor selection is typically based on multiple factors that include cost, schedule, quality management, safety, and technical ability (Dorsey 1995). Best-value procurement practices are increasingly being transferred to the public sector where permitted by legislation or when determined to be in the best interests of the agency under both traditional and alternative contracts.

NCHRP Report 451, "Guidelines for Warranty, Multi-Parameter, and Best Value Contracting," provided an introductory framework for best-value procurement in highway construction, and the initial framework set forth in that document has been incorporated into the comprehensive study within this report (Anderson and Russell 2001).

Although legislative requirements have traditionally required low bid for construction, more and more state legislatures have passed legislation that allows best-value procurement. The next section highlights some of the recent legislative revisions.

2.2 Legislative and Regulatory Trends

Legislation and regulations for public sector construction at the federal and state levels are moving toward greater use of contracting approaches to achieve the best value for dollars expended. The Federal Acquisition Regulation (FAR) Part 9, Contractor Qualifications, includes commentary regarding the reasons for this trend, explaining that the low-bid method fails to serve the public interest by creating the false impression that this will automatically result in the least cost to the owner (FAR 2004). FAR Section 9.103, Policy, describes the importance of setting appropriate responsibility standards whenever a low-bid methodology is used:

> The award of a contract to a supplier based on lowest evaluated price alone can be false economy if there is subsequent default, late deliveries, or other unsatisfactory performance resulting in additional contractual or administrative costs. While it is important that Government purchases be made at the lowest price, this does not require an award to a supplier solely because that supplier submits the lowest offer. A prospective contractor must affirmatively demonstrate its responsibility, including, when necessary, the responsibility of its proposed subcontractors.

FAR Part 15, Contracting by Negotiation, establishes a best-value "source selection" process for federal contracts (FAR 2004). This process is also known as "competitive negotiation" because negotiations (discussions) are conducted with multiple offerors simultaneously, instead of selecting a single offeror and negotiating with that entity. The source selection process might entail the selection of the lowest-priced technically acceptable proposals or it may consist of a tradeoff between price and other factors—resulting in an award that may not be to the lowest-priced offeror or the highest technically rated offeror. Regardless of which approach is used, the federal agency's source selection decision must be made based on a determination that the selected proposer has offered the best value to the government.

Many federal and state agencies have implemented various source selection methods and have developed instructions or procedures for development and implementation of these methods. At the federal level, the U.S. Postal Service, the Army, the Navy, the Department of Veterans Affairs, and the Federal Bureau of Prisons have developed procedures and guidelines for source selection contracting applicable to their construction programs (U.S. Postal Service Handbook 2000, Army 2001).

Federally imposed procurement requirements are applicable to state and local transportation agencies wishing to use federal-aid funds for highway projects. For many years 23 U.S.C. Section 112(b)(3) mandated use of a low-bid procurement methodology for most construction contracts, allowing alternative procurement procedures to be used only with special permission from the FHWA through its Special Experimental Project (SEP-14) initiative. Many of the projects authorized under SEP-14 involved use of best-value concepts, and the lessons learned from this program have added to the body of knowledge for best-value procurement in the highway sector (FHWA 1998). In 1998, Congress acknowledged the need to allow an alternative procurement process for design-build projects by enacting revisions to 43 U.S.C. Section 112(b)(3), allowing a best-value process to be used for award of such contracts. FHWA adopted implementing regulations that permit such projects to use a procurement procedure similar to the FAR 15 source selection process and continue to allow agencies to use other procurement processes through the SEP-14 program.

A number of states have adopted legislation allowing best-value procurements, often in the context of design-build projects but also allowing best value to be incorporated into construction contract procurements. The ABA has published model legislation and implementing regulations that, if adopted by a state legislature, would allow state and local agencies to incorporate best-value concepts into a competitive bidding process and to use competitive negotiations under specified circumstances. Note that one flaw to the Model Code is that it does not provide a model process for procurement of innovative contracts where the nature of the contract does not allow a price competition (although it does allow for the possibility of negotiated contracts for items and services available only from a single source). As a result, agencies proposing legislation based on the Model Code may wish to consider including an alternative process for such contracts. The Model Code does however provide an excellent prototype for legislation to allow best value to be considered in awarding traditional construction contracts. A copy of Article 3 of the Model Code is included in Appendix B. The Model Code provides for construction contracts to be procured using competitive sealed bidding unless deemed to be impracticable or not advantageous to the owner. The competitive sealed bidding process is established by Section 3-202 of the Model Code. Section 3-202(5) requires bids to be evaluated based on requirements set forth in the Invitations for Bid, and those criteria shall be "objectively measurable, such as discounts, transportation costs and total or life-cycle costs." The process thus permits the traditional low-bidding process where the owner awards to the responsible bidder that has provided the lowest responsive bid, and also permits agencies to implement a process addressing items that have a cost impact to the owner outside of the contract price. The competitive sealed bidding process cannot, however, be the basis for selecting one proposer over another simply because the owner believes the first proposer has offered a better product. If such a result is desired, the owner has the ability to use the competitive sealed proposal process, provided that the owner is able to justify use of such process.

The competitive sealed proposal process is described in Section 3-203 of the Model Code. The Model Code intends for this process to be used for design-build projects and for other projects for which competitive sealed bidding is determined to be impracticable or not advantageous to the owner. The competitive sealed proposal process may involve multiple steps, including prequalification, receipt and review of initial proposals, discussions to ensure that the proposer is fully aware of the owner's requirements and to advise the proposer of any necessary clarifications regarding its proposal, and receipt and review of final proposals. Award is based on evaluation of final proposals in accordance with the criteria specified in the request for proposals.

At the state level, various statutes allow use of best-value procurement for public works construction contracts. Refer to Appendix B for a list of various statutes that may allow DOTs in various states to incorporate best-value elements into procurement of construction contracts. Appendix B also includes excerpts from the FAR and from best-value statutes passed in Colorado, Delaware, and Kentucky. It should be noted that the Colorado and Kentucky laws do not appear applicable to DOT projects, but they may nevertheless be of interest in developing legislation for DOT projects. The Colorado revised statute provides for "competitive sealed best-value bidding," using some of the same terminology as the Model Code but offering less flexibility than the Model Code. The Colorado statute permits the procurement officer to " . . . allow bidders to submit prices for enhancements, options, or alternatives that will result in a product or service to the state having the best-value at the lowest cost," if a high-level determination has been made that such a process will be advantageous to the state. (The Model Code does not require a special determination to be made before incorporating best-value elements, but does include restrictions regarding the types of items that may be included.) The Colorado statute allows award to a bidder where the total price offered by the bidder, including the prices for enhancements, options, or alternatives, exceeds the total price offered by the other bidders, if it is determined "that the higher total amount provides a contract with the best value at the lowest cost to the state" based on criteria set forth in rules adopted by the procuring agency. The Colorado statute implicitly allows the owner to consider matters such as life-cycle costs in making the selection decision; the Model Code provision provides a much clearer statement regarding the process to be followed.

The Delaware Code allows the use of best-value procurement for large public works contracts, with best value determined on the basis of objective criteria that have been communicated to the bidders in the invitation to bid. Delaware agencies can elect to use a best-value procurement process without special findings. However, the Delaware law includes specific requirements regarding weightings to be assigned to the best-value criteria as follows:

> 1. Price—must be at least 70% but no more than 90% and
> 2. Schedule—must be at least 10% but no more than 30%.

Under the Delaware Code, a weighted average stated in the invitation to bid must be applied to each criterion according to its importance to each project. The agency must rank the bidder according to the established criteria and award to the highest ranked bidder. Every state agency and school district is required, on a yearly basis, to file a report with every member of the General Assembly and the Governor that states which projects were bid under best-value procurement and what contractor was awarded each contract. The Delaware legislature's decision to include specific weightings in the statute could be interpreted as requiring the agency to convert all criteria to numeric ratings even though another evaluation methodology might be more desirable. The logic underlying the requirement to give the bid price at least a 70% weighting and schedule at least a 10% weighting is unclear, and may be problematic for certain projects, for example, those for which long-term operations costs are significant.

The Kentucky revised statute provides for award of contracts using a competitive sealed bidding process, with the contract awarded "to the responsive and responsible bidder whose bid offers the best-value." The statute allows significant flexibility to the awarding agency in establishing the best-value criteria and their relative weightings, but makes it clear that the criteria must be objective and quantifiable. The statute includes the following definition of best value:

> 3. Best value means a procurement in which the decision is based on the primary objective of meeting the specific business requirements and best interests of the Commonwealth. These decisions shall be based on objective and quantifiable criteria that shall include price and that have been communicated to the offerors as set forth in the invitation for bids.

In summary, legislation at the federal and state levels is moving toward allowing the use of best-value selection strategies. Many states have adopted legislation allowing use of design-build and permitting award to be based on a best-value determination. A number of states have also passed general procurement legislation that would allow best-value concepts to be factored into the selection decision for other construction contracts as well. The best-value concepts, analysis and recommendations presented in this research work have been developed within the framework of legislative approaches currently in place for federal and state agencies.

2.3 Best-Value Contracting Concepts

As described in Chapter 1, in a broad sense, the definition of best value may encompass the concepts from and variations of current highway procurement methods, including prequalification, post-qualification, A+B bidding, multi-parameter bidding, bid alternates, and extended warranties.

The research team conducted more than 50 case studies from all sectors of construction to identify and categorize best-value concepts used in the public sector construction industry. These agencies include the U.S. Army Corps of Engineers, the U.S. Air Force, the Highways Agency in England, the National Aeronautics and Space Administration, the Spanish Road Administration, the Swedish Highway Administration, the U.S. Forest Service, and a number of U.S. DOTs. The majority of these case studies involve design-bid-build projects, but some design-build projects have been captured as good examples of best-value procedures. These case studies are presented in summary tables throughout this chapter and in a series of detailed case studies in Appendix D. Table 2.1 provides a summary of the detailed case studies that were used to develop the best-value concepts described in this report. It also presents a systematic approach to identifying and coding best-value parameters.

Table 2.1. Detailed case study index.

Case	Parameters	Award Algorithm	Evaluation Rating Scales
1. Air Force Base Pedestrian Bridge	A.0 + P.1	Qualitative Cost-Technical Tradeoff	Adjectival Rating
2. NASA Johnson Space Center Tunnel System	A.0 + P.0 + P.1	Qualitative Cost-Technical Tradeoff	Adjectival Rating
3. U.S. Army Corps of Engineers Canal	A.0 + P.1 + P.2 + P.4	Qualitative Cost-Technical Tradeoff	Not stated
4. Swedish Highway Administration Asphalt Paving Bids	A.0 + P.1 + P.2 + P.4 + D.0	Weighted Criteria	Direct Point Scoring
5. Alaska DOT Interchange	A.0 + A.1 + P.0 + P.4 + D.1	Weighted Criteria	Direct Point Scoring
6. University of Nebraska Cleanroom	B.0 + P.0 + P.2 + P.4 + D.1	Fixed Price—Best Proposal	Direct Point Scoring
7. U.S. Army Corps of Engineers Dam	A.0 + B.0 + P.1 + P.2 + P.3 + P.4	Qualitative Cost-Technical Tradeoff	Satisficing and Adjectival Rating
8. Spanish Road Association Asphaltic Paving and Highway Maintenance	A.0 + B.0 + P.1 + P.2 + P.3 + P.4	Weighted Criteria	Direct Point Scoring
9. Minnesota DOT Highway	A.0 + B.0 + P.0 + P.1 + Q.0 + D.1	Meets Technical Criteria—Low Bid	Satisficing
10. Missouri DOT Bridge Seismic Isolation System	A.0 + A.1 + B.0 + P.1 + P.3 + Q.0 + D.0	Meets Technical Criteria—Low Bid	Satisficing
11. Washington State DOT Interchange	A.0 + B.0 + B.2 + P.0 + P.1 + P.2 + P.4 + Q.0 + Q.4	Adjusted Score	Direct Point Scoring
12. U.S. Army Corps Air Freight Terminal/Airfield	A.0 + B.0 + P.1 + P.2 + P.3 + P.4 + Q.0 + Q.4 + D.0	Meets Technical Criteria—Low Bid	Modified Satisficing
13. U.S. Forest Service Highway	A.0 + B.0 + B.2 + P.0 + P.1 + P.2 + P.3 + P.4 + Q.4 + D.1	Quantitative Cost-Technical Tradeoff	Direct Point Scoring
14. Maine DOT Bridge	A.0 + A.1 + B.0 + B.2 + P.0 + P.4 + Q.0 + Q.2 + Q.3 + Q.4 + D.1	Adjusted Bid	Direct Point Scoring
15. Sea to Sky Highway Improvement Project: Sunset Beach to Lions Bay	A.0 + B.0 + B.2 + Q.3 + Q.4 + P.0 + P.1 + P.2 + P.4 + D.1	Meets Technical Criteria—Low Bid	Satisficing
16. RFP Form of the Government of the Ontario	A.0 + P.0 + P.2 + D.1 + Q.4	Adjusted Bid	Direct Point Scoring
17. RFP Form of the Government of the Yukon	A.0 + B.0 + P.1 + P.2 + D.1 + Q.3	Weighted Criteria	Direct Point Scoring
18. Model Contract Document in England	A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4	Weighted Criteria	Direct Point Scoring
19. Forth Road Bridge Toll Equipment Replacement Project in Scotland	A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4	Weighted Criteria	Direct Point Scoring
20. Valuascollege Project in the Netherlands	A.0 + P.1 + P.2 + P.4 + Q.3 + Q.4 + D.0 + D.1	Weighted Criteria	Adjectival Rating

Four primary concepts were derived from a review of these case studies. These concepts include parameters, evaluation criteria, rating systems, and award algorithms. Figure 2.1 illustrates how these concepts can be visualized in a best-value system.

Defining best-value parameters was not a simple task for project sponsors. It is critical to identify parameters that would actually add value to a project and be defensible to the industry and the public. As a first step, the best-value parameters must be defined and categorized. These parameters can then be further analyzed to determine which evaluation criteria add value to a project and result in a transparent and defensible procurement system.

Inspection of the literature and case studies identifies a number of best-value parameters that can be mixed and matched to create a best-value procurement. Evaluation criteria associated with these general parameters can be combined to create an appropriate best-value definition, evaluation, and award system. Some of these concepts overlap with multi-parameter bidding practices, but the parameter categories described herein are more comprehensive than those described in previous NCHRP multi-parameter contracting

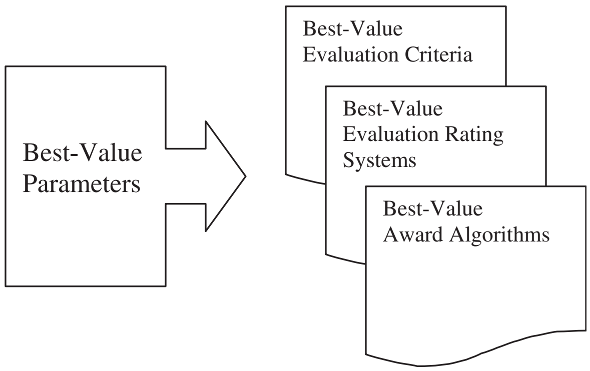


Figure 2.1. Best-value concepts.

literature (Anderson and Russell 2001). Each flows out of a combination of the following five major categories coded with a letter designation generally consistent with the literature:

- A = Cost
- B = Time
- P = Qualifications
- Q = Quality
- D = Design Alternates

The first two major categories are relatively standard components of multi-parameter contracting. However, within these generic categories several options were identified. Under the cost parameter, the options included the following initial capital cost and life-cycle cost:

- Cost = A.0
- Life-Cycle Costs = A.1

The time component includes lane rental and traffic control, which are measured in $/unit time. These will be referred to as follows:

- Time = B.0
- Lane Rental = B.1
- Traffic Control = B.2

The qualifications parameter has five major options: prequalification, past project performance, personnel experience, subcontractor information, and project management. These will be referred to as follows:

- Prequalification = P.0
- Past Project Performance = P.1
- Personnel Experience = P.2
- Subcontractor Information = P.3
- Project Management Plans = P.4

Quality has a number of variations on the theme. Some have been proposed as a component of a multi-parameter A + B + Q bid, but it is difficult to convert these concepts to a dollar or time amount in a rational way. These are referred to as follows:

- Warranty = Q.0
- Warranty Credit = Q.1
- Quality Parameter Measured with % in Limits = Q.2
- Quality Parameter Using Performance Indicator = Q.3
- Quality Management Plans = Q.4

Design issues can be a critical component of many best-value parameters. This is especially true if agencies are soliciting design alternates. These are referred to as follows:

- Design with Bid Alternate = D.0
- Performance Specifications = D.1

Finally, Incentive/Disincentive clauses often seem to be added to the mix of multi-parameter bidding particularly for time and quality parameters. Therefore, the suffix "with I/D" is added to the above generic set to indicate the use of that type of approach to contracting.

Thus, a set of potential variations on the theme of best value is created that is equal to the number of combinations that can be developed using two or more of these parameters. For example, the following would be a best-value project that has cost, schedule, prequalification, past project performance, and a quality parameter using performance indicator with incentive/disincentives:

- A.0 + B.0 + P.0 + P.1 + Q.3 with I/D

The first 14 case studies in Appendix D are presented in ascending order of the number of parameters used in the best-value decision. For example, Case 1 applies only two best-value parameters, cost and past performance, while Case 14 applies a total of eleven best-value parameters from all five categories (cost, time, qualifications, quality, and design alternates). Six case studies were added from the international CM scan project. These cases all involved multiple parameters. Unique projects have unique parameters that define the best-value system. While some projects need little more than cost and qualifications to define the best-value system, some require a complex interrelationship of a series of parameters.

In addition to the analysis of case study populations and literature review, the research team also conducted an opinion-based survey of its advisory board concerning each of the best-value concepts identified. The advisory board members were asked about their experience with each of the best-value concepts. They were then asked to rate the concepts based on chances for success and ease of implementation. Appendix E contains a copy of the advisory board survey. The results of the advisory board survey are presented at the end of this chapter, and comments from discussions with the advisory board members have been integrated into the critical analysis in this chapter.

2.4 Analysis of Best-Value Concepts

A thorough examination of the literature, case studies, and solicitation documents allowed the research team to further define and critically evaluate the best-value concepts and generate a series of advantages and disadvantages for each category. The next sections will detail that analysis for the major components including parameters, evaluation criteria, rating systems, and award algorithms.

Parameters

Cost

Best-value cost parameters generally include two options: initial capital costs of construction and life-cycle costs incurred after construction is complete. While best-value contracting seeks to award a project on a basis of other than low bid alone, cost usually plays an important part, if not the most important part, of the overall decision. In effect, the non-cost parameters are used as a way for the owner to measure the value of qualifications, schedule, quality, and design alternates. These must then be compared with the cost parameters to determine whether an increase in the project's construction cost is justified by the enhanced value brought to the project by a particular set of non-cost parameters. It may be possible to measure the impact of schedule, quality, and design alternates on the project's post-construction life-cycle cost of operations and maintenance, and thus use the other type of cost parameter as the performance metric to assess the long-term value of a particular proposal. Some of the non-cost parameters cannot be measured on either a capital cost or life-cycle cost basis, but the owner will include them based on the owner's perception of value to the project.

Cost parameters' greatest advantage in the best-value decision is that they are inherently objective. Often, the proposed bid price can be used to determine the contractor's understanding of the magnitude of the actual scope of work. Thus, an unrealistically low bid, while appearing to be a real bargain, may in fact result from the bidder's lack of competence to successfully complete the given project. This may also be cost parameters' greatest disadvantage in that public owners must have great justification to reject a bid that is unrealistically low. Additionally, public owners usually work with historic cost data such as statewide bid averages, whereas construction contractors work with current cost data obtained from their subcontractors and suppliers. Therefore, the second disadvantage lies in this disconnect between the owners' and contractors' estimating systems.

Life-cycle cost parameters' main advantage is that they permit the owner to compare the long-term advantages of competing proposals using an engineering economic analysis. State agencies will usually have the funding to complete new construction projects because most state statutes require funds to be available for public sector contracts. For federal-aid contracts, the state DOT signs a project agreement certifying that state funds will be available for the non-federal share of construction costs [23 U.S.C. Section 106(b)(1)]. However, they all have huge maintenance backlogs due to insufficient operations and maintenance funding (ASCE 2001, Ashley et al. 1998). Thus, it is quite logical for an agency to be willing to pay a marginally higher initial cost in exchange for reduced annual maintenance costs, extended design lives, or both. The difficulty in using life-cycle cost parameters lies in adequately defining the economic analysis and developing a relatively simple set of life-cycle cost input variables. Selecting arbitrary values for such important variables as the discount rate or the analysis period can have unintended consequences on the validity of the output. Thus, an owner who intends to use life-cycle cost parameters should first complete an exhaustive analysis of its algorithm to ensure that it will produce the mathematically unbiased, reliable output needed to truly make a best-value award.

Time

Best-value time parameters not only include direct contractor-proposed schedule systems such as A+B bidding, but also those methods that use lane rental and traffic control plans to indirectly influence the contractor's proposed schedule. Best-value time parameters can be objectively assessed based on cost by converting a time saving to user delay costs. However, these conversions are not yet universally accepted. The major advantage of best-value time parameters is allowing the contractor to establish a schedule that is complementary to the plan for executing the construction. These parameters also reward a contractor who proposes an aggressive schedule by making the final best-value award on a combination of both price and time, thereby allowing the price to rise as the schedule is reduced. Both lane rental and traffic control systems permit the owner to communicate the need to minimize a project's impact on the traveling public during construction. These parameters create an incentive toward innovative management of congestion in work zones and reductions in detour lengths and times by rewarding the proposal that minimizes impact on traffic flow during construction. Their disadvantage is in the selection of lane rental rates and other factors to price user construction costs. If the state highway agency is not careful when establishing rates for these variables, a bias can unintentionally be created, sacrificing construction product quality to avoid onerous lane rental charges if a planned activity gets behind schedule. One alternative (or supplement) to this approach is to consider the proposer's plan for reduction of traffic impacts as part of the proposal evaluation.

Qualifications

Best-value qualifications parameters allow the public owner to obtain some of the benefits from the historically accepted practice of a Brooks Act, Qualifications-Based Selection (QBS) used for procurement of design profession contracts. The common criticism of the traditional design-bid-build award to the low bidder, whether justified or not, is that any contractor that can produce a bid bond can bid on a project, and anyone who can post a performance bond can perform the contract regardless of past performance and professional qualifications. State agencies often use general past performance and experience criteria in their prequalification procedures to determine whether a contractor is qualified to bid. By using specific qualifications parameters in the selection process, the public agency can filter out unqualified contractors and can consider the contractor's past performance record, thereby increasing the probability that the project will be completed successfully (Gransberg and Ellicott 1996). However, the key to public sector application of qualifications parameters in a bid is the use of these parameters in the selection process. Their application must be justifiable and defensible.

Public agencies have used a broad range of evaluation criteria that fall within the best-value qualifications parameter. The first advantage of using best-value qualification parameters is the ability to restrict competition to contractors who have a proven track record of successfully completing a specific type of highway construction project, ensuring that all bidders will have the technical skills and experience to produce a high quality product. Additionally, by not forcing bidders to compete with less qualified contractors, the owner will also receive a bid price that accurately reflects the scope of work and adequately compensates the contractor for assuming the project risk. This reduces the probability of a bid error and its attendant repercussions with respect to quality and timely completion. The third advantage is the ability of the owner to influence the general contractor's subcontracting plan by elevating the importance of small business participation. Thus, a contractor may increase its potential to win the best-value contract by teaming with small business subcontractors. The final advantage is the ability to review and rate contractor project management plans before the contract is awarded.

The disadvantage associated with qualifications parameters mainly concerns the possibility of creating barriers to contractors who wish to participate in the competition but who cannot meet the narrow or unrealistically restrictive qualification requirements. This leads to potential accusations of favoritism, bid protests, and possible political difficulties during construction. However, these concerns can be minimized by making the qualifications parameters match the project's specific requirements and ensuring that the best-value award system is published and totally transparent to industry (Parvin 2000).

Quality

The major advantage of using best-value quality parameters is the ability to review and rate contractor quality management plans before the contract is awarded. This has the potential to change the whole dynamic of quality management from an adversarial, compliance-based system to a competitive, award-to-the-best-plan system. Coupling this with some form of warranty or performance-based acceptance indicator creates a situation where the focus of the proposal is toward delivering quality. Contractors will have an incentive to deliver the quality as promised if they will likely be judged on this performance in future projects. Some of the case studies actually put an extended warranty pay item in the bid form, thus creating an environment that communicates the owner's willingness to pay for the desired level of quality. One concern regarding this approach is that various factors may affect the functional ability of the owner to enforce an extended warranty after construction is complete. Warranties will be formed with restrictive and exclusionary language that the owner's facility operators must understand to avoid unintentionally invalidating the warranty through some error or omission. However, quality parameters included in the RFP and enhancements included in the contractor's proposal would become part of the final construction contract and are therefore enforceable through standard contractual procedures. However, it should be noted that some agencies prefer not to include the proposal as a contract document, because of concerns that it may not fully meet all RFP requirements. This concern can be addressed through appropriate contract language making it clear that the RFP prevails in the event that the proposal is noncompliant. If the proposal is not included in the contract documents, it is highly advisable to make sure that any features of the proposal that were the basis of the selection decision are incorporated into the contract, so that the contracting agency obtains the benefit of the bargain.

Design Alternates

Design criteria are a component of many best-value procurements, particularly when highway agencies are soliciting bid alternates under design-bid-build or using a design-build delivery method. Design alternates have advantages and disadvantages, depending on the delivery method.

The major disadvantage of using best-value design alternate parameters for design-bid-build projects relates to design liability considerations. In design-build, the owner sheds most of the design liability and transfers it to the design-build contractor who becomes a single point of responsibility for both design and construction issues. However, when an owner only allows a narrow amount of contractor-determined design scope, the responsibility for coordinating the contractor-proposed elements of work with the rest of the owner-designed construction project becomes less clear.

One advantage of requesting design alternates is that it opens the door to potentially innovative design solutions for a specific design problem. Sometimes the design alternate could be a better material or a more efficient construction process. At other times, it could take advantage of a drop in the cost of a desirable material or system. In both cases, the construction contractor who is aware of the latest developments in materials and technology in its section of the industry will usually be in a better position to turn a design alternate into a timely advantage for a public agency's project.

Highway agencies have experimented with alternate bids for specific materials, construction items, or pavement types with some success and evaluated the value received in terms of life-cycle cost analysis. The State of Missouri experimented with five competitively bid pilot projects in 1996 using portland cement concrete and asphaltic concrete pavement alternates. The specifications for these projects included an adjustment factor added to each asphalt concrete bid to reflect higher future rehabilitation costs during the chosen 35-year design period. For example, based on historical records, the asphalt pavement would need rehabilitation at 15 and 25 years versus 25 years for concrete. Certain assumptions were made regarding the design life (35-year analysis period), future construction and maintenance costs, salvage values, and the discount rate, to calculate the life-cycle costs for each alternative for an equivalent analysis period. Of the five projects let, the low bidders used asphalt for three projects and concrete for two projects (Missouri 1994).

The findings reported by Missouri indicated that

- Alternate bids were in line with comparable projects and engineering estimates, and provided a savings through increased competition.
- The asphalt and concrete industry questioned the assumptions made regarding the expected design life, maintenance expenditures, pavement thicknesses, and rehabilitation needs to create a level playing field between the two alternates.
- The state determined that life-cycle costs for the pavement alternatives need to be further refined to ensure that comparisons are made on an equivalent basis and all future costs are taken into account.

The success of bid alternates depends on the use of proven designs specified by the owner that can be evaluated for life-cycle costs on a reasonably equivalent basis.

In summary, public agencies can create a set of potential variations on the theme of best value that is equal to the number of statistical combinations that can be developed using two or more of the above best-value parameters. Looking at the case study projects, it is apparent that agencies have been experimenting with these variations in recent years. The case studies provide examples of agencies applying anywhere from two to eleven best-value parameters to a procurement from any or all of the best-value parameter categories. One conclusion emerging from this experience with best-value parameters is that *the owner should customize the parameters for the needs of the given project rather than strive to find a one-size-fits-all standard system*. To do otherwise would probably reduce the effectiveness of the project delivery system and create a procurement environment where minimal value, if any, could be accrued. In this vein, public agencies should also keep in mind that in many cases the tried and true design-bid-build and low-bid award system may indeed be the best delivery method for a specific project.

Evaluation Criteria

After defining the best-value parameters for a project, the agency must create an evaluation and award plan. This evaluation plan will involve determining best-value evaluation criteria from the previously mentioned parameters, defining evaluation criteria rating systems, and defining a best-value award algorithm.

Best-value evaluation criteria include those factors, in addition to price, that add value to the procurement. Evaluation criteria vary on each project as illustrated in the detailed case studies in Appendix D. In addition to the detailed case studies, the research team summarized the best-value and evaluation criteria from 50 RFPs as shown in Table 2.2, which illustrates the additional information gleaned from the analysis of best-value RFPs collected during Phase I of this study. Those solicitation documents included both vertical (building) projects and horizontal (transportation/utility) projects. The population concentrated on design-bid-build/best-value RFPs specifically, but as best-value contracting is in its infancy in highway construction, the population also looked at design-build projects to find those types of evaluation criteria that would easily be translated to design-bid-build/best-value contracts. The vertical projects were surveyed for the same reason. It can be seen that most of the criteria fit into one of the best-value parameter definitions. Public agencies also must include regulatory evaluation criteria to comply with their local procurement law constraints. Additionally, the team conducted interviews, surveys, and case studies associated with the International Construction

Table 2.2. Summary evaluation criteria as identified with best-value parameter from case study project population.

Evaluation Criteria (1)	Best-Value Parameter	Number of Contracts Using Evaluation Criteria (Total = 50) (2)
Price Evaluation	A.0	42
Low Bid	A.0	7
Life-Cycle Cost	A.1	2
Project Schedule Evaluation	B.0	19
Traffic Maintenance	B.2	3
Financial & Bonding Requirements	P.0	35
Past Experience/Performance Evaluation	P.1	44
Safety Record (or Plan)	P.1	25
Current Project Workload	P.1	17
Regional Performance Capacity (Political)	P.1	4
Key Personnel & Qualifications	P.2	41
Utilization of Small Business	P.3	30
Subcontractor Evaluation/Plan	P.3	29
Management/Organization Plan	P.4	31
Construction Warranties	Q.0	11
Construction Engineering Inspection	Q.2	1
Construction Methods	Q.3	1
Quality Management	Q.4	27
Proposed Design Alternate & Experience	D.0	26
Mix Designs & Alternates	D.0	2
Technical Proposal Responsiveness	D.1	37
Environmental Protection/Considerations	D.1	25
Site Plan	D.1	5
Innovation & Aesthetics	D.1	5
Site Utilities Plan	D.1	1
Coordination	D.1	1
Cultural Sensitivity	D.1	1
Incentives/Disincentives	I/D	4

Management Scan. This information is not shown in Table 2.2, but is incorporated into the analysis that follows the table.

Looking at Table 2.2, one can see that cost and qualifications criteria are used most in all types of best-value contracts. Cost and qualifications criteria are used most in the international projects as well. Past performance, qualifications of key personnel, and subcontracting/small business plans are the most popular of the qualifications parameter criteria. Of the six international projects reviewed, five used past project performance and six considered qualifications of key personnel. In the quality parameter group, evaluation criteria for quality management planning and warranties led the category. In the design parameter, criteria specifying an evaluation of technical proposals were used in the majority of the RFPs. The heavy use of this criterion must be compared with the use of the "proposed design alternates" criterion to understand the amount of design detail the agencies were willing to allow the contractor to apply to the project. Fifteen of the case study projects using the "proposed design alternates" criterion were design-build projects requiring evaluation of proposed alternates. The other 11 projects were design-bid-build projects where the agency asked for a design alternate for evaluation. Proposed environmental protection measures were also a popular aspect of design information that public agencies wanted to evaluate. Finally, among the design-related evaluation criteria, proposal responsiveness was the preeminent criterion as would be expected.

The crux of communicating the requirements and selecting the best-value parameter for a project is in the owner's development of definitive evaluation criteria. These criteria articulate the quality, cost, schedule, and qualifications requirements for a given project. These criteria are the basis of the best-value procurement and become the foundation for the final contract. The evaluation criteria that were identified in the best-value case studies have been placed into four categories:

- Management
- Schedule
- Cost
- Design Alternate

Each of these evaluation criteria categories corresponds to the parameters discussed in Section 2.4. Keep in mind, however, that the management category includes both qualifications and quality parameters.

Management

A strong argument can be made that the success of the best-value project depends on the people and organizations that are selected to execute it. This is because a well-qualified construction team with highly experienced team members can probably sort out the post-award technical issues regardless of the quality and clarity of the technical requirements in the solicitation. Management criteria come in three general varieties:

- Qualifications of the individual personnel
- Past performance of the organizations on the best-value team
- Plans to execute the project

Many public owners include schedule in the management-planning portion of their best-value solicitations, but because it is a unique and overarching feature of the project environment, it will be dealt with individually in the next section.

Individual qualifications can generally be placed into to two broad categories. The first category is the professional credentials held by the individuals, that is, personal credentials that qualify an individual to perform a specific function on a team. One obvious requirement is proper licensure in the state in which the project will be built. This and certain other qualifications requirements are mandated by law and would have to be met even if not specifically articulated in the solicitation. However, to avoid potential misunderstandings, it is good practice to publish evaluation criteria that are at least minimally responsive to legal requirements. In certain cases, it may be advisable to include requirements that exceed the minimum legal standards.

The next category of qualifications is specific experience requirements. It is critical to the success of a project for the key members of the contractor's team to have experience building similar projects. However, in developing evaluation criteria for personal experience, owners must not be arbitrary in setting the performance standard. For example, a requirement for the project superintendent to have 20 years of experience working on a particular type of project or on projects with a particular agency would probably exclude many individuals who would be qualified for the job. In setting the experience requirements, agencies should also keep in mind that seniority requirements will drive up the personnel costs while reducing the competitive field of qualified candidates, and that high seniority requirements may exclude individuals who could perform the work competently even though their level of experience may be short of the arbitrary mark set in the solicitation.

The past performance of the organizations is a criterion often used in prequalification and in most best-value solicitations—this is understandably the case because one of the reasons owners are interested in a best-value approach is to ensure that they can select the best contractor for the job. However, there are a number of issues associated with this criterion, and the contracting authority must carefully consider how to implement it such that it is accurate and unbiased and should evaluate the pros and cons when making the decision to use past performance in the evaluation. The federal government and a number of state agencies have for many years maintained a database of contractor evaluations on past projects and often use this resource as a means to measure the contractor's track record. Despite certain drawbacks, this appears to be the best means of assessing past performance as it allows contractors the opportunity to appeal negative ratings. However, this type of system has been accused of being resource intensive, overly subjective or biased, and subject to challenge. Owners that do not have such systems in place may decide to address past performance by asking for evaluations from project owners for similar projects completed by the contractor in the recent past, often asking for specific data relating to schedule, cost, and claims performance on those specific projects. The use of these metrics can be controversial due to concerns relating to due process because the contractors do not have the opportunity to object to negative ratings and because of concerns regarding the validity of the information obtained. Careful consideration should therefore be given to a decision to use such a process to ensure that appropriate questions are asked and that the results are both fair to the contractor and useful to the owner.

The Ontario Ministry of Transportation (MTO) in Canada has developed a system to rate consultants' and contractors' past performance, which it began to implement in 2001. The Registry, Appraisal and Qualification System (RAQS) is used to prequalify consultants and contractors and is also used in what would be considered best-value selection in this report (Ministry of Transportation 2004). In addition to measuring financial status, the RAQS uses performance appraisals and infraction reports at the end of each project (no interims) to establish an overall performance rating. The rating is maintained on a 3-year rolling average basis. Penalty adjustments are made for poor performance through an infraction process and contractor performance rating system. The MTO's use of RAQS has enhanced their prequalification process and has allowed them to completely eliminate performance bonding requirements for all construction contracts—saving approximately $2 million per year (Minchin and Smith 2001).

The MTO's use of the performance rating is demonstrated by how they rate consultants to perform construction administration. These consultants are selected on a combination of price, performance, and quality, at assigned percentages of 20%, 50%, and 30%, respectively. The system they have developed for conducting this assessment is called the Consultant Performance and Selection System (CPSS), which yields a Corporate Performance Rating (CPR). The following is a description of the consultant selection process taken from the CPSS Procedures Guide (Ontario Ministry of Transportation 2003; See RAQS website <https://www.raqsa.mto.gov.on.ca/>[viewed July 2004]

Corporate Performance Rating

- Past performance is measured by a consultant's CPR, which is the weighted-average of a consultant's appraisals over the last 3 years.
- Appraisals for all types of capital project consultant assignments are included to calculate corporate CPR for each consultant. The CPR of a consultant firm is calculated by the following equation:

$$\text{CPR} = \frac{3(\text{Avg.Yr. }1) + 2(\text{Avg.Yr. }2) + 1(\text{Avg.Yr. }3)}{6}$$

Avg. Yr.1 = Average of all appraisals within the most recent 12 months

Avg. Yr.2 = Average of all appraisals in 12 months prior to Year 1

Avg. Yr.3 = Average of all appraisals in 12 months prior to Year 2

- The following applies for calculating CPR:
  - When a consultant assignment is completed, an appraisal will be completed for the prime consultant only. A prime consultant is defined as the party who has signed the legal agreement with the MTO. Appraisals will not apply to subconsultants.
  - In the case of consortiums or legal partnerships, one overall performance appraisal rating for the assignment will be completed. This rating will apply to each member of the consortium or partnership.
  - The MTO's RAQS automatically calculates CPR on a quarterly basis, for each consultant, using past performance appraisals (e.g., January 1, April 1, July 1, and October 1).
  - Only "approved" performance appraisals are included in the CPR calculation. An appraisal is "approved" if the consultant signs off the Performance Appraisal Form or does not respond within the 30-day time limit (to request a formal review). In case of a request by a consultant for a formal review, the appraisal is not considered approved until the completion of the regional manager review stage or the Qualification Committee review stage, depending on how far the consultant chooses to proceed with the review.

Matters such as past experience, financial capability, bonding capacity, and other measures of financial solvency do not present the same issues as past performance criteria, since they can be more readily determined in an objective manner. Experience requirements can readily be defined with reference to years of experience, number of similar successful projects, or a similar measure (Vacura and Bante 2003). Owners may also establish criteria for past joint performance or experience of the various members of the contractor's team such as major subcontractors and specialty consultants.

The final category of management evaluation criteria that is typically included in a best-value procurement deals with the contractor's management plans to execute the project. These plans can cover a multitude of issues that are important to the owner. The rule of thumb for deciding which plans to evaluate is to ask for those that cover areas that are critical to project success and will assist the owner in making the best-value award decision. It is a waste of both the owner's and the proposer's resources to require that the plan include aspects that are not significant to the project award decision. Thus, a solicitation might only ask for a specific solution to a critical construction safety problem rather than an entire project safety plan. The owner should develop proposal requirements that will enable the competitors to focus their limited resources available for preparation of proposals on submitting highly responsive proposals that address the key issues of the given project.

The key plans that are addressed in most best-value solicitations are as follows:

- Construction quality management
- Safety
- Traffic control/congestion management
- Environmental protection
- Logistics management
- Public outreach and information
- Small business participation
- Other management plans that are important to making the best-value award decision

Table 2.3 shows the typical types of management evaluation criteria that were found in the case study data collection effort. When comparing these criteria with the associated number of occurrences for each type of criteria in Table 2.2, one finds that public owners currently use a wide range of management evaluation criteria to arrive at a best-value award decision. Thus, those agencies that are considering the implementation of best-value contracting have a broad base of public experience from which to draw.

England, Finland, the Netherlands, and Scotland all include quality management plan in their evaluation criteria (Case Studies 18–20). Both Ontario and England have developed annual quality management rating systems that are used for both prequalification and best-value award.

Table 2.3. Case study management evaluation criteria.

Management Evaluation Criteria (1)	Best-Value Parameter (2)
Financial & Bonding Requirements	P.0
Past Experience/Performance Evaluation	P.1
Safety Record (or Plan)	P.1
Current Project Workload	P.1
Regional Performance Capacity (Political)	P.1
Key Personnel & Qualifications	P.2
Utilization of Small Business	P.3
Subcontractor Evaluation/Plan	P.3
Management/Organization Plan	P.4
Construction Engineering Inspection	Q.2
Construction Methods*	Q.3
Quality Management	Q.4

* Owner's specialized means and methods to achieve desired quality levels.

The Ontario Government requires a quality management plan in the previously mentioned RAQS. To be qualified to bid construction contracts that require a qualification rating, contractors are required to submit a declaration showing that they have a Quality Management System (QMS). A QMS replaces traditional quality control (QC) plans as the "quality component" of the MTO's qualification requirements. Contractors who wish to remain qualified, or become qualified, to bid for major MTO construction contracts must choose one of the following approaches:

- Alternative 1: Annual declaration that the QMS meets MTO's minimum requirements
- Alternative 2: Annual declaration that the Company is certified to ISO 9001 quality management standard

To assist the qualifications based procurement, the Highways Agency in England has recently developed the CAT (Highways Agency 2003). The CAT is a system for contractors' self assessment of their capabilities, which are combined with a past performance rating to develop a qualification based score for procurement. The system relies heavily on a company's strategic management and quality management plans to establish the ratings. The CAT is a very structured qualifications assessment tool that was developed in consultation with industry. The CAT was developed using principles that underpin a number of business excellence models. The CAT considers what companies need to do to be effective. The CAT relies on the following capability attributes:

1. Direction and leadership
2. Strategy and planning
3. People
4. Partnering
5. Processes
6. Internal resources

The following website contains detailed information on the implementation of the CAT process and how each of these attributes are scored:

http://www.highways.gov.uk/roads/705.aspx

Schedule

Developing schedule evaluation criteria for the best-value selection is more than just setting a contract completion date. Anything that the owner knows that might have a material impact on the schedule must be disclosed in the solicitation. If the schedule is an item of competition (i.e., the owner allows the offerors to propose the schedule), definitive evaluation criteria must be established against which the proposal evaluation panel can rate the various proposals. Schedule criteria can be categorized in four general forms:

- Completion criteria
- Intermediate milestone criteria
- Restrictive criteria
- Descriptive criteria

Developing completion criteria is quite straightforward. If the proposal date is set, the RFPs could simply provide that submittal of a proposal constitutes a commitment to complete by the stated date, or they could include a pass/fail requirement, such as the following statement:

> The proposal shall include a commitment to complete the project no later than [date].

However, if the owner wants to ask the proposers to consider whether it will be possible to accelerate project milestones or project completion and take into account commitments to accelerate the schedule as part of the best-value evaluation, the RFPs for proposals will need to communicate the owner's wishes to the proposers. In addition, the evaluation plan and rating system must give schedule an appropriate weight among all other rated categories. One way to communicate this concept is as follows:

> Offerors shall submit their proposed completion date and a critical path schedule that supports a completion no later than (date). Completion before that date is highly desirable, and proposals with an early completion will be given preference.

Intermediate milestone criteria are called for if the owner needs to control the pace of the project. Often these criteria can be applied to those aspects of the project's progress that are not completely controlled by either the owner or the contractor, such as the need to obtain permits from outside agencies. Another example would be a requirement to complete a portion of the project to be placed in service in advance of completion of the entire project or to require certain work to be completed before proceeding with other work, a process commonly called "phased construction." An example of this type of performance requirement is as follows:

> The critical path schedule shall show completion of all Phase I construction including receipt of all digging permits by (date). No Phase II work will proceed until Phase I work and permits have been inspected and accepted by the owner.

Constraints that would prevent the contractor from being able to complete as fast as possible must be disclosed and are required to be included in the schedule. Items such as work hour restrictions, prohibition on performance of work during specified periods of time, limitations on work on holidays, and security precautions might all be addressed. The owner may request maintenance of traffic plans as part of the proposal and evaluate them in determining best value. An example of RFP language dealing with noise restrictions follows:

> The contractor shall minimize the use of construction means and methods that require the production of loud noise levels. The critical path schedule shall highlight in green those activities that routinely produce noise levels in excess of XX decibels. Those activities may not take place during normal business hours of 8:00 a.m. to 5:00 p.m., Monday through Friday nor late at night on any day of the week between the hours of 10:00 p.m. and 6:00 a.m. Additionally, the proposal will contain a calendar that shows those periods in which loud activities will be planned. Those proposals that show the fewest number of days that exceed the prescribed noise limit will be preferred.

Descriptive schedule requirements are used to establish a uniform format for the proposal's schedule-related submittals. The underlying concept is to put all proposals on a level playing field and thus facilitate equitable evaluation. In developing these criteria, the owner should seek to minimize the "bells and whistles" on the schedule submittals reducing the submittal requirement to a stark, easy to analyze document. One way to do this is as follows:

> The critical path schedule shall be displayed as a bar chart with no more than 50 activities. The following major milestones shall be shown on the chart along with their associated completion date: (list of milestones such as major submittal completions, construction phase completions, final acceptance, etc.).

Additionally, the owner can include recommendations in the RFP to influence the approach the contractor takes to the scheduling of the project. Table 2.4 lists different approaches to schedule evaluation found in the case study data collection effort. Table 2.2 shows the public agencies that constitute the case study population have frequently used best-value procurement to accelerate completion through an A+B formula and have also evaluated different approaches to traffic maintenance.

Cost

Properly written proposal submittal requirements give the owner an opportunity to obtain cost information from proposers allowing the owner to understand the best-value contractor's thought process in developing the proposal and to obtain a competitive break-down of project costs to use later in change order negotiations. Often, cost information required to be included in the proposal can help communicate the relative importance of cost in the best-value award decision. Cost information can range from a simple requirement to provide a lump sum amount to a complex requirement to provide detailed elements of a build-operate-transfer

Table 2.4. Case study schedule evaluation approaches.

Schedule Evaluation Criteria (1)	Best-Value Parameter (2)
Project Schedule Evaluation (A+B)	B.0
Project Completion	B.0
Traffic Maintenance	B.2

financing scheme. Generally, three types of cost information requirements and associated evaluation were found:

- Cost limitations
- Cost breakdowns
- Life-cycle costs

Cost limitations include cost constraints applicable to the project as well as cost-related goals for the project. Many solicitations contain only a single cost criterion: the proposed price. The following is a list of typical cost limitation criteria set by the owner:

- Maximum price
- Target price
- Funds available
- Public project statutory limits
- Type of funding
  - Multiple fund sources
  - Fiscal year funding

A maximum price criterion is a cost constraint that defines the allowable cost ceiling for the project. This criterion creates a constraint on the technical scope of work. In essence, the proposal must be developed within the limits established by the cost constraint, and the final proposal must not only comply with all the technical and schedule performance criteria but it must also be able to be delivered at or below the maximum allowable price to the owner. Thus, if the owner is providing the project design, measures must be taken to ensure that the design is consistent with the budget ceiling. This type of criterion would be used in the fixed price-best proposal best-value award algorithm. The following is an example of this type of requirement:

> The final firm fixed price shall not exceed $XX,XXX.

A target price criterion operates in much the same manner as the maximum price criterion but is less restrictive. It conveys the level of overall quality the owner desires using financial rather than technical terms. Target price criteria are often stated as unit prices rather than lump sum amounts. The owner uses these criteria to constrain the proposed design alternates to proper cost levels and to help guide the contractor's proposal development and to ensure that the proposed solution will be one that fits the owner's intent. These criteria all serve to make these cost limitations a part of the final contract. For instance, requirements relating to a target price criterion using a lump sum amount would be as follows:

> The landscaping around bridges, interchanges, and rest areas, including sodding, trees, and plantings shall cost $XX,XXX ± Y% per site. The proposal shall contain a narrative describing the details of the proposed landscape plan for a typical area.

Thus, the owner in this example is effectively telling the contractor the price payable for a specific feature of work and asking to be told how much quality will be provided in exchange for that fixed amount of money. Specifically, the contractor will be competing with other bidders to furnish as much landscaping as possible for the target price.

Cost breakdown criteria establish a means for the owner to better understand the basis of the contractors' price proposals and help establish the foundation on which the cost of change orders and contract modifications will be negotiated. Under typical unit priced contracts for highway construction, this cost breakdown is essentially provided in the bid form. As previously stated, the price proposal is one mechanism that the owner has to evaluate the contractor's understanding of the scope of work. Typically, the owner will have conducted its own estimate and will use this as a yardstick to measure the quality and completeness of each price proposal. (For federal-aid contracts, the owner's estimate will be reviewed as part of the price reasonableness analysis conducted for such projects.) The owner may also use cost breakdown criteria to evaluate the realism and reasonableness of each feature of work's value. An example of this is shown as follows:

> The price proposal shall be broken out as shown on the Price Proposal Form. To be deemed responsive, the value of each feature of work shall not fall outside the range of ± 5% of the independent estimate for that feature of work. If any item does, the contractor will be so informed during discussions and asked to justify its proposed price in greater detail in its final proposal.

Best-value procurement also allows an owner to take a longer look at the project's ultimate costs and consider including life-cycle costs in the evaluation process, in addition to initial capital cost. Life-cycle cost criteria can be addressed through design alternates such as asking the contractor to propose the type of pavement it will use or through requirements such as pricing of extended construction warranties that "lock in" future costs of maintenance and rehabilitation. Research has shown that the calculation of project life-cycle cost is a relatively straightforward application of engineering economics (FHWA 1993). However, additional work is needed to form the algorithm by which a fair and equitable decision can be made as to the accuracy of the calculation.

When using life-cycle cost criteria, the public owner must be aware of the actual ability of the offerors to guarantee a specific life-cycle cost for a given project. With the tools available at this writing, the only means by which an owner can "lock in" a discrete value for annualized life-cycle costs is to award a contract that includes long-term operations and maintenance, long-term maintenance, or a long-term warranty. Such contracts are not common for highway projects and are most likely to be used for revenue generating projects such as toll roads. Proposals for a Design-Build-Maintain highway contract would include the price for the initial capital improvements, annual maintenance costs, and the costs of capital asset replacement necessary to ensure that the project will meet the specified standards at the end of the maintenance period prior to transfer of maintenance responsibility to the owner. The owner would evaluate the technical and price proposals, determine which proposer offered the best value based on the criteria specified in the RFPs, and would award the contract to the proposer offering the best value. To a significant extent, the risk that the actual costs will exceed their contract values is transferred to the contractor. Such contracts typically provide for certain types of costs to be passed back through to the owner; contractors are generally opposed to accepting a total transfer of the risk except in the context of public-private partnerships where the private sector is granted a franchise to collect revenues. This approach has the advantage of tying the best-value contractor financially to the actual success of the project after construction is complete. Thus, construction decisions will be made in the context of operability and maintainability rather than merely minimizing construction cost while delivering the specified standard of quality.

The other method that an owner can use to ensure a project's life-cycle cost after construction completion is using extended warranties, maintenance bonds, or both. The first approach requires the contractor to come back to the project to repair any defects in the project; the second would give the owner the right to call on the bond if project operation and maintenance costs exceed those promised in the winning proposal. It should be noted that the current surety market will not support bonds longer than 5 years. Also, as time passes the owner's ability to call on either a warranty or a maintenance bond will be subject to the defense that the defect was caused by the owner's failure to maintain or improper use. The owner bears the risk in both cases that the winning contractor or surety may have gone out of business by the time a claim is made.

Table 2.5 synopsizes the cost evaluation criteria that were found in the case study population. Life-cycle cost criteria were only found in two of the cases, and eleven cases used extended warranties. Most of the cases used some form of price evaluation beyond comparing low bids.

Design Alternates

Bidding of design alternates on highway construction projects is not a new concept, but it is not a common practice in the United States.

Nevertheless, traditional highway construction projects often contain limited requirements for design alternate components such as contractor-furnished/DOT-approved asphalt and concrete mix designs within owner established limits that are created as construction submittals, and such projects can be reviewed to determine how to factor design alternates into a best-value procurement. In addition, there is an extensive body of knowledge relating to evaluation of design alternatives for design-build projects. The only real difference between use of design alternates for design-bid-build highway projects and use of design alternates for design-build highway projects lies in the scope of the proposed design work. In the arena of best-value competitive sealed bidding, contractors will only be asked to propose design solutions for a very narrow, discrete portion of the contract scope or a "pre-engineered" component. The amount of design work involved does not affect the process to be followed in evaluating the merits of the design proposal, and as a result, knowledge gained in review of design-build proposals should be directly transferable to evaluation of design alternatives in connection with competitive sealed bid procurements.

Table 2.6 shows typical design alternate evaluation criteria that were found in the case study population.

Best-Value Evaluation Rating Systems

Public owners have used a variety of evaluation (scoring or rating) systems. Many are quite sophisticated and some are quite simple. All can generally be categorized into the following four types of systems (see Figure 2.2):

- Satisficing (more commonly called "Go/No-Go")
- Modified Satisficing
- Adjectival Rating
- Direct Point Score

Table 2.5. Case study cost evaluation criteria.

Cost Evaluation Criteria (1)	Best-Value Parameter (2)
Price Evaluation	A.0
Low Bid	A.0
Life-Cycle Cost (of alternatives)	A.1
Construction Warranties	Q.0

Table 2.6. Case study design alternate evaluation criteria.

Design Alternate Evaluation Criteria (1)	Best-Value Parameter (2)
Proposed Design Alternate & Experience	D.0
Mix Designs & Alternates	D.0
Technical Proposal Evaluation	D.1
Environmental Protection/Considerations	D.1
Site Plan	D.1
Innovation & Aesthetics	D.1
Site Utilities Plan	D.1
Coordination	D.1
Cultural Sensitivity	D.1

Satisficing

Satisficing is the simplest and easiest evaluation system to understand for evaluators and bidders. To use it, the evaluation planner must establish a minimum standard for each and every evaluation criterion against which the proposals can be measured. This is relatively simple for certain kinds of criteria such as qualifications standards. Satisficing is often referred to as "Go/No-Go" by the industry.

According to U.S. Army Materiel Command, the definition of evaluation standards is "a baseline level of merit used for measuring how well an offeror's response meets the solicitation's requirements. Standards are usually a statement of the minimum level of compliance with a requirement which must be offered for a proposal to be considered acceptable." Given these minimal values, the evaluators decide whether or not alternatives are acceptable. Because of its strong intuitive appeal, satisficing has long been used as an assessment technique (MacCrimmon 1968). With the satisficing method, it is possible to successively change the minimal requirements and hence to successively reduce the feasible set of alternatives. Numerical information about values is unnecessary, but can be used just as easily if the information happens to come in numerical form.

Satisficing is an "all or nothing" process, thus it is not critical to determine an accurate value for alternatives. An alternative is either acceptable or not acceptable. An alternative that exceeds the minimum would merely be considered acceptable, regardless of the amount of value added. The main advantage of satisficing is that it can be used to reduce the number of alternatives to be evaluated. On the other hand, satisficing would not be an appropriate evaluation methodology for alternatives where the project owner wishes to take value-added features into account.

Modified Satisficing

Modified satisficing recognizes that there may be degrees of responsiveness to any given submittal requirement. As a result, the range of possible ratings is expanded to allow an evaluator to rate a given category of a proposal across a variety of degrees. Thus, a proposal that is nearly responsive can be rated accordingly and not dropped from the competition due to a minor deficiency. Additionally, an offer that exceeds the published criteria can be rewarded by a rating that indicates that it exceeded the standard. Modified satisfied systems usually differentiate between minor deficiencies that do not eliminate the offeror from continuing in the competition and major or "fatal" deficiencies that cause the proposal to be immediately rejected. It is important for owners to include the definition of a fatal deficiency and its consequences in the solicitation. The simplest of the forms of modified satisficing that are currently in use is the "red-amber-green" system with the definitions for each rating are as follows:

- Green—fully responsive to the evaluation criteria
- Amber—not responsive, but deficiency is minor
- Red—not responsive due to fatal deficiency

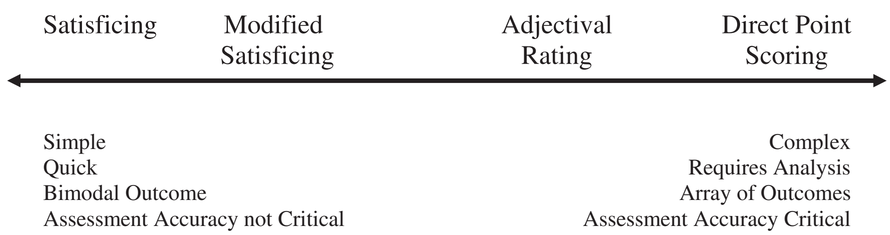


Figure 2.2. Best-value evaluation rating system continuum.

Table 2.7. Modified satisficing examples (USAED, New York 2002; U.S. Air Force 2001).

Army Rating	Definition	Air Force Rating	Definition
Dark Blue	Proposal meets the minimum SOLICITATION requirements for this item and has salient features that offer significant advantages to the Government.	Blue	Exceeds specified minimum performance or capability requirements in a way beneficial to the Air Force.
Purple	Proposal meets the minimum SOLICITATION requirements for this item and has salient features that offer advantages to the Government.	N/A	N/A
Green	Proposal meets the minimum SOLICITATION requirements for this item.	Green	Meets specified minimum performance or capability requirements necessary for acceptable contract performance.
Yellow	Proposal meets most of the minimum requirements for this item, but offers weak area or mimics SOLICITATION language rather than offering understanding of the requirements.	Yellow	Does not clearly meet some specified minimum performance or capability requirements necessary for acceptable contract performance, but any proposal inadequacies are correctable.
Red	Proposal meets some but not all the minimum requirements for this item or does not address all required criteria.	Red	Fails to meet specified minimum performance or capability requirements. Proposals with an unacceptable rating are not awardable.

The next step in the modified satisficing evaluation process is to roll-up the individual ratings for each evaluation criterion and arrive at an overall rating for each proposal. Table 2.7 shows the approach used in solicitations from two military best-value projects. One notices that both agencies use color coding to make it easier to identify the areas in which a particular proposal offers advantages to the government. The Army distinguishes between proposals that offer advantages to the government and those that offer significant advantages, while the Air Force provides only one category for proposals that exceed the minimum requirements.

The reader should note that the examples of modified satisficing evaluation systems in Table 2.7 are not examples of the standard for all projects in either of the two military departments. They were pulled from solicitations that were developed specifically for the projects for which they were written. They do furnish excellent examples of how two different owners defined the ratings that were used on two typical projects. Additionally, the reader should note that the definitions shown in Table 2.7 were published in the respective RFPs. Thus, the contractors were cognizant of the evaluation scheme and could craft their proposals accordingly. It should also be noted that the definition of each rating is clear and offers a standard against which the evaluators can measure each individual proposal.

Adjectival Rating

Adjectival rating systems use a specific set of adjectives to describe the conformance of an evaluated area within a proposal to the project's requirements in that area. Adjectival rating systems are an extension of modified satisficing. They recognize that a more descriptive rating system is in order and that the rating system should be continuous rather than discrete. Table 2.8 illustrates how one owner developed a series of adjectival criteria to rate different components of a proposal.

There are three important elements of an adjectival rating system:

- Definitions
- Performance indicators
- Differentiators

Each adjectival rating must have all three. The definition must be both clear and relevant to the specific factor being evaluated. It should portray to the evaluators the essence of what the evaluation plan writer intends to be identified and rated. In the example provided in Table 2.8, the definition provided for "Proposal Risk" indicates that evaluators are to assess and rate the "weaknesses and strengths associated with the proposed approach as it relates to accomplishing the requirements of the solicitation." Following along with this example, the rating will take the form of one of three adjectives, "high," "moderate," or "low." Each of these adjectives is then defined in terms of a performance indicator that is cogent to the factor that is being evaluated. The evaluators will use the indicator as a marker with which to determine the appropriate rating for the evaluated element. Again looking to the example provided in Table 2.8, the performance indicators associated with proposal risk include the potential to disrupt the schedule, increase costs, or degrade performance. To assist the evaluators with those proposals that seem to

Table 2.8. Example adjectival rating for three different evaluated areas (U.S. Air Force 2001).

Evaluated Area / Adjectival Rating	Evaluation Plan Definition
PROPOSAL RISK	Proposal risk relates to the identification and assessment of the risks, weaknesses and strengths associated with the proposed approach as it relates to accomplishing the requirements of the solicitation.
High	Likely to cause significant disruption of schedule, increased cost, or degradation of performance. Risk may be unacceptable even with special contractor emphasis and close government monitoring.
Moderate	Can potentially cause some disruption of schedule, increased cost, or degradation of performance. Special contractor emphasis and close government monitoring will probably be able to overcome difficulties.
Low	Has little potential to cause disruption of schedule, increased cost, or degradation of performance. Normal contractor effort and normal government monitoring will probably be able to overcome difficulties.
PERFORMANCE RECORD	More recent and relevant performance will have a greater impact on the Performance Confidence Assessment than less recent or relevant effort. A strong record of relevant past performance will be considered more advantageous to the government.
Exceptional High Confidence	Based on the Offeror's performance record, essentially no doubt exists that the Offeror will successfully perform the required effort.
Very Good Significant Confidence	Based on the Offeror's performance record, little doubt exists that the Offeror will successfully perform the required effort.
Satisfactory Confidence	Based on the Offeror's performance record, some doubt exists that the Offeror will successfully perform the required effort.
Neutral/Unknown Confidence	No performance record identifiable.
Marginal Little Confidence	Based on the Offeror's performance record, substantial doubt exists that the Offeror will successfully perform the required effort. Changes to the Offeror's existing processes may be necessary in order to achieve contract requirements.
Unsatisfactory No Confidence	Based on the Offeror's performance record, extreme doubt exists that the Offeror will successfully perform the required effort.
RELEVANCY OF PAST PROJECTS	Past projects will be compared with the solicitation and those that involved features of work that are similar in size, scope, and technical complexity will be considered relevant.
Highly Relevant	The magnitude of the effort and the complexities on this contract are essentially what the solicitation requires.
Relevant	Some dissimilarities in magnitude of the effort and/or complexities exist on this contract, but it contains most of what the solicitation requires.
Somewhat Relevant	Much less or dissimilar magnitude of effort and complexities exist on this contract, but it contains some of what the solicitation requires.
Not Relevant	Performance on this contract contains relatively no similarities to the performance required by the solicitation.

straddle two adjectival grades, differentiators are also provided to further distinguish between the grades. In the example, a "low" proposal risk is described as one for which difficulties will probably be overcome through normal contractor effort and normal government monitoring. In contrast, a "moderate" proposal risk suggests that special contractor emphasis and close government monitoring will likely be needed to overcome difficulties.

Direct Point Scoring

Direct point scoring evaluation allows for more rating levels and thus may appear to give more precise distinctions of merit. However, point scoring may lend an unjustified air of precision to evaluations, providing an appearance of objectivity even though the underlying ratings are inherently subjective. Evaluators assign points to evaluation criteria based on some predetermined scale or the preference of the evaluator. Case Study 14: Maine DOT Bridge, in Appendix D, illustrates the direct point scoring system through the use of a percentage defining a raw score definition as follows that is then translated into the final point allocation.

Raw Score Definition

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Marginal (0%) — Average (70%) — Exceptional (100%)

Table 2.9. Direct point scoring example from Case Study 19.

Standard	Service Delivery Level	Mark
Very high standard	Proposals likely to exceed all delivery targets	10
Good standard	Proposals likely to meet all delivery targets and exceed some delivery targets	8-9
Acceptable standard	Workable proposals likely to achieve all or most delivery targets	5-7
Poor standard	Significant reservations on service delivery targets but not sufficient to warrant exclusion of bid	1-4
Not acceptable	Bid excluded from further consideration	0

Some agencies use adjectival ratings as the basis of direct point scoring systems. These should still be considered direct point scoring methods, but the adjectival ratings are used to narrow down the scoring to within ranges. Case Study 19: Forth Road Bridge Toll Equipment, in Appendix D, provides a simple example of a direct point scoring system that is based on adjectives shown in Table 2.9.

The Washington State DOT I405 Kirkland Stage I HOV Design-Build RFP provides a more detailed direct point scoring system that is based on adjectival ratings.

- Excellent (90–100%): The Proposal demonstrates an approach that is considered to significantly exceed the RFP requirements/objectives in a beneficial way (providing advantages, benefits, or added value to the Project) and provides a consistently outstanding level of quality. In order for the Proposal to meet the minimum criteria to be considered to be Excellent, it must be determined to have a significant strength and/or a number of strengths and no weaknesses. The minimum score for Excellent is 90%. The greater the significance of the strengths and/or the number of strengths will result in a higher percentage, up to a maximum of 100%. There is no risk that the Proposer would fail to meet the requirements of the RFP.
- Very Good (80–89%): The Proposal demonstrates an approach that is considered to exceed the RFP requirements/objectives in a beneficial way (providing advantages, benefits, or added value to the Project) and offers a generally better than acceptable quality. In order for the Proposal to meet the minimum criteria to be considered to be Very Good, it must be determined to have strengths and no significant weaknesses. The minimum score for Very Good is 80%. The greater the significance of the strengths and/or the number of strengths, and the fewer the minor weaknesses will result in a higher percentage, up to a maximum of 89%. There is very little risk that the Proposer would fail to meet the requirements of the RFP.
- Good (70–79%): The Proposal demonstrates an approach that is considered to meet the RFP requirements/objectives and offers an acceptable level of quality. In order for the Proposal to meet the minimum criteria to be considered to be Good, it must be determined to have strength(s), even though minor and/or significant weaknesses exist. The minimum score for Good is 70%. The greater the significance of the strengths and/or the number of strengths, and the fewer the minor or significant weaknesses will result in a higher percentage, up to a maximum of 79%. The Proposer demonstrates a reasonable probability of meeting the requirements of the RFP.
- Non-responsive (0–69%): The Proposal demonstrates an approach that contains minor and/or significant weaknesses and no strengths. The Proposal is considered not to meet the RFP requirements and may be determined to be non-responsive.

The direct point scoring system or variations of it are used by many transportation agencies. However, federal agencies do not typically use such a system because the use of numerical rating systems in conjunction with specific percentage weightings for the factors requires the source selection authority to convert the decision-making process to a formula without knowing what will be offered. Such a process allows virtually no discretion to the selection official.

Direct point scoring evaluation is probably the most complex best-value evaluation method. One of its weaknesses is the variation that is induced by evaluators who are assigning numerical scores to the same category. Even if the evaluators are restricted to using integers, each individual will have his or her own methodology for arriving at a point score. Thus, it becomes difficult for the owner to ensure that the evaluation system is both fair and uniformly applied to all proposals. Fundamentally, two engineers looking at the same thing can probably agree on whether or not it is satisfactory or unsatisfactory (i.e., an adjectival rating), but getting them to agree on exactly how many points a given category should be awarded will be much more difficult. For the evaluators, this presents a psychological issue rather than a technical issue, which is sometimes dealt with by resolving outlier scores through the use of adjectival ratings that are then converted to numbers.

Table 2.10. Meets technical criteria—low-bid example.

Offeror	Technical Score (60 maximum) (40 minimum)	Price Proposal
1	51	$1,400,000
2	53	$1,200,000
3	**44**	**$1,100,000**
4	39	NR

Direct point scoring evaluation's greatest strength is the flexibility of the scale on which each proposal is rated. If the owner does not require its evaluation panel to achieve consensus, but rather chooses to use an average of the individual scores, direct point scoring in effect becomes an "expert system" in every sense of the computer-related definition of that term of art. This becomes valuable in those projects where the salient aspects of the project are hard to quantify. Direct point scoring evaluation allows the average numerical ratings to act as the collective expert. However, an averaging approach has the potential for allowing a single evaluator with a bias to affect the outcome. Some agencies eliminate the high and low scores in order to reduce the likelihood of this type of problem.

Best-Value Award Algorithms

Best-value award algorithms define the steps that owners take to combine the parameters, evaluation criteria, and evaluation rating systems into a final award recommendation. Seven best-value award algorithms have been found through a comprehensive analysis of the literature, case studies, and project procurement documents. Building, water/wastewater, industrial, and highway projects from both the public and the private sector were analyzed. The seven algorithms are as follows:

- Meets technical criteria—low bid
- Adjusted bid
- Adjusted score
- Weighted criteria
- Quantitative cost—technical tradeoff
- Qualitative cost—technical tradeoff
- Fixed price—best proposal

A description of each of these procedures follows. The algorithms are described through formulas and illustrated through generic examples. Case studies illustrating each of the algorithms can be found in Appendix D.

Meets Technical Criteria—Low Bid

In the meets technical criteria—low-bid algorithm, the final award decision is based on price. Technical proposals are evaluated before any cost proposals are reviewed. The price proposal is opened only if the technical proposal is found to have met the minimum requirements. The technical proposal review can be done on a pass/fail basis or using numerical ratings with a predetermined minimum score required for the proposal to be considered responsive. If the proposal does not meet the minimum standards, it is deemed non-responsive and the associated price proposal will not be opened. The price proposals associated with responsive technical proposals are then opened, often publicly, and the contract is awarded to the proposer offering the lowest price. See the following generic algorithm and Table 2.10. Case Studies 9, 10, and 12 in Appendix D also provide examples of the meets technical criteria—low-bid algorithm.

Algorithm: **If $T > T_{min}$, Award to P_{min}**
If $T < T_{min}$, Non-responsive
T_{min} = Determination that proposal meets minimum technical requirements
P = Project Price

Adjusted Bid

The adjusted bid algorithm requires use of numerical scoring (or adjectival ratings converted to numbers). Price proposals are opened after the technical proposals are scored. When the price proposal is opened, the project price is adjusted in some manner by the technical score, typically through the division of price by a technical score from 0–1 or 0–100. The adjusted bid is used only for project award. The contract price will be based on the amount stated in the price proposal. The offeror with the lowest adjusted bid will be awarded the project. See the following generic algorithm and Table 2.11. Case Study 14 in Appendix D also provides an example of the adjusted bid algorithm.

Algorithm: **AB = P/T**
Award AB_{min}
AB = Adjusted Bid
P = Project Price
T = Technical Score

Table 2.11. Adjusted bid example.

Offeror	Technical Score	Price Proposal	Adjusted Bid
1	0.85	$1,200,000	$1,411,765
2	0.95	$1,250,000	$1,315,789
3	**0.90**	**$1,150,000**	**$1,277,777**
4	0.70	$1,100,000	$1,571,429

Adjusted Score

The adjusted score algorithm also requires use of numerical scoring (or adjectival ratings converted to numbers). The price proposals are opened after the technical proposals are scored. The adjusted score is calculated by multiplying the technical score by the total estimated project price and then dividing by the price proposal. Award is made to the offeror with the highest adjusted score. See the following generic algorithm and Table 2.12. Case Study 11 in Appendix D also provides an example of the adjusted score algorithm.

Algorithm: $\mathbf{AS = (T \times EE)/P}$
Award $\mathbf{AS_{max}}$
AS = Adjusted Score
T = Technical Score
EE = Engineer's Estimate
P = Price Proposal

Weighted Criteria

The weighted criteria algorithm also requires use of numerical scoring (or adjectival ratings converted to numbers). The technical proposal and the price proposal are evaluated individually. A weight is assigned to the price and each of the technical evaluation factors. The sum of these values becomes the total score. The offeror with the highest total score is selected. See the following generic algorithm and Table 2.13. Case Studies 4, 5, and 8 in Appendix D also provide examples of the weighted criteria algorithm.

Algorithm: $\mathbf{TS = W_1S_1 + W_2S_2 + \ldots + W_iS_i + W_{(i+1)}PS}$
Award $\mathbf{TS_{max}}$
TS = Total Score
W_i = Weight of Factor i
S_i = Score of Factor i
PS = Price Score

Quantitative Cost-Technical Tradeoff

The quantitative cost-technical tradeoff algorithm also requires use of numerical scoring (or adjectival ratings converted to numbers). It involves calculating the technical score and the price score increment and then examining the difference between the incremental advantages of each. The increment in the technical score is calculated by dividing the highest technical score by the next highest technical score minus one multiplied by 100%. The increment in price score is calculated by dividing the highest price score by the next highest price score minus one multiplied by 100%. The award is made to the offeror with the lowest price, unless the higher priced offers can be justified through a higher technical value. This justification is made by determining whether the added increment of price is offset by an added increment in technical score. See the following generic algorithm and Table 2.14. Case Study 13 in Appendix D also provides an example of the quantitative cost-technical tradeoff algorithm.

Algorithm: **Order offers by increasing price proposals**
$\mathbf{T_{Increment} = [(T_j/T_i) - 1] \times 100\%}$

Table 2.12. Adjusted score example.

Offeror	Technical Score* (1,000 maximum)	Price Proposal	Calculations (Engineer's Estimate = $10 million)	Adjusted Score*
1	930	$10,937,200	$\frac{930 \times 10^6}{10,937,200}$	85
2	**890**	**9,000,000**	$\mathbf{\frac{890 \times 10^6}{9,000,000}}$	**99**
3	940	9,600,000	$\frac{940 \times 10^6}{9,600,000}$	98
4	820	8,700,000	$\frac{820 \times 10^6}{8,700,000}$	94

* Note: Technical Score —(Sum of Technical Score for all evaluation factors); Adjusted Score =(Technical Score x 1,000,000)/Price Proposal ($)

Table 2.13. Weighted criteria example.

Offeror	Technical Score* (60 maximum)	Calculation of Price Score	Price Score (40 maximum)	Calculation of Total Score	Total Score (100 maximum)
1	51	$1,000,000 x 40 / $1,200,000	33	51 + 33 =	84
2	**53**	$1,000,000 x 40 / **$1,250,000**	**32**	**53 + 32 =**	**85**
3	44	$1,000,000 x 40 / $1,100,000	36	44 + 36 =	80
4	39	$1,000,000 x 40 / $1,000,000	40	39 + 40 =	79

* Note: Sum of technical scores for all evaluation factors defined in the technical review evaluation plan.

$P_{Increment} = [(P_j/P_i) - 1] \times 100\%$
If $T_{Increment}$ < Increment, Award $Proposal_i$
If $T_{Increment} > P_{Increment}$, Retain $Proposal_j$ for possible award and repeat with $Proposal_{j+i}$
Repeat Process until $T_{Increment} > P_{Increment}$
T = Technical Score
P = Price Proposal

In this example, because the difference between the low and second low price proposals is 8%, the difference in the weighted scores of the two proposals should be greater than 8% to justify expending the additional increment of cost. In this case, the 33% difference in weighted scores and corresponding 8% increase in price indicates that Proposal #2 is a better value than Proposal #1. This is not the case when comparing Proposal #2 to Proposal #3—the 3% increase in cost is not justified by the 1% increase in technical score. Thus, the best value in this example is Proposal #2.

Qualitative Cost-Technical Tradeoff

The qualitative cost-technical tradeoff is used by many federal agencies under the FAR. This method relies primarily on the judgment of the selection official to determine the relative advantages offered by the proposals following a review of the evaluation ratings and prices (Army 2001). The final decision consists of an evaluation, comparative analysis, and tradeoff process that often require a subjective judgment on the part of the selecting official. Figure 2.3 depicts the qualitative cost-technical tradeoff algorithm as described in the Army Source Selection Guide (Army 2001). Case Studies 1, 2, and 3 in Appendix D provide examples of the qualitative cost-technical tradeoff algorithm.

The tradeoff analysis is not conducted solely with the ratings and scores. The selection official must analyze the differences between the competing proposals and make a rational decision based on the facts and circumstances of the specific acquisition. Although different selection officials may not necessarily come to the same conclusion, the same criteria must be met in all cases. Specifically, the decision must

- Represent the selection official's rational and independent judgment,
- Be based on a comparative analysis of the proposal, and
- Be consistent with the solicitation evaluation factors and subfactors.

Fixed Price—Best Proposal

The fixed price—best proposal algorithm is based on the premise that the project owner will establish either a maximum price or a fixed price for the project. Each Offeror must submit a technical proposal accompanied by an agreement to perform the work within the specified pricing constraints. The award is based only on the technical proposal evaluation. The offeror that provides the best technical proposal will be selected. See the following generic algorithm and Table 2.15. Case Study 6 in Appendix D also provides an example of the fixed price—best proposal algorithm.

Algorithm: Award T_{max}, Fixed P
T = Technical Rating
P = Project Price

Table 2.14. Quantitative cost-technical tradeoff example.

Proposal	Price	Weighted Score	Price Increment	Score Increment
1	$4.0 M	300	--	--
2	**$4.3 M**	**400**	**+ 8%**	**+ 33%**
3	$4.4 M	405	+ 3%	+ 1%

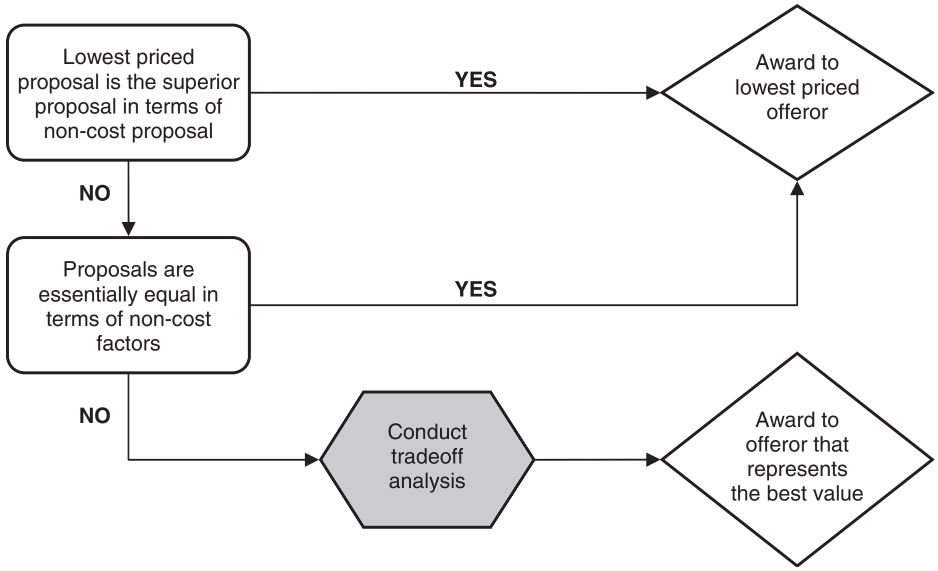


Figure 2.3. Decision model of determining the successful offeror using qualitative cost-technical tradeoff (Army 2001).

Industry Applications of Best-Value Award Algorithms

Table 2.15 illustrates the additional information gleaned from the analysis of best-value RFPs collected during the first phase of this study. The following case study summary is based on the same 50 cases previously presented in Table 2.1 in the best-value parameter section of this chapter. As shown in Table 2.16, it is very simple to classify the various agency best-value methodologies into the seven generic best-value award algorithms proposed in this study.

All seven of the best-value award algorithms are represented in the case studies. The generic classification of the award algorithms provides a baseline for comparison among agencies. Figure 2.4 depicts the frequency of use for the award algorithms.

The qualitative cost-technical tradeoff and the weighted criteria algorithms are the most frequently used and make up one-half of the sample population. The adjusted score, adjusted bid, and meets technical criteria–low-bid algorithms are approximately equal in number and constitute 44% of the sample. The quantitative cost-technical tradeoff and the fixed-price–best proposal algorithms represent only 6% of the sample.

Comparison of Award Algorithms

Ultimately, no matter which algorithm is selected, the owner must have a result that allows it to differentiate a less competent contractor with a low bid from a more highly competent contractor whose proposal adds value to the project. The next step is to differentiate between those apparently competent and valuable proposals to determine which proposal is the optimum combination of price and non-price factors that delineate the true best value.

Meets technical criteria–low bid (cost) is defined as any selection process where the eventual award will be made to the lowest priced, fully qualified and/or responsive bidder. This category includes the processes named "equivalent design/low bid" and "meets criteria/low bid" and the FAR method named "fully responsive–lowest price" as well as other variations on this theme.

As a general rule, the low-bid approach was preferred on projects where the scope was very tight and clearly defined, and innovation or alternatives were not being sought. This might include highway projects with a specified type of pavement,

Table 2.15. Fixed price—best proposal example.

Offeror	Technical Score (100 maximum)
1	91
2	**93**
3	84
4	79

Table 2.16. Best-value award algorithm case study summary.

State/Agency	Agency Terminology	Remarks	Best-Value Award Algorithm
Alaska DOT	Criterion Score	Divide Technical Score by Price	Adjusted Score
Arizona DOT	Quality Adjusted Price Ranking	Percentage system used to adjust bid price for technical score	Adjusted Bid
Colorado DOT Pre-1999	Low Bid, Time Adjusted	Multi-parameter bid with qualifications	Meets Technical Criteria—Low Bid
Colorado DOT Post-1999	Best Value	May use weighted criteria to arrive at an adjusted score	Adjusted Score
Delaware DOT	Competitive Proposals	Design Alternates, Qualifications, Scheduled, and Price scored	Weighted Criteria
District of Columbia DPW	Best Value	Adds owner contract administration costs to price	Adjusted Score
Florida DOT	Adjusted Score	May also include time adjustment	Adjusted Score
Georgia DOT	Low Bid, Prequalified	Short list by qualifications	Meets Technical Criteria—Low Bid
Idaho DOT	Weighted Selection	Cost 51%; Qualifications/Past Experience 49%	Weighted Criteria
Indiana DOT	Low Bid, Fully Qualified	Minimum technical score to be found qualified	Meets Technical Criteria—Low Bid
Maine DOT	Overall Value Rating	Divide Price by Technical Score	Adjusted Bid
Mass Highway	Best Value	Included life-cycle cost criteria	Weighted Criteria
Michigan DOT	Low Composite Score	Divide Price by Technical Score	Adjusted Bid
Minnesota DOT	Low Bid, Fully Qualified	Short list by qualifications	Meets Technical Criteria—Low Bid
Missouri DOT	Low Bid + Additional Cost	Additional costs include life-cycle cost calculation	Meets Technical Criteria—Low Bid
New Jersey DOT	Modified Low Bid	Included design costs	Meets Technical Criteria—Low Bid
North Carolina DOT	Quality Adjusted Price Ranking	Percentage system used to adjust bid price for technical score	Adjusted Bid
Ohio DOT	Low Bid	Includes design costs	Meets Technical Criteria—Low Bid
Oregon DOT	Best Value	Combine technical with cost by weights	Weighted Criteria
South Carolina DOT	Low Composite Score	Divide Price by Technical Score	Adjusted Bid
South Dakota DOT	Best Value	Divide Price by Technical Score	Adjusted Bid
Utah DOT	Best Value	Combine technical with cost by weights	Weighted Criteria
Virginia DOT	Two Step Selection	Qualifications/Experience in Step 1 and Price and Technical in Step 2	Weighted Criteria
Washington DOT	High Best-Value Score	Divide Technical Score by Price	Adjusted Score
Alberta, Canada, Ministry of Highways	Value Index	Divide Technical Score by Price	Adjusted Score
Alameda Transportation Corridor Agency	Lowest Ultimate Cost	Add Price to Authority's Costs Associated with Proposal	Meets Technical Criteria –Low Cost

(*continued*)

geometric design, and minimal ancillary works. It also is used on building projects where the owner has completed most of the design development and the contractor only needs to complete the final construction documents. If the "cost" element is added to the selection process, it can also be used for more complex projects where different proposals impact life-cycle costs, right-of-way expense, or other costs incurred by the project owner.

The **adjusted bid** algorithm is identified by the act of dividing the price by some factor related to the technical evaluation. Its thrust is to logically modify the price in a manner that reflects the value of the underlying proposed qualitative factors. Its selection as an award algorithm indicates that price is an important consideration but that some other aspects of the project must be included in the algorithm to determine best value. This is in effect a unit pricing of quality (Gransberg et al. 1999).

Adjusted score is the mathematical reciprocal of adjusted bid. In this case, some function of the technical score is divided by the proposed price to give an index in the units of technical points per dollar. It would follow that the adoption

Table 2.16. (*Continued*)

State/Agency	Agency Terminology	Remarks	Best-Value Award Algorithm
City of Reno, Nevada	Best Value	Qualifications & Past Performance equal to Price	Weighted Criteria
City of Santa Monica, California	RFP Process	Requires Guaranteed Maximum Price and life-cycle criteria	Qualitative Cost-Technical Tradeoff
City of Wheat Ridge, Colorado	RFP Process	Uses Weighted Criteria approach to arrive at technical score	Fixed Price/Best Design
District of Columbia Schools	Best Value	Responsiveness check for qualifications, experience & subcontracting plan Award to lowest, fully responsive bid	Meets Technical Criteria—Low Bid
Federal Bureau of Prisons	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
Federal Highway Administration	Best Value	Adds owner contract administration costs to price. Uses Adjusted Score formula to differentiate between bids	Quantitative Cost-Technical Tradeoff
Fort Lauderdale County, Florida	Selection/Negotiation	Requires Guaranteed Maximum Price	Weighted Criteria
General Services Administration	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
Los Alamos National Laboratory	Best Value	Two phase selection	Weighted Criteria
Maricopa County, Arizona	Quality Adjusted Price Ranking	Uses Weighted Criteria approach to arrive at technical score. Then computes a "$-value" of technical proposal and subtracts from price	Adjusted Bid
Naval Facilities Engineering Command	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
Nashville County, Tennessee	Competitive Sealed Proposals	Qualifications, Management Plan and Price plus Warranty	Adjusted Score
National Aeronautics and Space Administration	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
National Institute of Standards and Technology	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
National Park Service	Best Value	Uses "technically acceptable" approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
Pentagon Renovation Program Office	Best Value	Uses Weighted Criteria approach to arrive at technical score; includes incentive clauses	Qualitative Cost-Technical Tradeoff
Seattle Water Department	Best Value	Uses Weighted Criteria approach to arrive at technical score	Cost-Technical Tradeoff
University of Colorado	Best Value	Qualifications/Experience in Step 1 and Price and Technical in Step 2	Weighted Criteria
University of Nebraska	Best Value	Qualifications/Experience in Step 1 and Price and Technical in Step 2	Weighted Criteria

(*continued*)

of this approach would signal that the owner is less concerned about cost than quality. The adjusted score approach seems to work well when overall outcomes can be clearly defined and a number of alternatives exist which could provide the desired outcomes. This could include public buildings where the owner has some design constraints but is open to innovative solutions within the constraints. It has also been used in highway projects where alternative geometric designs and material types are acceptable or water treatment plants where the owner wants to evaluate alternative treatment processes.

The definition of **weighted criteria** is the broadest definition of all best-value algorithms. The weighted criteria algorithm is selected when innovation and new technology are to be encouraged or specific types of experience are required to obtain the desired outcome. This approach may also be used when a fast track schedule is required or when constructability is inherent to the successful execution of the project. The

Table 2.16. (*Continued*)

State/Agency	Agency Terminology	Remarks	Best-Value Award Algorithm
U.S. Army Corps of Engineers	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
U.S. Customs Service	Best Value	Uses Weighted Criteria approach to arrive at technical score. Requires Guaranteed Maximum Price	Qualitative Cost-Technical Tradeoff
U.S. Department of Energy	Best Value	Uses Weighted Criteria approach to arrive at technical score	Cost-Technical Tradeoff
U.S. Forest Service	Best Value	Uses Adjusted Bid formula to differentiate between bids	Quantitative Cost-Technical Tradeoff
U.S. Postal Service	Best Value	Uses Weighted Criteria approach to arrive at technical score	Qualitative Cost-Technical Tradeoff
Utah Dept. of Natural Resources	Value Based Selection	Combine technical with cost by weights	Weighted Criteria

weighted criteria algorithm has the advantage of distinctly communicating the owner's perceived requirements for a successful proposal through the weights themselves. For instance, if a project owner is very concerned about the architectural appearance of the project, a disproportionate weight can be given to the evaluation criteria that directly define the ultimate aesthetic appeal. On the other hand, if an owner is concerned that the project's program might exceed the available budget, price can be given a weight of greater than 50% of the total. Thus, best-value bidders will be encouraged to propose design alternates that will reduce the price or will only cause a minimal price increase.

Next, both **qualitative and quantitative cost-technical tradeoff** are algorithms that include the federally mandated variations of best-value award and those jurisdictions where technical and price must be evaluated separately (USACE 1994, NAVFAC 1996). The qualitative cost-technical best-value algorithm could be the most subjective of all the award algorithms. In essence, the owner compares the value of the various features of the technical, schedule, and organization against the proposed price, and, using professional judgment, determines if the aspects of a given proposal justify its price and whether the additional positive attributes of a higher bid are worth more than the attributes contained in the low bidder's proposal.

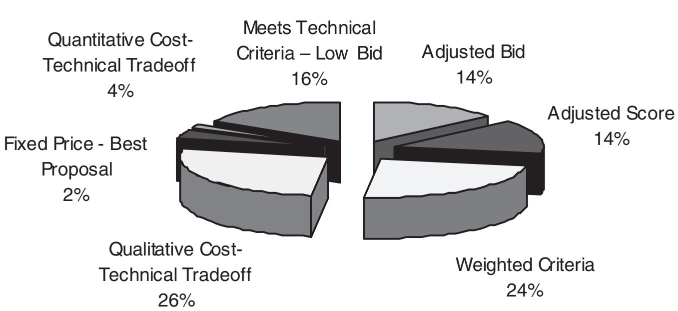


Figure 2.4. Frequency of use for the award algorithms.

The quantitative cost-technical tradeoff best-value algorithm uses the classic industrial engineering "Defender-Challenger Analysis" (Riggs and West 1986) to structure the comparison of price and all other non-price criteria. This algorithm starts by ranking the proposals from lowest to highest based on price. Then, it uses an incremental analysis of the percentage increase in price versus the percentage increase in technical score. If the technical incremental increase is greater than the price incremental increase, then the higher priced proposal is preferred. This analysis is continued proposal by proposal until the relative amount by which the score goes up is less than the relative amount by which the price goes up. The best-value proposal is the highest rated proposal with an incremental analysis showing that the increase in price is justified by the increase in technical rating.

Finally, **fixed cost—best proposal** is a relatively recent addition to the best-value award discipline. In design-build projects, it is sometimes called "Design-to-Cost." This method stipulates a fixed or maximum price and uses project scope, qualifications, schedule, and other non-cost factors instead of bid price. This method has the advantage of immediately allowing the owner to determine if the required scope is realistically achievable within the limits of a tight budget. It also reduces the best-value decision to a fairly straightforward analysis of proposed design alternates and other non-cost factors. Lastly, it truly is responsive to the efficient use of capital by committing virtually all available funding up front and using the quantity and quality of project proposals to determine the most attractive offer.

Thus, given the previous discussion, it is now possible to classify each of the existing best-value award algorithms into the proposed seven general categories. It is believed that by doing so, much confusion about the details of the various selection methods can be eliminated.

Each algorithm brings strengths and weaknesses to the best-value contract award process. Meets technical criteria–low bid (cost) is by far the simplest and mechanically the closest to the existing design-bid-build/low-bid award process. As such, it is probably the easiest to implement by an agency that has no previous best-value experience. It is also the algorithm that will probably face the least opposition to its use for two reasons. First, the concept of short-listing design firms on a qualifications basis is well accepted. Therefore, extending that concept to determining a short list of the best qualified construction contractors should be fairly direct. Secondly, awarding to the lowest priced proposal from the list of prequalified firms is not very different from the typical public agency low-bid paradigm, and factoring owner costs into the equation involves a minimal change to that paradigm. This approach would fit into the "competitive sealed bidding" category of the ABA Model Procurement Code even though it allows the owner to consider certain elements in addition to the bid price. It is likely to be acceptable in those states that still require both qualifications-based selection of designers and low-bid award for construction (Wright 1997). The greatest weakness of meets technical criteria—low bid is its focus on price alone, which eliminates one of best-value procurement's greatest benefits: the ability to compare different construction solutions to the same problem. The addition of cost elements helps to solve this problem, allowing a process to be used that is very close to low bid, where the differences between the proposals can be converted into future out-of-pocket expense to the project owner.

Adjusted bid and adjusted score, on the other hand, allow competition between varying design alternates, construction management approaches, and contractor qualifications if appropriate for the project. This encourages innovative approaches by industry while preserving the ability to rate the qualifications of the contractors. The major drawback to these methods and other technical score-related algorithms is the reliance on the evaluator's ability to develop an accurate technical score for a proposal. Evaluators often have difficulties translating evaluation criteria into points and end up trying to equate a dollars-per-point for each evaluation decision. Additionally, by mathematically combining the technical and the proposed contract price, there is a potential to create an environment where construction contractors may be tempted to play games with the numbers to increase their adjusted bids or scores. The adjusted bid system appears to be useful on projects where funding is constrained but where some qualitative feature of the project, such as a fast track schedule or external factors such as traffic disruption or innovative environmental protection, is also very important to the owner. Adjusted bid seems to be most appropriate for projects where innovation is encouraged but where a high degree of price competition is desired. Adjusted score is more appropriate where the technical content is more important than the price.

Weighted criteria allows significant flexibility to the project owner in determining the best-value proposal. It preserves the ability to tailor the evaluation plan to the specific needs of each project and rate the qualifications of all bidders. It provides a method for including price as only one of several evaluation areas and permits the agency to adjust the weights of each rated category as required to meet the needs of the particular project. Its greatest drawback is the complexity of the evaluation planning. To properly implement the weighted criteria algorithm, a great deal of up-front investment in time and human resources must be made during the development of the RFP and its evaluation plan.

The cost-technical tradeoff algorithms preserve the owner's option to award based on a qualitative (possibly, subjective) comparison of the value of higher priced proposals or to make the cost-technical tradeoff decision quantitatively as shown in the U.S. Forest Service Highway Case Study. It also furnishes the most robust method with which to make the best-value decision. The use of a cost-technical tradeoff forces the owner to relate the price and the value of the other evaluated factors in a way that highlights the best features of best-value award algorithms. Additionally, the cost-technical tradeoff is mandated for federal projects (FAR 2004). It is probably best used when the owner anticipates a very competitive set of proposals submitted by a sophisticated, well-qualified group of competitors. It furnishes an avenue to step back after the evaluation and contemplate the relative desirability of the various combinations of qualifications, design approach, and price. Finally, it should be noted that this discussion assumes the technical evaluation is conducted using a methodology such as the weighted criteria algorithm.

The fixed-price best proposal award algorithm is similar to all of the algorithms that assign a technical score to the best-value offer, but the price is fixed for all offerors. This award algorithm should only be considered when the bidding of design alternates is being entertained. This is an excellent system when owners have a fixed budget and would like to get more construction for their money. However, the engineer's estimate for the scope of the project must be sound. An estimate that is too high may result in offerors adding unneeded scope to win the project. Even worse, an estimate that is too low could result in offerors proposing scopes that do not meet technical standards.

The selection of an algorithm requires determining which approach is the most appropriate for the project in question. The goal of best-value contract award is to devise a system that maximizes the probability of selecting a contractor who will successfully complete the project. In many cases, the tried and true low-bid price only method will in many cases be the most appropriate method. Therefore, a careful analysis of the project must be made before deciding on a project award algorithm and its associated criteria.

The best-value parameters, evaluation criteria, evaluation rating systems, and award algorithms described in this section are a generic synthesis of what the entire design and construction industry defines as best-value procurement. Some of the differences in concepts are due to the agencies that use them and some are due to the nature of the projects themselves. The next sections discuss the results of a survey regarding the use of best-value procurement in the highway construction industry and a benchmark comparison of project performance results for best-value contracting with design-bid-build.

2.5 National Transportation Agency Survey Results

As outlined in the Research Approach presented in Section 1.4, the research team developed a survey to obtain information related to the state of practice of best-value procurement in the transportation industry. The questionnaire, shown in Appendix C, was designed to identify the current state of practice in the industry and to identify key respondents that could provide additional project-related information for follow-up case studies. It identified transportation agencies that are using or considering the use of a best-value procurement process consistent with the definitions and concepts discussed in the previous section. It also asked respondents to identify any new best-value concepts that may not be reflected in the literature or the team's database. Lastly, it asked if respondents had specific projects using best-value procurement where the team could obtain case study and performance data for Phase 2 of this study by following up with the designated contact person. The survey was e-mailed to AASHTO representatives from each of the 50 state highway agencies and various other affiliated transportation organizations. The initial contact list consisted of representatives from the AASHTO Subcommittee on Construction and related highway organizations. The survey asked that questions be completed by the personnel responsible for procuring and administering the agency's construction program, particularly with regard to alternative contracting methods.

The research team received 44 responses, including 41 from transportation agencies. Of the 41 agency representatives responding, 27 respondents answered that the agency had some experience with best-value procurement, two agency representatives responded that the agency had no experience but planned to use best-value procurement in the near future, and 12 respondents indicated that the agency had no experience with best-value procurement. The answers to this question revealed that among the respondents, the majority (66%) of agencies had experience with some form of best-value procurement.

The second question asked respondents to define the particular selection strategy or strategies used among the methods defined in the questionnaire. The following list summarizes and Figure 2.5 depicts the variety of selection strategies used and the frequency of their use:

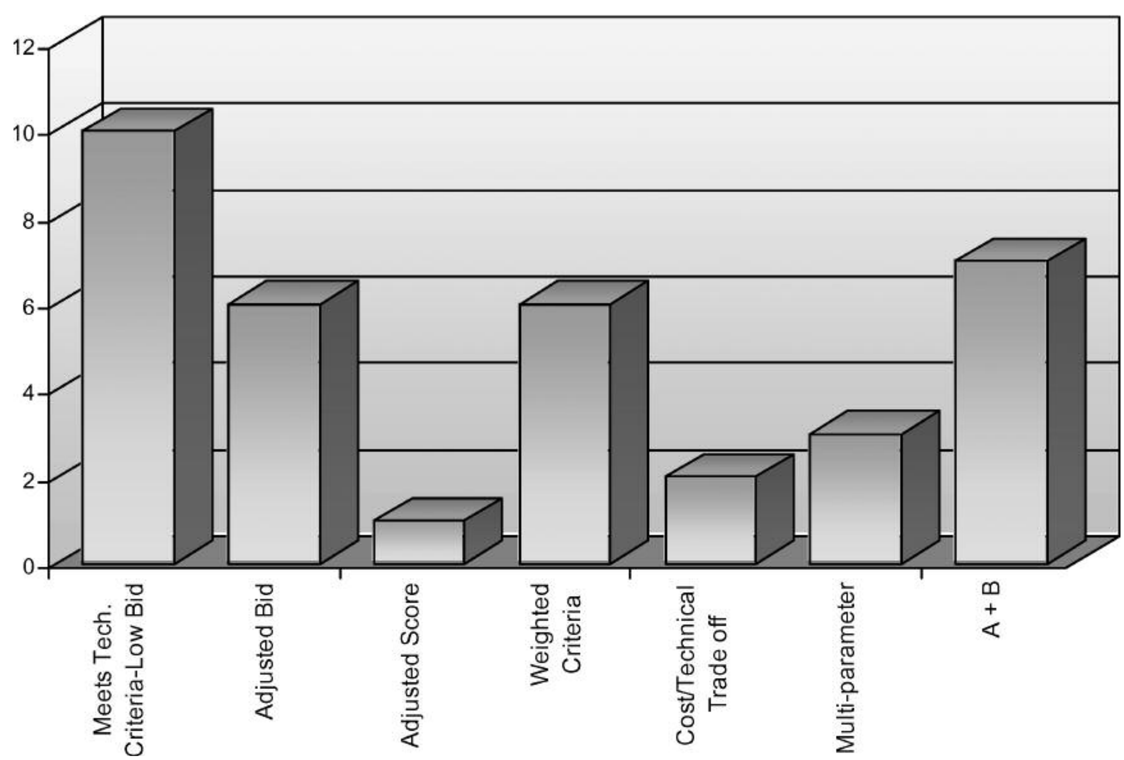


Figure 2.5. Selection strategy used in best-value procurement.

- 10 of 27 used Meets Technical Criteria—Low Bid (37%)
- 7 of 27 used A+B (26%)
- 6 of 27 used Adjusted Bid (22%)
- 6 of 27 used Weighted Criteria (22%)
- 3 of 27 used Multi-parameter (11%)
- 2 of 27 used Cost-Technical Tradeoff (7%)
- 1 of 27 used Adjusted Score (4%)

The responses indicated that the best-value selection strategy used most often (37%) was meets technical criteria—low bid. Several respondents included A+B bidding and multi-parameter bidding as selection strategies in the "other" category. If these strategies are assumed to be equivalent as noted in the definition, the multi-parameter strategy was the next most frequently used strategy (31%). This distribution indicates that the best-value selection strategies adopted by transportation sector agencies are more closely aligned with the low-bid system compared with the frequency distribution of the award methods of a larger sample of projects, including vertical projects and projects outside of the transportation sector, presented in this chapter. The larger sample population presented in Figure 2.4 indicated that the weighted criteria and cost-technical tradeoff strategies were the most frequently used, constituting one-half of the sample population.

The third question asked respondents to identify what key criteria were used by the agency in the qualification or selection process. The following list summarizes and Figure 2.6 depicts the key criteria and frequency of their use:

- 16 of 25 used Past Performance (64%)
- 15 of 25 used Projected Time (60%)
- 13 of 25 used Personnel Qualifications (52%)
- 11 of 25 used Management Capabilities (44%)
- 6 of 25 used Public Interface Plan (24%)
- 6 of 25 used Technical Capability/Solutions (24%)
- 9 of 25 used other categories (36%)

The survey results for the transportation agencies indicate that past performance and projected time are the most frequently used criteria followed by qualifications of personnel. In comparison, the larger sample population cited past performance and qualifications of key personnel as the most frequently used criteria. In the case of transportation agencies, it appears that projected time performance is a more important criteria, and they have more experience with time as a bid parameter than other commonly used criteria.

The fourth question asked respondents to identify a formula or algorithm (if applicable) used to combine price and technical criteria. Eleven of 27 (41%) respondents provided a formula or algorithm to combine price and technical criteria. The most frequent algorithm (cited by 4 of 11 respondents) was a multi-parameter formula (A+B) using time as the additional parameter. This result is consistent with the responses to the third question. Other formulas cited were adjusted bid, adjusted score, a prequalification rating formula, and weighted criteria combined with life-cycle cost.

The fifth question asked respondents to identify what relative weightings of price and technical factors were used, where

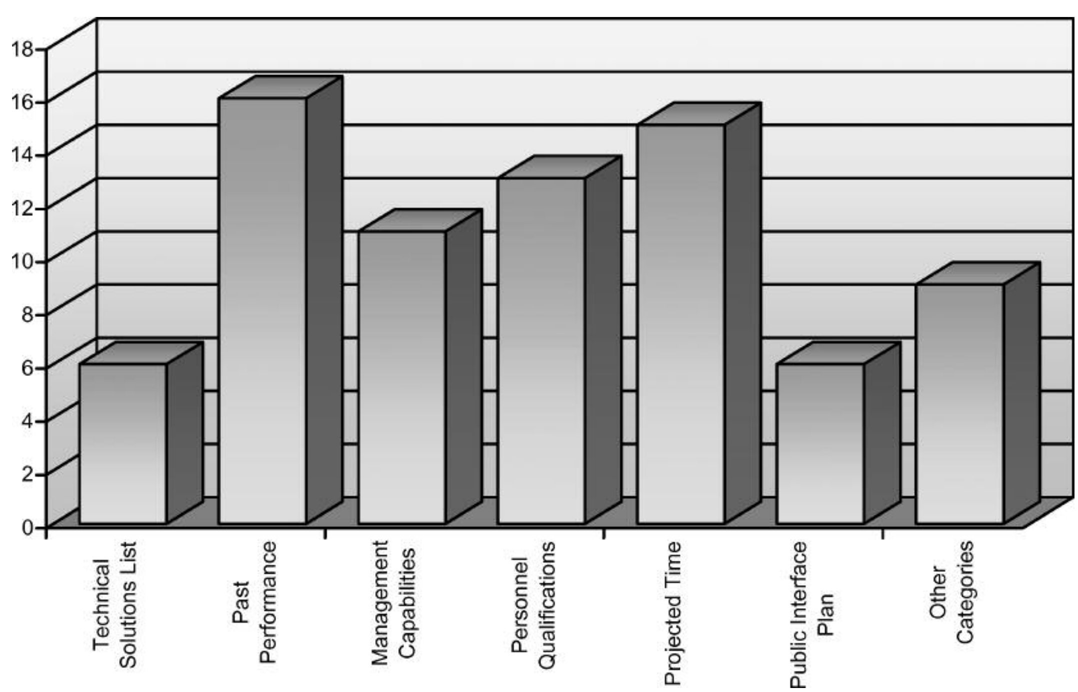


Figure 2.6. Key criteria used in the qualification or selection process.

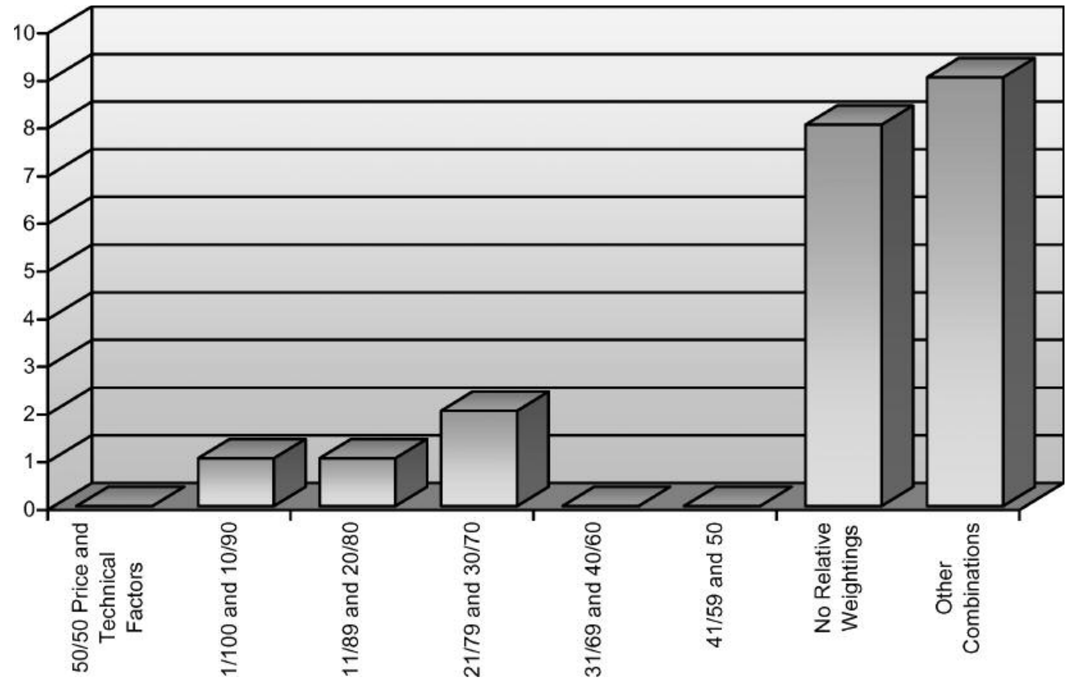


Figure 2.7. Weighting of price and technical factors.

applicable. Fifteen of 27 respondents gave relative weightings of price and technical factors. The following list summarizes and Figure 2.7 depicts the distribution:

- 1 of 15 used 1/100 and 10/90 (7%)
- 1 of 15 used 11/89 and 20/80 (7%)
- 2 of 15 used 21/79 and 30/70 (13%)
- 8 of 15 used No Relative Weightings of Price vs. Technical Used (53%)
- 9 of 15 listed other combinations (60%)

The majority of respondents chose the "Other Combinations" category. Under this category, the responses ranged from variable (project-specific weightings) to 25/75 price and technical to not applicable (for prequalification).

Finally, 16 of 27 (59%) respondents supplied projects using best-value procurement that the research team could follow up with a case study. Twenty-five projects were identified as candidates for further study.

Based on these responses, a second questionnaire, also included in Appendix C, was developed and sent out in Phase 2 to obtain more detailed information and performance results for highway projects using best-value procurement. At the time of publication of this report, the additional data gathered was minimal and inconclusive in terms of performance results for traditional design-bid-build projects. This confirmed that highway agency experience with best-value procurement was limited, and that it was primarily used in conjunction with design-build projects.

2.6 Baseline Project Performance Results

As part of the investigation into the state of practice of best-value procurement, the research team identified factors that may be included in a best-value procurement that appear to have the greatest measurable impact on actual project performance. This effort started by first adding an additional 500+ projects to the research team's original 600+ project database to craft a study database of more than 1,100 projects with an aggregate contract value of more than $5 billion. The next step involved separating those projects in the study population into two major groups: those delivered by traditional design-bid-build, low bid, and those delivered using a best-value award method. Next, each major group was divided by type into horizontal projects (highways, bridges, runways, etc.) and vertical projects (buildings, water treatment plants, transit stations, etc.) to give the researchers a basis to compare best-value procurement and design-bid-build within the two major types of projects. This was also done to develop a foundation on which to gauge the performance of those vertical projects that were used for the case studies that are a part of the research. In addition to vertical and horizontal design-bid-build projects, the sample contained three types of projects awarded using best-value methods:

- A+B bidding
- Design-Bid-Build/RFP with award based on bid price and at least one other parameter
- Design-Build

Table 2.17. Sample populations.

Category	Horizontal					Vertical	
Delivery Method	DBB Projects	Best-Value Projects*	A+B Projects	DBB/RFP Projects	DB Projects	DBB/RFP Projects	DBB Projects
Projects in Database	708	119	77	10	32	20	394
Aggregate Value	$3.4 billion	$1.1 billion	$824 million	$140 million	$166 million	$131 million	$273 million

* Includes all non-low-bid projects

Table 2.17 shows the breakdown of the types and numbers of projects in each category. It should be noted that a sizable sample of vertical design-build projects was also available. However, they were not included in the analysis because of this project's emphasis on best-value delivery of design-bid-build projects. Therefore, only the vertical design-bid-build RFP projects were included in the sample population.

As show in Figure 2.8, the projects came from 20 different agencies made up of 16 state DOTs, a state turnpike authority, a state port authority, a state transit authority, and a federal military department. The projects were located in 19 different states across the country. The A+B projects were primarily highway construction or rehabilitation jobs. The design-bid-build RFP projects were airfield and marine upgrade and expansion projects. The design-bid-build projects were mainly resurfacing, upgrade, and bridge projects. The geographic dispersion of sample projects is from coast to coast and border to border. Additionally, the preponderance of projects came from state agencies, which helps make the study results more specifically aligned with the highway construction focus of this study. A short explanation of the various project delivery methods follows.

Best-Value Contracting

The Utah Technology Transfer Center published *Best Practices Guide for Innovative Contracting Procedures* (UTTC 2001). This guide established an elegant definition for alternative project delivery methods (i.e., innovative contracting). The following statement is from the guide:

> Traditional contracting requires that the selection of a contractor be based solely on the low bid of a responsive bidder. The equation below identifies the factors that go into a bid for

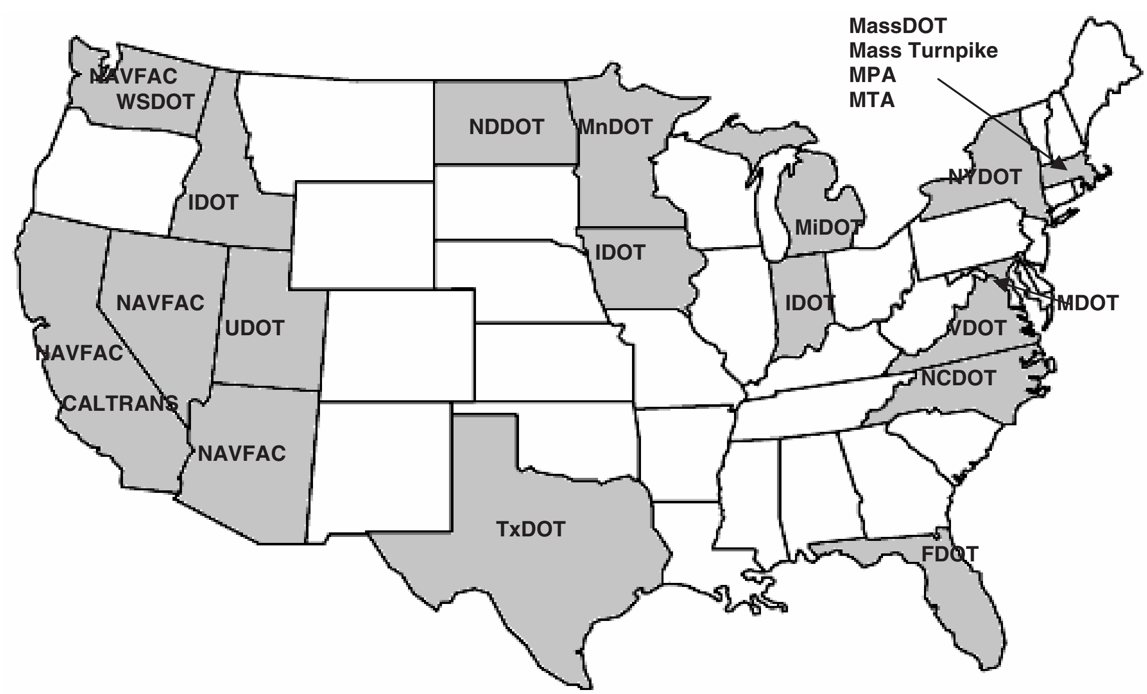


Figure 2.8. Locations of public agencies with projects in the database population.

a construction project. In traditional contracts, motivations to satisfy the social costs are only met to provide a responsive bid for a project. Innovative contracting procedures, however, place the emphasis on meeting performance criteria for one or more of the social cost variables:

$$\text{Contractor's Bid Price} = C_S + C_M + C_Q + C_T + C_O \qquad \text{Eq. 1}$$

Contract Costs:

C_S = Cost or profit for providing the service

C_M = Cost of providing materials and equipment

Social Costs:

C_Q = Cost of providing a quality service or product

C_T =Cost of finishing a project on time

C_O =Cost associated with the risk of other social cost considerations such as legal/administrative, complexity of design, environmental, and safety

A contractor approaches their function in the traditional bidding process by determining the cost to meet the owner's responsive parameters for C_M, C_Q, C_T, and C_O. They also try to minimize the "Contractor's Bid Price" and maximize profit (C_S). The levels the owner sets for these parameters could be met or exceeded by a responsive bidder (UTTC 2001).

This approach directly applies to the problem of awarding highway construction contracts on a best-value basis. Using this terminology, the research seeks ways to quantify the "social costs" and combine them with the "contract costs" to arrive at an objective calculation of best value. Each of the following project delivery methods takes on one or more of the social costs and forms a best-value decision-making algorithm to arrive at an objective determination for a construction contract award.

Design-Bid-Build

Design-bid-build is the traditional method of delivering highway construction projects. Its universal acceptance in public infrastructure project delivery springs from the concern that a construction contractor will not adequately safeguard public health and safety and, therefore, needs the close supervision of a design professional. Thus, the owner retains an engineer on a separate contract to complete the design of the public facility. Once the design is finished, a set of plans, specifications, and contract boilerplate is advertised for bid by the construction industry. Construction contractors submit a price, and the project is awarded to the lowest responsive and responsible bidder.

In design-bid-build, responsive means that the bidder has properly completed the required bid forms and posted the requisite bid security (Ellicott 1994). Responsible normally means that the low bidder can post the required performance bond within the established award timeframe (Konchar and Sanvido 1998). By requiring bonds in this method, the owner is in effect relying on the surety industry to filter out unqualified contractors. Many states have laws requiring the registration or prequalification of bidders. While this takes the qualification of contractors one step farther, most requirements merely consist of the submission of a form listing the contractor's business information and are treated as another responsiveness check rather than a critical look at contractor qualifications. The State of Oklahoma recently passed a law authorizing alternative project delivery methods for public buildings (Stamper 2001). This law requires contractors to attain individual national certification to qualify for construction management or design-build contracts. The law was designed to create a professional requirement for constructors that mirrors the qualifications-based selection for registered professional engineers and architects. To attain certification, the constructor must employ individuals whose combination of professional education, experience, and a national examination qualify them to perform the duties of a construction professional on a construction management or design-build project.

Under the design-bid-build approach, the owner has separate contracts with the designer and the builder, and therefore assumes constructability risk vis-à-vis the builder. Thus, if a design error is found and must be corrected, the owner must first pay the contractor for the change and then attempt to collect the added cost from the designer. While in theory this should be possible, in practice it is very difficult, because the owner must prove that the designer has liability based on negligence or another legal theory.

Cost-Plus-Time Bidding

The FHWA recognized cost-plus-time bidding (referred to herein by its more commonly used name, A+B bidding) in its SEP-14 as one desirable means to break from traditional design-bid-build award of highway projects (FHWA 1998). These contracts often include an incentive clause that rewards the contractor for completing the project ahead of schedule and exacts a disincentive in addition to the requirement to pay a liquidated amount for the owner's administrative costs for completing the project late. The incentive/disincentive clause enforces the spirit of the A+B method by discouraging bidders from deliberately underbidding the time component and by encouraging the selected contractor to finish earlier than the proposed contract time. It rewards the contractor that can most efficiently manage a project by allowing it to win the contract with a bid that is higher but accurately reflects the cost of faster completion. In the UTTC equation, A+B brings the social cost of finishing the project on time (C_T) out of the contractor's bid price and lays it on the table for all to see.

A+B contracts are awarded based on a combination of the price for the contract items (A) and the associated cost of time (B) needed to complete the work according to a formula that calculates an economic cost (the cost to the driving public) per day of work. The price portion is not the only consideration in the award. The project is awarded to the contractor with the lowest sum of A+B. The A+B bidding technique is designed to shorten the total contract time by allowing each contractor to "bid" the number of days in which the work can be accomplished. This method of bidding allows the contractor with the best combination of price and estimated time cost per day (time) to attain the bid. This cost-plus-time method of bidding enables the contractor to determine a reasonable contract duration required for project completion. Awarding agencies believe that the contractor is often best qualified to determine the length of time necessary to complete a project (Bordelon 1998). Various public agencies have used A+B along with financial incentives. Different agencies use different names and different methods to do this. Florida uses the same daily dollar amount of the B portion of the A+B bid as the incentive/disincentive. If the general contractor completes the job early, the contractor earns the daily B portion for every day that it beats the target. If the contractor exceeds the allotted number of days, the general contractor is contractually obligated to pay the excess B portion of the work as a disincentive (WSDOT 1997).

Design-Bid-Build Request for Proposals

Design-bid-build RFP delivers a project by advertising a completed design and asking for proposals on other parameters as well as a bid price. The award is usually made on a basis of some formula where price is given a certain percentage weight and the rest of the parameters make the remaining portion. In *NCHRP Report 451*, a best-value case study, Interstate 5 Columbia River Bridge in Oregon, was presented as an example of best-value procurement in the highway sector. The best-value non-price parameters included specialized construction experience, qualifications, and project staffing. The award was based on a 50/50 split of technical and price using a cost-technical tradeoff evaluation (Anderson and Russell 2001). The South Carolina DOT uses a formula where price counts for 60% and the remaining parameters make up the remaining 40%. The Naval Facilities Engineering Command's policy is that price will be roughly equal to all other factors combined (NAVFAC 1996). Because it retains the separation of designer and builder, the design-bid-build RFP category probably has good potential for immediate acceptance by public owners, consulting engineers, and the highway construction industry. The idea of creating project-specific constructor qualifications rather than general financial qualifications is quite intuitive. This best-value method also allows great flexibility in the inclusion of other parameters such as extended warranties, design alternatives, traffic control planning and public outreach programs as means to add value to a given proposal and justify not awarding to the low bid. In the UTTC equation, C_Q (the cost of quality), C_O (other social costs), or both may be parameters used to identify best value.

Design-Build

Design-build RFP development is driven by specific project requirements, and award procedures are constrained by both legal and policy restrictions (FHWA 1996). Thus, the most important piece of the design-build contract is the evaluation process. The definition of success is the creation of a fair, consistent evaluation system that has a bias to select the design-builder with the highest probability of successfully completing the project at a higher level of quality than is required by the RFP. By giving design responsibility to the contractor, design-build allows the owner to evaluate the effectiveness of each proposal and is the only method that combines all of the parameters in the UTTC innovative contracting equation.

The evaluation process for a best-value design-build procurement typically has three parts (Molenaar et al. 1999). First, the qualifications of the design-build contractor team must be checked to ensure that the proposed designer-of-record possesses both the requisite registrations and the necessary past experience to develop a design that will meet the project's technical requirements. The design-build process permits something that is not as common in the construction industry: a qualifications check on the construction contractor. The second part of the evaluation is a technical review of the design-build contractor's proposed design solution. This mainly consists of ensuring that the design is fully responsive to the requirements outlined in the RFP and satisfies the project's functional requirements. This portion of the evaluation permits competing technical solutions, such as concrete versus asphalt pavement, to be compared. In addition, the design-builder is allowed to propose a technical solution that it, as an organization, is particularly well qualified to implement and for which it has excellent past history to aid in the accurate estimation of project price. Evaluating the proposed project price for realism and reasonableness is the final step in the process.

Project Performance Metrics

A series of project performance metrics were created to measure each dataset and allow comparison. As some of the projects in the database did not have both cost and time information, a decision was made to calculate each metric separately for those projects in the database that contained the relevant input data. Thus, for each metric the actual number of projects that were used in its calculation will be shown to permit the reader to gauge the depth and significance of the output. This technique allows the research team to maximize the information gleaned from the available data. The following project performance metrics were calculated:

- Award growth
- Cost growth
- Time growth
- Construction placement
- Average contract value

Award growth (AG) is an indicator of the feasibility of awarding a construction project. It is defined by the difference between original contract cost and engineer's estimate, divided by the engineer's estimate as shown in Equation 2. Before the advertisement, the engineer's estimate needs to be calculated. This estimate is done for the owner and indicates how much money the project will require. The owner then obtains financing in this amount, trusting that the project's actual bid price will be less than the engineer's estimate. A positive award growth indicates that the owner's financing is insufficient and obtaining additional funds may cause a delay. This is especially true for public projects where agencies typically have to return to legislative bodies for increases in project authorization amounts (Gransberg 1999). Negative award growth indicates that the owner may have budgeted money against project requirements that were not realized. This often reduces the annual size of an agency's annual construction program by obligating available funding that is not used (Gransberg 1999). Award growth is an excellent measure of how well an owner understands the market in which the facilities are to be constructed. This metric furnishes a view of the government's ability to forecast the cost of capital improvements. As a project proceeds from concept to completion, the owner's commitment to actual delivery gets greater and greater. If the owner underestimates the project's cost in early stages, that owner is liable to be more willing to pay an inflated price for the project as it draws closer to fruition. It is very important that the owner be able to develop a good cost forecast immediately after design is complete so that a project that is marginally feasible is not awarded for construction. A high award growth indicates the potential that a public agency will build projects that are economically unjustified merely because a public commitment to project delivery has been made. This metric also measures the efficient use of available funding. If the award growth is negative, then it means that the public agency has needlessly tied up available funding that might have been used on other projects.

$$\text{Award Growth (AG)} = \frac{\text{Original Contract Amount (\$)} - \text{Engineer's Estimate (\$)}}{\text{Engineer's Estimate (\$)}} \qquad \text{Eq. 2}$$

Cost growth is the percentage change in cost between the final contract cost and the original contract cost, expressed as a percentage and shown in Equation 3. Cost growth can be positive or negative. When cost growth is positive, there were change orders or claims increasing the cost of the project during its performance. If cost growth is negative, the original contract cost was possibly overestimated or the actual scope of work was reduced.

$$\text{Cost Growth (CG)} = \frac{\text{Final Contract Amount (\$)} - \text{Original Contract Amount (\$)}}{\text{Original Contract Amount (\$)}} \qquad \text{Eq. 3}$$

Time growth is the percentage change in time between the final contract time and the original contract time, expressed as a percentage. Time growth can also be positive or negative depending on the outcome of the project. In fact, time growth changes as the scope of the project changes. When time growth is positive, it means that the project was performed using more time than specified in the original contract, and therefore, the project finished late. When time growth is negative the project's time growth was overestimated, that is, the project was completed ahead of schedule. TG is calculated as shown in Equation 4.

$$\text{Time Growth (TG)} = \frac{\text{Final Contract Time (days)} - \text{Original Contract Time (days)}}{\text{Original Contract Time (days)}} \qquad \text{Eq. 4}$$

Construction placement (CP) is the measure obtained by dividing the final construction cost by the final construction time as shown in Equation 5. Therefore, construction placement measures the average rate at which the contractor earns the contract value across the period of a construction contract. A high rate of construction placement indicates an efficient and effective construction management system. If two contractors performed identical lump sum projects in identical environments, the one that finished first would have incurred the least cost, and this would be indicated by a higher rate of construction placement. The U.S. Army Corps of Engineers uses construction placement as one of its fundamental project performance parameters and has more than 30 years of experience with its use (USACE 1994).

$$\text{Construction Placement (CP)} = \frac{\text{Final Construction Contract Cost (\$)}}{\text{Final Construction Contract Time (days)}} \qquad \text{Eq. 5}$$

Next, the non-traditional projects were separated and compared by procurement method type using the same set of metrics. This allows the research team to quantitatively rank the impact of different best-value elements. For instance, comparing the performance of A+B bidding projects with the performance of low-bid projects will allow the research team to measure the impact of permitting the construction contractor rather than the owner to establish the project schedule. The performance of design-bid-build RFP projects will give an indication of the impact of including contractors' qualifications. Finally, the performance of design-build projects will quantify the impact of allowing the contractor to set the level of quality through the details of the design. The results of this analysis are shown in Figures 2.9 through 2.12.

In Figure 2.9, one can see that award growth is about the same for horizontal best-value and horizontal design-bid-build projects. This shows that an across the board move to implement best-value contracting for highway projects will probably not adversely affect the efficient use of capital. This observation does not consider the possible positive effect of incorporating life-cycle costs in the evaluation plan.

Looking at the three best-value types in the best-value population as shown in Figure 2.9, one sees that A+B projects have a slight increase in cost from the engineer's estimate. This increase is due to the fact that these projects are not generally awarded to the low bidder, and the engineer's estimates are probably formed using traditional design-bid-build bid tabulations. One would therefore expect to see award growth

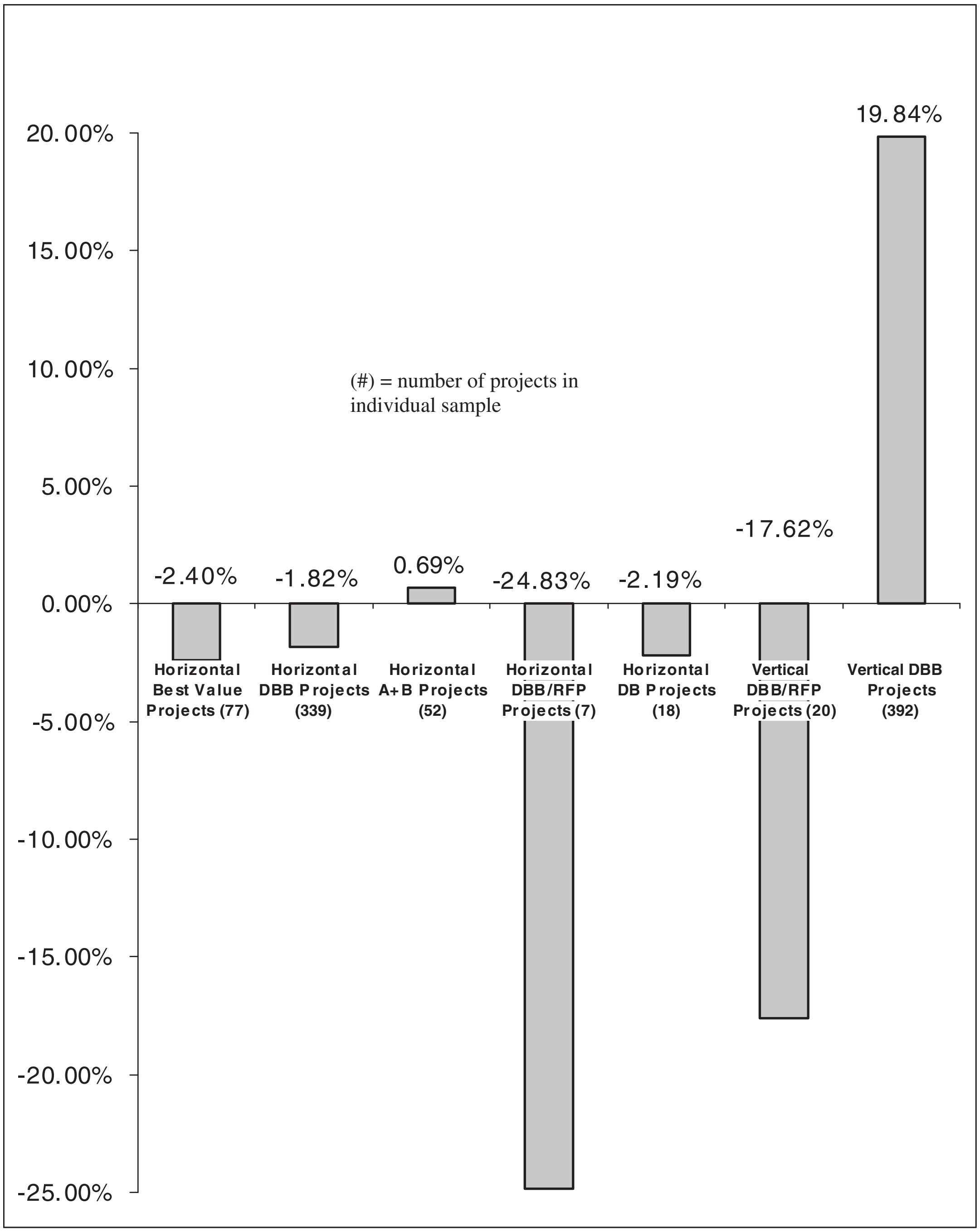


Figure 2.9. Results of award growth analysis.

in A+B projects. The horizontal design-bid-build RFP projects have a large negative award growth. However, the sample is small and this probably represents a statistical anomaly rather than a trend. Therefore, it is discounted. Horizontal design-build projects' award growth is in line with the total population and the traditional projects. Comparing the horizontal award growth numbers to the vertical ones is also quite interesting. The vertical best-value projects had a large negative award growth while the vertical design-bid-build projects had a commensurately large positive award growth. Awarding vertical projects using best-value procurement is a relatively new development (Allen et al. 2002). Therefore, it appears that the owners of public vertical projects have not yet "calibrated" their estimating system to account for this delivery method, hence the large negative award growth. As for the traditional vertical projects, one must remember that architectural and engineered process plant projects are typically more complex in terms of design detail. Therefore, it is reasonable that the owners and their designers would have less accurate pre-award estimates than horizontal owners.

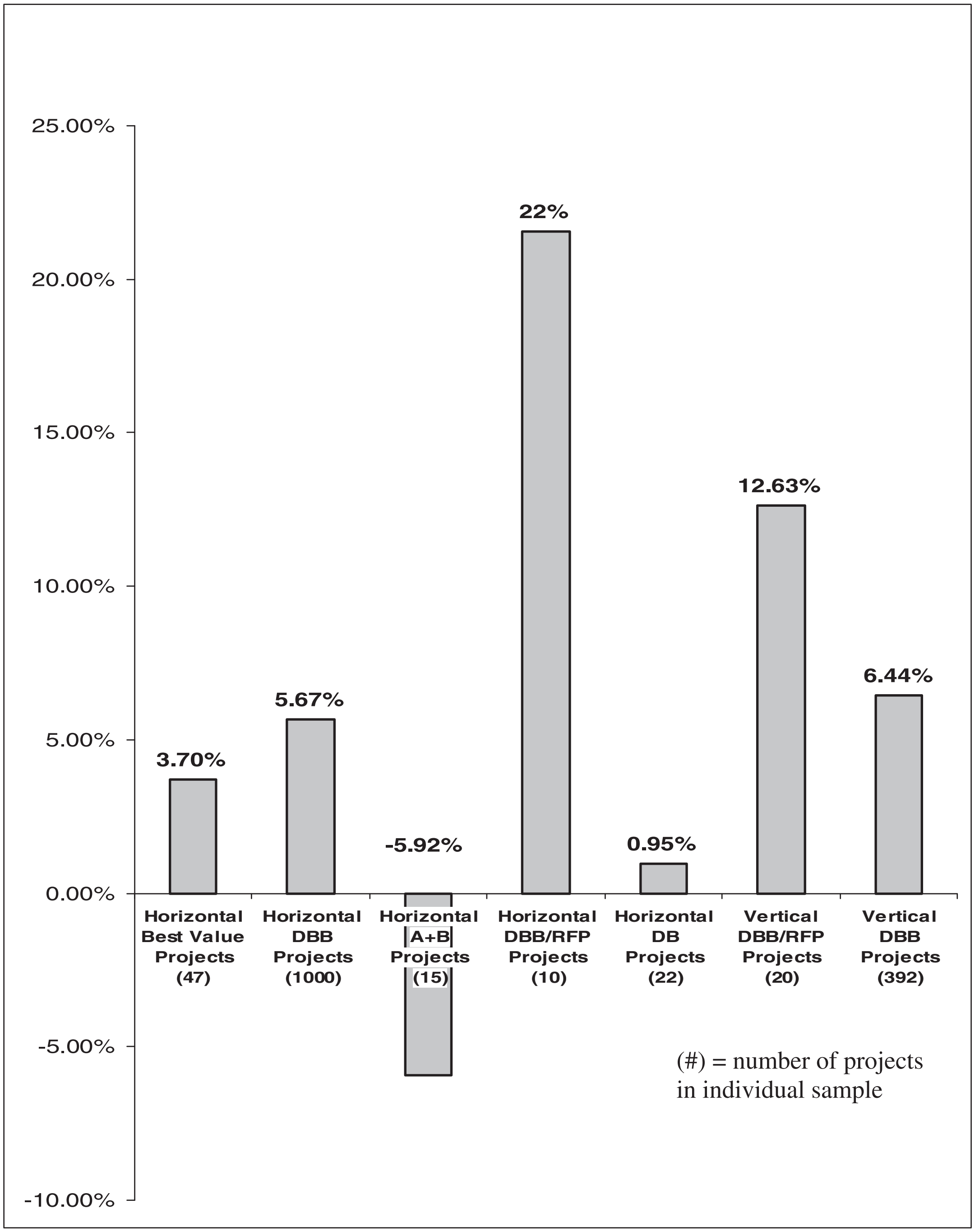


Figure 2.10. Results of cost growth analysis.

Figure 2.10 shows that horizontal best-value projects have less average cost growth than similar projects delivered by design-bid-build. The best performing projects were A+B projects that actually had a negative actual cost growth. This is an interesting phenomenon. It can be argued that A+B projects are by nature schedule driven. Therefore, it is in the contractor's best interest to finish the project on time or, if there is an early completion bonus, ahead of schedule. As a result, the incentive to generate change orders may be reduced. Again, no conclusion can be made with regard to the performance of horizontal design-bid-build RFP projects. However, it is interesting to note that while they were awarded at about 25% less than the engineer's estimate, they were completed at 22% over the original contract price, basically breaking even with the original pre-award estimate. Horizontal design-build projects had less than 1% cost growth, and this result tracks with similar results found in the literature (Ellis et al. 1991, Bordelon 1998).

One can see from Figure 2.11 that the principal benefit accrued from implementing best-value contracting is

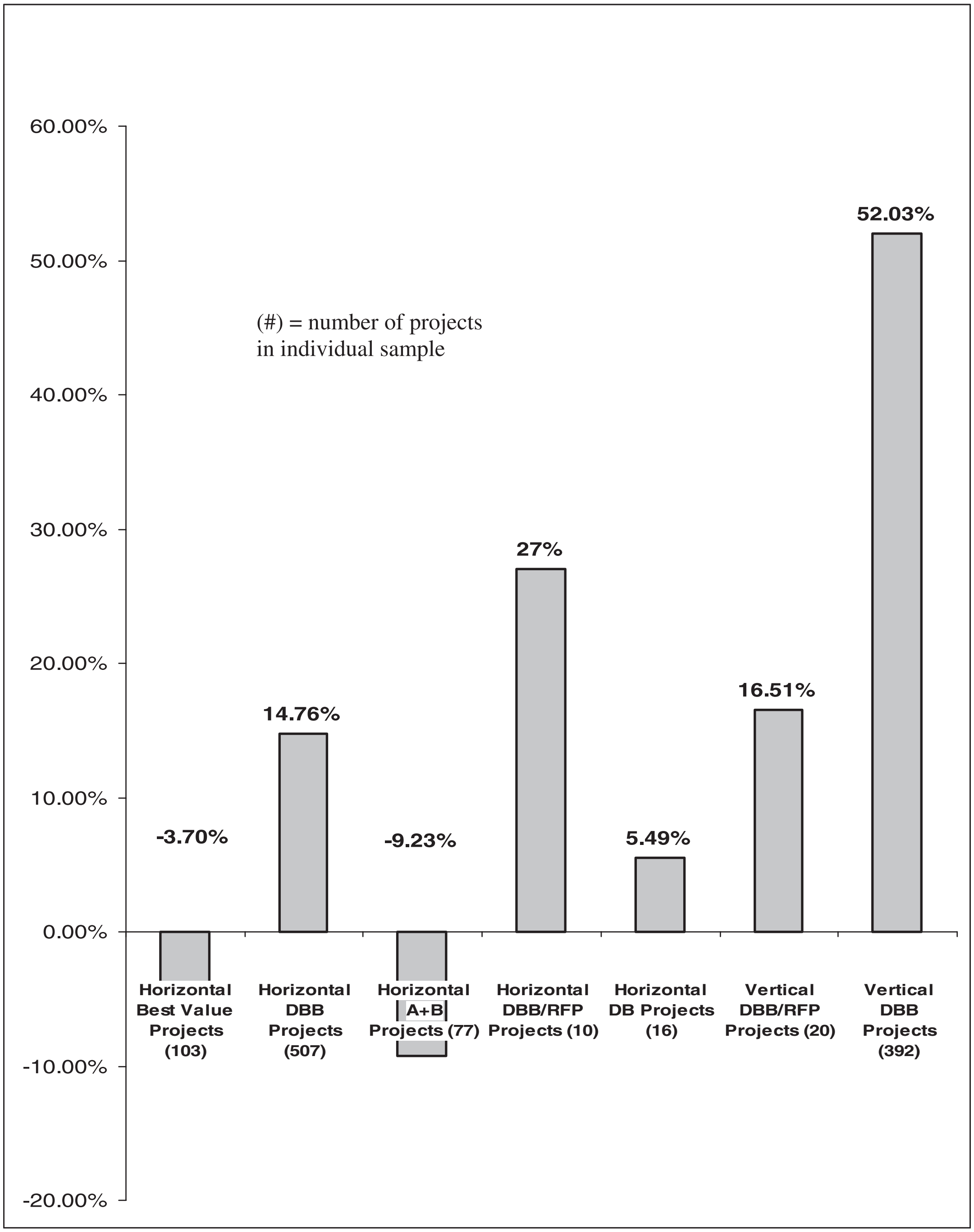


Figure 2.11. Results of time growth analysis.

a substantial reduction in time growth. This appears to be true for both horizontal and vertical projects. The A+B projects are probably the best example of schedule-driven project delivery and show an average time growth of -9.23%. This validates the previous assertion that creating an incentive to finish early drives the contractor to finish early. Horizontal design-build projects have more than 10% less time growth than traditional projects. This is due to the flexibility and greater control allowed the contractor and to the fact that the owner is no longer liable for delays caused by design errors and omissions when the design responsibility is shifted to the design-build contractor. Thus, any time growth that occurs in these projects is most likely a result of either unforeseen conditions (which neither party can control) or owner-caused increases in project scope after award. It can be seen in the vertical projects that a substantial reduction in time growth is realized by using best-value award procedures instead of low-bid award. Once again, the design-bid-build RFP horizontal projects buck the trend and, as before, the small sample size makes it impossible to infer any trend with regard to these types of projects.

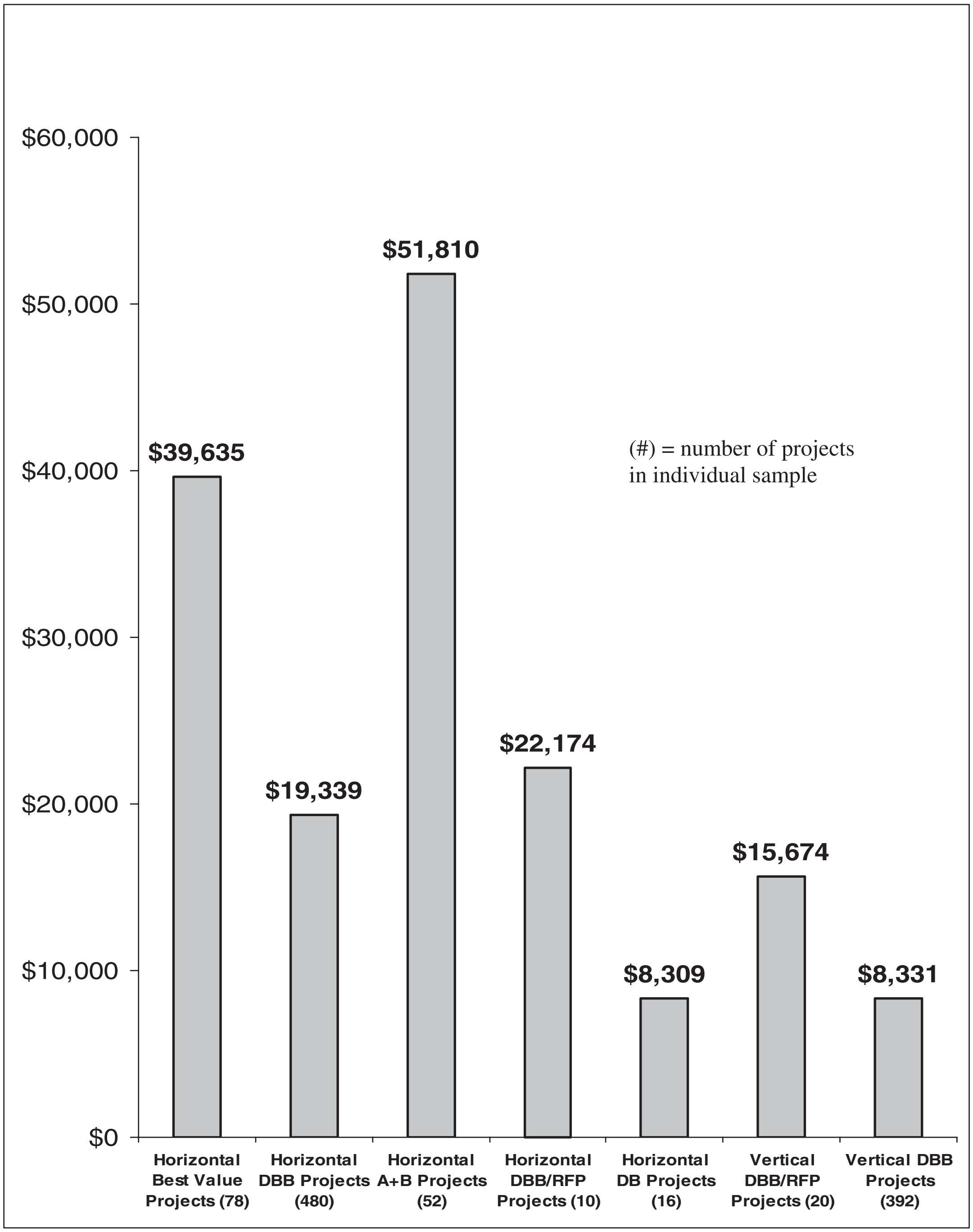


Figure 2.12. Results of construction placement analysis.

Table 2.18. Average contract value for the sample population.

Category	Horizontal					Vertical	
Delivery Method	**Best-Value Projects***	**DBB Projects**	**A+B Projects**	**DBB/RFP Projects**	**DB Projects**	**DBB/RFP Projects**	**DBB Projects**
Projects in Database	119	708	77	10	32	20	394
Average Contract Value	$13.0 million	$2.0 million	$15.9 million	$17.9 million	$6.0 million	$6.5 million	$1.0 million

* Includes all non-low-bid projects

The final performance metric that was calculated is construction placement, and the results are shown in Figure 2.12. Based on Equation 5, a larger number is more desirable than a smaller number. This metric measures the efficiency with which the project delivery method is implemented by creating a measure of financial velocity ($/day) at which the contractor earns the full value of the contract amount. It can be seen that implementing best-value procurement effectively doubled the average construction placement for horizontal projects. The A+B projects had 25% more construction placement than the population as a whole. This would be expected because the A+B projects are by definition schedule driven. Only the horizontal design-build projects failed to outperform the horizontal design-bid-build. However, this outcome is misleading because the design-build project contract period includes the design phase. Therefore, one should expect that overall CP would be lower than those projects that completed construction only. The doubling of CP over traditional low-bid projects also held true for vertical best-value projects.

Average contract value is not a performance metric but it must be calculated to allow the research team to put the previous discussion in perspective. Table 2.18 shows that to date public owners seem to have reserved best-value contracting for their larger projects. In both the horizontal and vertical cases, the average contract amount of the traditional low-bid projects is about an order of magnitude less than the best-value projects.

Conclusions from the Project Performance Metrics Analysis

A number of conclusions can be drawn from this analysis. It appears that the implementation of best-value contracting on horizontal projects has the potential to accrue both cost and time benefits to the public owner. The experience portrayed in the database shows that the use of best-value procurement reduced both time and cost growth and increased the financial efficiency of the projects. While this is significant in itself, it is even more convincing when one takes into account the results of Table 2.18 that show that these savings were accrued on projects that were on average 10 times as large as the traditional projects.

The analysis also shows the A+B projects have the best performance as measured by these metrics. This result clearly demonstrates that letting the construction contractor establish the project schedule and implementing an incentive for early completion accrues a direct benefit to the owner. In highway construction, the user costs of congestion, delay, and accidents can reach as high as $250,000 per day on an urban freeway (Walls and Smith 1998). Thus, the use of a project delivery method that creates a bias toward timely completion (and possibly a bonus for early completion) can quickly amortize the incrementally higher cost for accelerated completion in a matter of days or weeks when the cost to the traveling public is factored into the project life-cycle cost equation.

Finally, the implementation of best-value contracting does not appear to have a significant impact on bid prices as measured by the change in award growth between best value and design-bid-build. The results show that best-value projects can be awarded in a variety of forms with no apparent negative impact to the public owner's project delivery process.

2.7 Expert Interviews

To further validate the results of these findings, the research team surveyed the 14 members of the industry advisory board to ascertain their opinions of the best-value system. While the sample size is small, the board represents a panel of experts, all of whom have personal experience with implementing best-value contracts in highway construction. Thus, the results of this survey act as a "reality check" for the results of the national survey of state highway agencies and federal construction agencies. The board also contained members from the construction contractor community and therefore furnishes a counterpoint to the opinions expressed by the community of owners surveyed in the first group. The survey results are summarized as follows.

The responses indicated that the panel had experience with all of the best-value parameters except warranty credits and the two measured quality parameters. They rated cost, schedule, and past performance the most likely to be successful and cost and incentive/disincentive schemes as the easiest to implement. Warranties were rated as least likely to be successful and design

Table 2.19. Summary of advisory board responses regarding best-value parameters.

Best-Value Parameter	Number That Had Used It	Average Success Rating (1=none; 5=absolute)	Average Ease of Implementation Rating (1=effortless; 5=difficult)
Cost = A.0	5.0	4.2	1.2
Schedule = B.0	5.0	4.0	2.8
Lane Rental = B.1	3.0	2.7	3.0
Traffic Control = B.2	1.0	3.0	4.0
Prequalification = P.0	3.0	3.3	2.7
Past Project Performance = P.1	1.0	4.0	2.0
Personnel Experience = P.2	3.0	3.0	2.7
Warranty = Q.0	2.0	2.5	3.5
Design with Bid Alternate = D.1	3.0	2.7	4.0
Incentive/Disincentive clauses	4.0	2.0	1.5

alternates and traffic control alternates as the most difficult to implement. Table 2.19 contains a summary of the responses.

With regard to the best-value evaluation criteria summarized in Table 2.20, the advisory panel rated price and schedule as most important and having the highest probability of success. Warranties were rated both least important to project success and least likely to be successfully implemented. The panel rated bid price as easiest to implement and design alternates as the most difficult.

Most of the respondents had experience with direct point scoring systems. In Table 2.21, one can see that no trend exists for this component of the best-value contracting system.

Advisory board responses for award algorithms appear in Table 2.22. Adjusted bid was the most frequently used best-value award algorithm. Interestingly, adjusted score was ranked higher than adjusted bid with regard to its probability of success. Finally, as would be expected, meets technical criteria—low bid was rated as the easiest to implement and weighted criteria was rated as the most difficult.

A written comment came from one construction contractor representative that responded to the survey. It is a good summary for this section:

> "My overriding comment is that the various criteria are not better or worse but should be most applicable to meet the owner's need. For example, an owner with limited funds (e.g., issuing bonds based on future toll revenues) may place a higher emphasis on price and strong contract terms while other owners may be more concerned with the quality of the finished product and be willing to pay a premium to get that quality (e.g., higher emphasis on subjective quality criteria or on long term warranty or life-cycle pricing)." Greg Henk, Flatiron Structures

This statement confirms the findings that the best-value selection and award system will probably be most successful if maximum flexibility is preserved and state highway agencies are allowed to customize the selection process to meet the specific needs of each project.

Table 2.20. Summary of advisory board responses regarding best-value evaluation criteria.

Best-Value Evaluation Criteria	Average Importance Rating (1=no importance; 5=imperative)	Average Success Rating (1=none; 5=absolute)	Average Ease of Implementation Rating (1=effortless; 5=difficult)
Bid Price	4.8	4.6	1.6
Past Performance	4.0	2.8	3.5
Qualifications of Project Personnel	3.5	2.8	3.4
Management Plan	3.3	3.3	3.0
Life-Cycle Cost	3.0	2.0	3.0
Schedule	4.3	4.3	2.3
Warranties	2.0	2.0	3.0
Technical Design	4.0	3.5	3.5
Design Alternatives	3.0	3.0	4.5

TABLE 2.21. Summary of advisory board responses regarding best-value rating systems.

Best-Value Rating Systems	Number That Had Used It	Average Success Rating (1=none; 5=absolute)	Average ease of Implementation Rating (1=effortless; 5=difficult)
Satisficing	1	3	2
Modified Satisficing	2	3.5	3
Adjectival Rating	1	3	3
Direct Point Scoring	4	3.5	3.5

TABLE 2.22. Summary of advisory board responses regarding best-value award algorithms.

Best-Value Award Algorithm	Number That Had Used It	Average Success Rating (1=none; 5=absolute)	Average Ease of Implementation Rating (1=effortless; 5=difficult)
Meets Technical Criteria—Low Bid	1.0	2.0	2.0
Adjusted Bid	3.0	3.7	3.3
Adjusted Score	2.0	4.0	3.5
Weighted Criteria	1.0	3.0	4.0
Cost-Technical Tradeoff	0.0	n/a	n/a
Fixed Cost-Best Proposal	1.0	3.0	3.0

2.8 Summary of Findings

This chapter has defined the state of the industry for best-value procurement methods. Current trends in practices and legislation are paving the way for widespread use of best-value procurement for highway construction projects. The four key best-value concepts—parameters, evaluation criteria, evaluation rating systems, and award algorithms—have been defined in this research and presented in this chapter. The application of these concepts was validated through 50 summary level and 14 detailed best-value case studies from all sectors of public construction both nationally and internationally. The universe of evaluation criteria, rating systems, and award algorithms were defined, categorized, and analyzed in terms of their relative advantages and disadvantages. A highway industry survey was conducted to introduce best-value concepts, gauge the level of experience of highway users, and obtain additional case study and performance data. Lastly, best-value procurement use in the highway industry was benchmarked though a nationwide survey of state transportation agencies.

Chapter 3 addresses the development of a recommended best-value system, criteria for screening projects, and strategies for implementation. Ultimately, the best-value procurement system must include appropriate criteria, rating systems, and algorithms tailored to the project to ensure that the best-value system truly adds value to the products of construction.

CHAPTER 3

Interpretation, Applications, and Recommendations for Implementation

3.1 Development of Best-Value Procurement Methods

This section of the report presents a best-value procurement framework that was developed from the performance benchmarking case study results and the analysis of best-value concepts addressed in Chapter 2. The proposed framework presents practical, objective criteria and processes (including a scoring system). The results of the national transportation agency survey validated the proposed framework. Objective screening criteria to identify suitable projects for best-value procurement methods are also provided. To facilitate the project-selection process, a screening and selection tool has been developed and is included in Appendix F.

The screening criteria are important because they also provide the basis from which the content of the best-value procurement method is selected considering the needs of the project. Both one- and two-phase procurement processes, similar to those in the case study projects, are integrated with the best-value parameters and are implemented in the following manner:

1. One-Step Best-Value Procurement: For those projects that the owner determines will derive no benefit from using a competitive screening system to develop a shortlist, the single phase best-value procurement would generally follow these steps:
   a. The owner selects which best-value parameters are most appropriate for a given project. From the list of possible best-value evaluation criteria shown in Table 3.1, the owner then selects those criteria associated with the chosen best-value parameters whose formal evaluation will add value to the project.
   b. These criteria then make up the evaluation plan, and a best-value rating (scoring) system is selected to complete the evaluation plan.
   c. A best-value award algorithm is then selected based on the scope and complexity of the given project, and the best-value RFP will be published detailing both the award algorithm and the requirements to submit information and documentation to be responsive to the best-value evaluation plan.
   d. Depending on the nature of the evaluation plan, an evaluation panel may be formed to conduct the formal evaluation of best-value proposals. This will happen when some element of the design must be evaluated to ensure that it complies with agency regulations, design policy, and specifications.
   e. Proposals are then received and evaluated in accordance with the published evaluation plan and the award is made using the selected best-value award algorithm.
2. Two-Step Best-Value Procurement: For those projects that would benefit from the use of a competitive screening system to develop a shortlist, the two-phase best-value procurement generally follows these steps:
   a. Step 1 is evaluation of qualifications and quality information (P.1–P.5 and Q.4) and development of a shortlist of best-qualified bidders. It must be noted that this method involves a more detailed evaluation of qualifications than the current administrative prequalification process in use by many state construction agencies. It is anticipated that the agency will publish a formal "request for qualifications" for each individual project using evaluation criteria that have been customized to the needs of the given highway construction project. For each evaluation criteria, the agency must develop a measurable standard against which the qualifications would be measured.
   b. The "statements of qualifications" (SOQs) will be evaluated, and the list of prequalified firms will be announced.
   c. A best-value RFP will be published detailing both the award algorithm and the method by which the Step 1 qualifications ranking/scores will be carried over into the final evaluation.
   d. The evaluation panel will evaluate all responsive proposals in accordance with the published evaluation plan and award will be made according to selected best-value award algorithm.

The use of both systems allows the proposed best-value procurement method to retain maximum flexibility while maintaining an appropriate focus and tradeoff between cost and non-cost parameters. Additionally, it provides the owner with a powerful selection tool that draws the bulk of its details from the methods used to successfully procure the case study projects.

Best-Value Parameters

Figure 2.1 in Chapter 2 illustrated the research team's initial attempt at conceptualizing a best-value framework. As described in that chapter, the best-value parameters, which reflect the ultimate goals of the project, form the foundation of the best-value contracting framework. Using Figure 2.1 as a basis, the research team then developed Figure 3.1 to better depict the relationship between the parameters and the components making up the evaluation plan.

Once the owner has determined which parameters are most appropriate for a given project, the remainder of the details of the best-value procurement can be determined. The evaluation criteria stem directly from the best-value parameters, with the selected criteria then yielding the appropriate rating system and award algorithm.

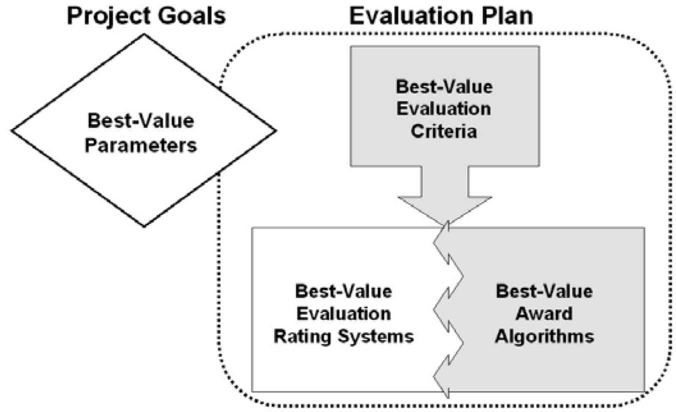


Figure 3.1. Best-value concepts.

MAP Case Study Evaluation Criteria to Best-Value Parameters

The first step in deriving a proposed best-value procurement framework is to map the results of the best-value project case study content analysis to the best-value parameters and evaluation criteria. To do this, the research team determined that the best measure of potential success for a given generic evaluation criterion was repetitive use by those agencies that have experimented with best-value procurement. Accordingly, the following standard was developed for selecting a given best-value evaluation criterion to be recommended for use in the proposed framework:

> To be recommended, the criterion must appear in >50% of the sample population solicitations, or, if none are >50%, the single highest occurrence will be used.

With this standard in mind, Table S.1 was revised into Table 3.1. It should be noted that the only evaluation criterion that did not meet the 50% rule was "Project Schedule Evaluation." It was included based on the advisory panel survey indicating that it had a "high potential" for successful implementation. The widespread use in the highway industry of A+B contracts, through which a contractor-proposed schedule is integrated into the award algorithm to determine

Table 3.1. Summary evaluation criteria as identified with best-value parameter from total case study project population.

Evaluation Criteria	Best-Value Parameter Designation	Number of Contracts Using Evaluation Criteria (Total = 50)
Price Evaluation	A.0	42
Project Schedule Evaluation	B.0	19
Financial & Bonding Requirements	P.0	35
Past Experience/Performance Evaluation	P.1	44
Safety Record (or Plan)	P.1	25
Key Personnel & Qualifications	P.2	41
Utilization of Small Business	P.3	30
Subcontractor Evaluation/Plan	P.3	29
Management/Organization Plan	P.4	31
Quality Management	Q.4	27
Proposed Design Alternate	D.0	26
Technical Proposal Responsiveness	D.1	37
Environmental Considerations	D.1	25

Table 3.2. Summary of proposed best-value parameters and evaluation criteria.

Parameter	*Final Designation	Evaluation Criteria	Includes	Remarks
Cost	A.0	Initial Capital Cost	Construction and procurement costs (also include design costs in a DB project)	Sometimes called the "bid" price
Time	B.0	Schedule	Time to build project (also include design time in a DB project)	Sets contract performance period
Qualifications & Performance	P.0	Prequalification	Financial and corporate information as well as bonding requirements	Typically a routine government form used for all contracting opportunities
	P.1	Past Project Performance	Project experience on past projects that are similar to the project at hand. Also might include past history of claims and litigation	Preference is given to offerors with the most relevant experience
	P.2	Key Personnel Experience & Qualifications	Qualifications of key personnel	Licenses, registrations, and past project experience of individuals
	P.3	Subcontractors' Information	Subcontracting plan including small business utilization	Often requires that goals for participation by certain types of firms be met
	P.4	Project Management Plans	Plans for logistics, material management, equipment, traffic control, etc.	Often related to schedule constraints
	P.5	Safety Record and/or Plan	Corporate safety record and plans for specific safety hazards	Often uses the Workers' Compensation Insurance Modifier as a metric to measure safety record
Quality	Q.0	Quality Management Plans	Typical QA/QC program submitted prior to award	May include design QC if bid alternates or DB is used
Design Alternates	D.0	Proposed Design Alternate	Owner allows contractor to propose an alternate material or technology for a given feature of work	Bid is submitted with and without alternates. Owner makes decision as to which alternates will be accepted prior to award
	D.1	Technical Proposal Responsiveness	Proposals are considered responsive if they receive a minimum technical score	Requires that a measurable standard be developed for each evaluation criteria
	D.2	Environmental Considerations	Plans to prevent and/or mitigate pollution during construction	Many are required by law and/or regulation

* Note: Best-value parameter designations have been changed to simplify the final implementation of the results of this report.

DB = design build

the best value on a basis of cost and time, also supported the decision to include this criterion.

On the basis of Table 3.1, Table 3.2 was developed to allow the direct association of proven case study best-value evaluation criteria with the underlying best-value parameters. The owner can now apply this suite of evaluation criteria to the development of a best-value evaluation plan. In addition to the evaluation criteria, the overall evaluation plan also consists of a rating system and an award algorithm. A discussion of these two remaining best-value concepts is provided in Section 3.2.

3.2 Proposed Best-Value Award Algorithms and Rating Systems

The selection of a best-value award algorithm is also project specific. Some projects will need a more complex system than others. For example, a project with little variability in the experience of potential contractors will not benefit from an extensive evaluation of qualifications, although an urban freeway project having no schedule constraints may benefit greatly by including the schedule in the competitive bid process. As an additional example, a project requiring special technical expertise that is not present in the agency may benefit from contractors proposing certain aspects of the design as alternates. Each of these situations requires a different best-value award algorithm to ensure, throughout the process of evaluation and award, the continued emphasis of salient aspects of the project that factored in its selection to be procured using best value. Seven best-value award algorithms were identified in the first phase of this study and are shown in Table 3.3. The table further shows the variables used in each algorithm and the method used to determine the award. It should be noted that five of the seven award algorithms entail point scoring or some mathematical combination of price and non-price scores.

These algorithms were all drawn from the case study projects identified in Phase 1 of this research. Many of the case study projects were not highway projects, because the research team was committed to looking for possible best-value procurement solutions across both highway and building construction industries. If the vertical projects are eliminated and only those algorithms that were used to procure horizontal construction projects are included, the sample becomes much smaller. However, it becomes more relevant because the case study best-value award algorithm results are restricted to those that may be most suitable for highway construction projects. Twenty-eight of the case study projects fell into the horizontal category. Additionally, Table 2.16 in Chapter 2 contains a summary of published agency best-value award algorithm practices. These data were drawn from the case study projects as well as from other published information in the literature. The sample contains 36 transportation agencies. Combining the two samples furnishes a means to gain insight as to the applicability of existing best-value award algorithms to highway construction. The results of this analysis appear in Table 3.4.

It should be noted that the sum of the Qualitative and Quantitative Cost-Technical Tradeoff (53%) is highest in the horizontal case study project sample because of the large percentage (61%) of Federal projects that are in the population. Cost-Technical Tradeoff is mandated by federal regulation if a low-bid award is not used. Three of the six low-bid case study projects were federal low-bid best-value projects. Thus, even though it is the most prevalent in the case study population, the reader should not interpret that statistic to mean that it is the best algorithm for all horizontal projects. Looking at the number of transportation agencies that use the various types of algorithms, if the two types of cost-technical tradeoff algorithms are added together, one can see that actual usage is almost evenly split among the algorithms. Therefore, no clear trend seems to exist. Thus, it must be concluded that flexibility in the selection of a best-value award algorithm should be maintained.

Using this analysis as a starting point, the best-value award algorithms can be condensed into three basic types. It should be noted that each has an associated best-value evaluation

Table 3.3. Summary of best-value award algorithms.

Best-Value Award Algorithm	Algorithm	Variables	Award Determination
Meets Technical Criteria—Low Bid	If $T > T_{min}$, Award to P_{min} If $T < T_{min}$, Non-Responsive	T = Technical Score P = Project Price	Lowest Price
Adjusted Bid	AB = P/T Award AB_{min}	AB = Adjusted Bid	Numerical analysis using point scoring, a mathematical combination of price and non-price factors, or a quantitative tradeoff analysis
Adjusted Score	AS = (T x EE)/P Award AS_{max}	AS = Adjusted Score EE = Engineer's Estimate	
Weighted Criteria	$TS = W_1S_1 + W_2S_2 + \ldots + W_iS_i + W_{(i+1)}PS$ Award TS_{max}	TS = Total Score W_i = Weight of Factor i S_i = Score of Factor i PS = Price Score	
Quantitative Cost-Technical Tradeoff	$T_{Increment} = [(T_j/T_i) - 1] \times 100\%$ $P_{Increment} = [(P_j/P_i) - 1] \times 100\%$ If $T_{Increment} > P_{Increment}$, Award $Proposal_i$ If $T_{Increment} < P_{Increment}$, Retain $Proposal_j$ for possible award and repeat with $Proposal_{j+1}$ Repeat Process until $T_{Increment} > P_{Increment}$	T = Technical Score P = Project Price	
Fixed Price—Best Proposal	Award T_{max}, Fixed P	T = Technical Score P = Project Price	
Qualitative Cost-Technical Tradeoff	Similar to above, only no quantitative analysis of difference. Award to proposal that has best value in proposed scope. See Figure 3.3.	Evaluation panel reaches consensus as to which proposal is the best	Qualitative tradeoff analysis of cost and technical factors

Table 3.4. Case study best-value award algorithm usage.

Best-Value Award Algorithms	Number of Transportation Agencies Using Award Algorithm		Number of Horizontal Case Study Projects Using Award Algorithm	
Meets Technical Criteria–Low Bid	7	19%	6	21%
Adjusted Bid	7	19%	3	11%
Adjusted Score	6	17%	1	4%
Weighted Criteria	8	22%	3	11%
Quantitative Cost-Technical Tradeoff	2	6%	3	11%
Fixed Price–Best Proposal	1	3%	0	0%
Qualitative Cost-Technical Tradeoff	5	14%	12	42%
Totals	**36**	**100%**	**28**	**100%**

rating system that best fits the mechanics of the award algorithm. The results are as follows:

1. Meets Technical Criteria—Low Bid: All non-cost criteria are evaluated using a satisficing rating system. Direct point scoring may be used to determine if the technical proposal meets the minimum technical score. Those proposals found to be fully responsive make up the "competitive range" (FAR term that fits this case). The bids are then opened, and the project is awarded to the lowest price proposal.
2. Cost-Technical Tradeoff (Qualitative): All non-cost criteria are evaluated using either an adjectival or modified satisficing rating system. Those proposals found to have no fatal deficiencies make up the competitive range, and then the bids are opened and the project is awarded to the best value, without any mathematical manipulation or combination of price and non-price factors.
3. Value Unit Price ($/technical point): All non-cost criteria are evaluated using a direct point scoring system. Those proposals found to have no fatal deficiencies make up the competitive range. The bids are then opened, and the project is awarded to the best value using a mathematical manipulation or combination of both price and non-price factors, a tradeoff analysis, or points. This category would include adjusted bid, adjusted score, quantitative cost-technical tradeoff, weighted criteria, and fixed price—best proposal (technical score only). The use of this algorithm permits the owner to put a dollar value on a point of score, creating a "best-value unit price."

Meets Technical Criteria—Low Bid

To implement this best-value award algorithm, the owner will use the process that is illustrated graphically in Figure 3.2 with the following steps:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. The project screening and selection tool provided in Appendix F can facilitate this screening process. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications and technical evaluation criteria based on the screening criteria. For each evaluation criteria, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value solicitation. The solicitation will contain the following items as a minimum:
   a. Scope of work, plans, and specifications
   b. Bid form
   c. Contract completion date or days
   d. Best-value evaluation plan listing the evaluation criteria with corresponding standards
   e. Description of what constitutes a non-responsive proposal
4. Receive best-value proposals and sealed bids.
5. Evaluate best-value proposals against published standards and determine which proposals are fully responsive in meeting the technical and qualifications criteria.
6. Return the sealed bids to the authors of non-responsive proposals.
7. Open the bids of those competitors that remain in the competitive range.
8. Award to the lowest bid from within the competitive range.

It is important in this award algorithm to limit the number of qualification and technical criteria to those from categories that carried high importance in the project's best-value screening. The evaluation plan should be written to be completely transparent to members of industry. To avoid the possibility of dispute or bid protest, the owner should

> "Clearly state the evaluation criteria and the weight assigned to each item and ensure that the evaluation team uses them. Clearly state the requirements of the RFP including what will be considered a non-responsive proposal." (Parvin 2000)

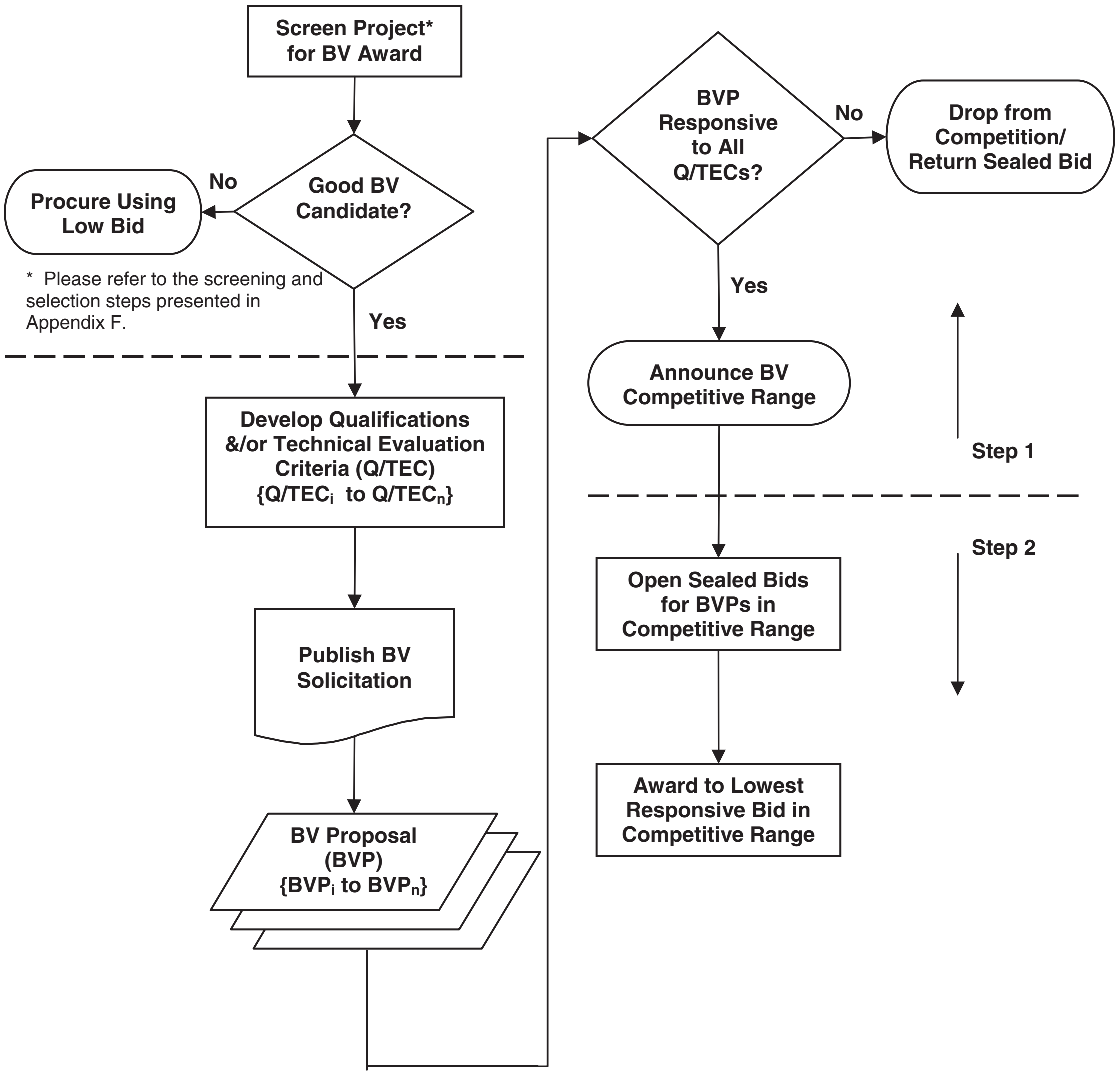


Figure 3.2. Two-step meets technical criteria—low bid best-value procurement flowchart.

The goal is to have as many responsive competitors at the end of the first step as possible, thus ensuring the greatest possible price competition in the second step of the procurement. Therefore, only evaluation criteria that will assist the owner in differentiating among the pool of potential competitors should be included in the evaluation plan.

Cost-Technical Tradeoff (Qualitative)

To implement this best-value award algorithm, the owner will follow the process that is illustrated graphically in Figure 3.3. Implementation includes the following steps:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. The project screening and selection tool provided in Appendix F can facilitate this screening process. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications, technical, schedule, and cost evaluation criteria (QC, TC, SC, and CC, respectively, in Figure 3.3) as appropriate based on the screening criteria. For each evaluation criteria, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value RFQ. The solicitation will contain the following items as a minimum:
   a. Description of scope of work
   b. SOQ forms
   c. Contract completion date or days
   d. List of qualifications evaluation criteria with corresponding standards
   e. Description of process to be followed for the best-value proposal evaluation plan
   f. Description of what constitutes a non-responsive SOQ

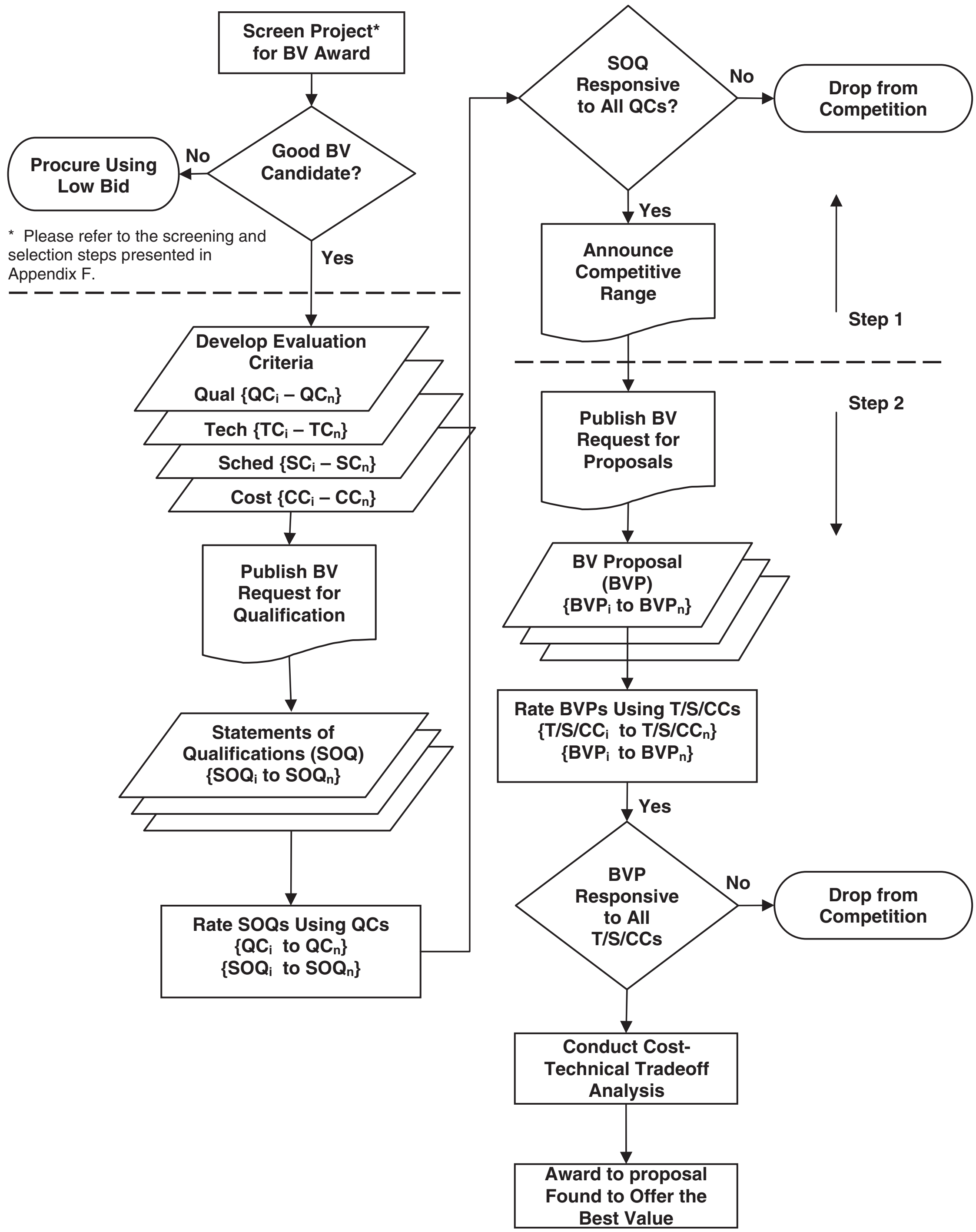


Figure 3.3. Two-step cost-technical tradeoff (qualitative) best-value procurement flowchart.

4. Receive SOQs.
5. Evaluate SOQs against published standards and determine which statements are fully responsive and meet the qualifications criteria.
6. Announce the list of prequalified firms.
7. Publish the best-value RFPs. The solicitation will contain the following items as a minimum:
   a. Scope of work and relevant plans and specifications
   b. Proposal forms
   c. Contract completion date or days (if applicable)
   d. Method to carry forward Step 1 qualifications ranking/scores into final evaluation (if applicable)
   e. Best-value proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards
   f. Description of what constitutes a non-responsive proposal

8. Evaluate proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
9. Eliminate any non-responsive proposals from the competitive range.
10. Roll up evaluation results.
11. Convene selection panel and conduct qualitative cost-technical tradeoff analysis to identify the best proposal.
12. Award to the firm within the competitive range offering the best-value proposal.

This is the most subjective of the three best-value award algorithms, and as a result, it will be the least popular to implement. However, numerous conversations with procurement officials in the federal sector indicate that they have had more award protest problems with the quantitative cost-technical tradeoff than with this more subjective approach. Feldman's Government Contract Awards treatise states as follows various issues associated with quantitative and qualitative ratings in Sections 10:20 and 10:21 (Feldman 1994, footnotes omitted):

> The General Accounting Office (GAO) has approved the use of qualitative ratings as opposed to numerical ratings, so long as they give the source selection official a clear basis for considering the merits of proposals. [§10:21]
>
> Indeed, the Comptroller General has stated that such ratings 'may be a more direct and meaningful method' than the numerical evaluation of technical proposals, even though both evaluation approaches characteristically reflect the disparate, subjective judgments of the evaluators. As with numerical rating systems, the GAO has said that qualitative ratings are best used as guides to intelligent decision making and are not generally controlling for award. [§10:21]
>
> Sometimes, both agency and industry personnel assign talismanic importance to point scores. The Comptroller General has stated repeatedly, however, that point scores are useful only as guides to intelligent decision making and are not generally controlling for award because they reflect the subjective and sometimes disparate judgments of the evaluators. [§10:20]
>
> [T]he Comptroller General (and some agency regulations) consistently have disapproved of agencies' establishing predetermined cutoff scores for deciding technical acceptability. [§10:20]

This qualitative approach enables owners to differentiate between competitors when the relative merits of each proposal are difficult to quantify using a point scoring system, but the project has specific technical or experiential requirements to be successful.

Value Unit Price

To implement this best-value award algorithm, the owner will follow the process that is illustrated graphically in Figure 3.4. Implementation includes the following steps:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. The project screening and selection tool provided in Appendix F can facilitate this screening process. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications, technical, schedule, and cost evaluation criteria (QC, TC, SC, and CC, respectively, in Figure 3.4) as appropriate based on the screening criteria. For each evaluation criterion, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value RFQs. The solicitation will contain the following items as a minimum
   a. Description of scope of work
   b. SOQ forms
   c. Contract completion date or days
   d. List of qualifications evaluation criteria with corresponding standards
   e. Description of process to be followed for the best-value proposal evaluation plan
   f. Description of what constitutes a non-responsive SOQ
4. Receive SOQ.
5. Evaluate SOQs against published standards and determine which statements are fully responsive and meet the qualifications criteria.
6. Announce the list of prequalified firms.
7. Publish the best-value RFPs. The solicitation will contain the following items as a minimum:
   a. Scope of work and relevant plans and specifications
   b. Proposal forms
   c. Contract completion date or days (if applicable)
   d. Method to carry forward Step 1 qualifications ranking/scores into final evaluation (if applicable)
   e. Best-value proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards
   f. Description of what constitutes a non-responsive proposal
8. Evaluate proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
9. Eliminate any non-responsive proposals from the competitive range.
10. Roll-up evaluation results and determine the final point score for each responsive proposal.
11. Compute the $/technical point using the formula published in the RFP to identify the best proposal.
12. Award to the firm within the competitive range offering the lowest best-value unit price.

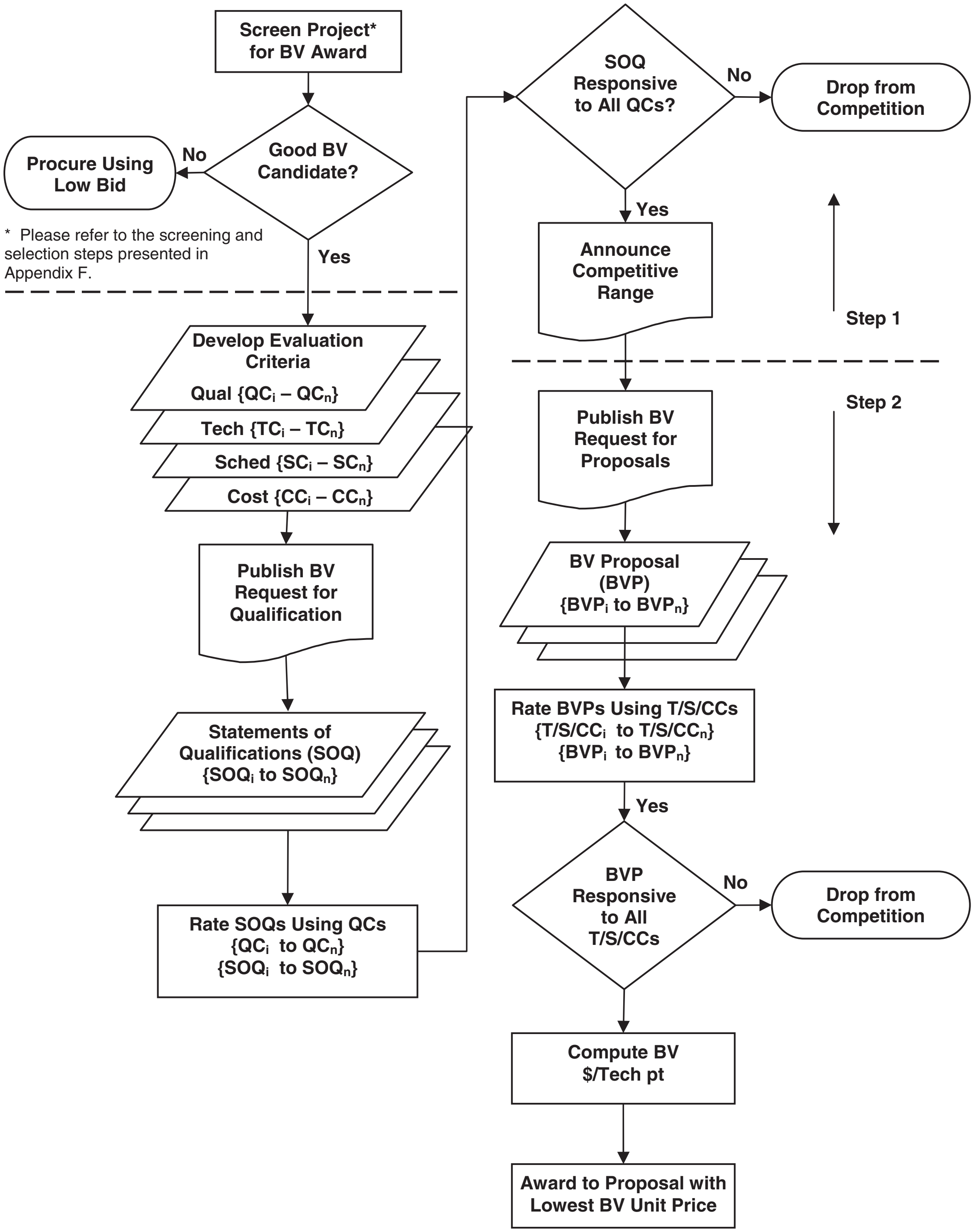


Figure 3.4. Two-step value unit price best-value procurement flowchart.

The value unit price algorithm assumes that the owner will develop a specific formula that can be used to calculate the best-value objective decision criterion. Table 3.3 contains the formulae that are currently in use for the various best-value award methods. This algorithm is extremely dependent on the proper implementation of a thoughtfully developed direct point scoring system. Once the direct point scoring system has been selected, the owner must make a number of decisions about the details of the system to ensure the integrity of the scoring process. Unfortunately, the extremely important decision regarding the numerical range of possible points to be awarded is often made arbitrarily without regard to its overall impact on the scoring system.

Owners must make sure that the cost-value of a single point of score is consistent with its actual value to the project. In a direct point scoring system, the total number of points awarded in each rated category is usually determined by the weight that the owner allocates to that category. For example, the qualifications of the project's quality control engineer might carry a total possible score of 5 points, whereas, the quality management plan may carry a maximum total score of 45 points. If the maximum total score for all rated categories adds up to 1,000 points, then the weight assigned to each rated category is proportional to its individual maximum total score. Continuing with this hypothetical example, if this project's estimated cost is $20 million, the value of each point will be $20,000. Thus, the cost value of the engineer's qualifications will be $100,000 and the cost value of the quality management plan feature of the design is $900,000. Thus, the overall evaluated value of the two is $1.0 million or 5% of the project. The reader must remember that these values are not absolute. However, if the amount of money at risk if the project is not properly constructed is estimated at $5.0 million, then these rated categories are under-weighted relative to the entire project value. Therefore, more weight should be given (i.e., more points assigned) to the quality management feature of the project in the evaluation plan. If, on the other hand, the quality management aspects of this project are a minor portion of the work, and the technical and performance risk lies in other rated categories, then these two evaluation categories may be over-weighted, and the points assigned to them should be reduced and moved to other more important categories.

A detailed discussion of best-value evaluation rating systems for the other two award algorithms is found in Chapter 2. The details of each evaluation rating system should ultimately be based on the requirements of the individual project under analysis. Those projects that are relatively straightforward should have a simple rating system. On the other hand, those projects that are technically complex will need a more complex rating system to be able to identify the best value. Additionally, the owner must ensure that the rating system can be mapped back to the project screening system and ensure that those areas are thoroughly evaluated. Any weighting that is developed must be consistent with the project screening criteria as well and ensure that those areas that have the greatest importance in the procurement are the most heavily weighted. Finally, the owner should test the weighting with a small number of pilot projects to ensure that the system behaves as anticipated.

3.3 Summary of Proposed Best-Value Procurement Framework

Table 3.5 is a summary of the proposed best-value procurement framework. It shows how the practical, objective

Table 3.5. Summary of best-value procurement framework.

Award Algorithm / BV Parameter and Evaluation Criteria	Meets Technical Criteria—Low Bid (Cost)	Cost-Technical Tradeoff (Qualitative)	Value Unit Price
Price			
Price: A.0	X	X	X
Time			
Schedule: B.0	X	X	X
Cost			
Cost: C.0	X	X	
Qualifications			
Prequalification: P.0	X		
Past Project Performance: P.1		X	X
Key Personnel Experience: P.2		X	X
Subcontractor Information: P.3		X	X
Project Management Plans: P.4		X	X
Safety Record/Plan: P.5	X	X	X
Quality			
Quality Management: Q.0	X	X	X
Design Alternates			
Design with Proposed Alternate: D.0		X	X
Technical Proposal Responsiveness: D.1	X		
Environmental Considerations: D.2		X	X
Rating System			
	Satisficing	Adjectival or Modified Satisficing	Direct Point Scoring

evaluation criteria are related to both the best-value award algorithms and the rating (scoring) system.

Table 3.5 shows how the four elements of best-value procurement can be brought together in a cogent manner that allows the owner to develop a best-value procurement methodology systematically on a project-by-project basis. When used in conjunction with the best-value project screening and selection system, this framework will permit state agencies to create a standardized procurement policy for best-value projects.

3.4 Implementing the Proposed Best-Value Procurement Method

Figure 3.5 is a flow chart that illustrates the process by which an agency would implement best-value procurement. The process is designed to be project-specific and stems from the output of the project screening and selection process that was used to pick a given project to be delivered using best-value

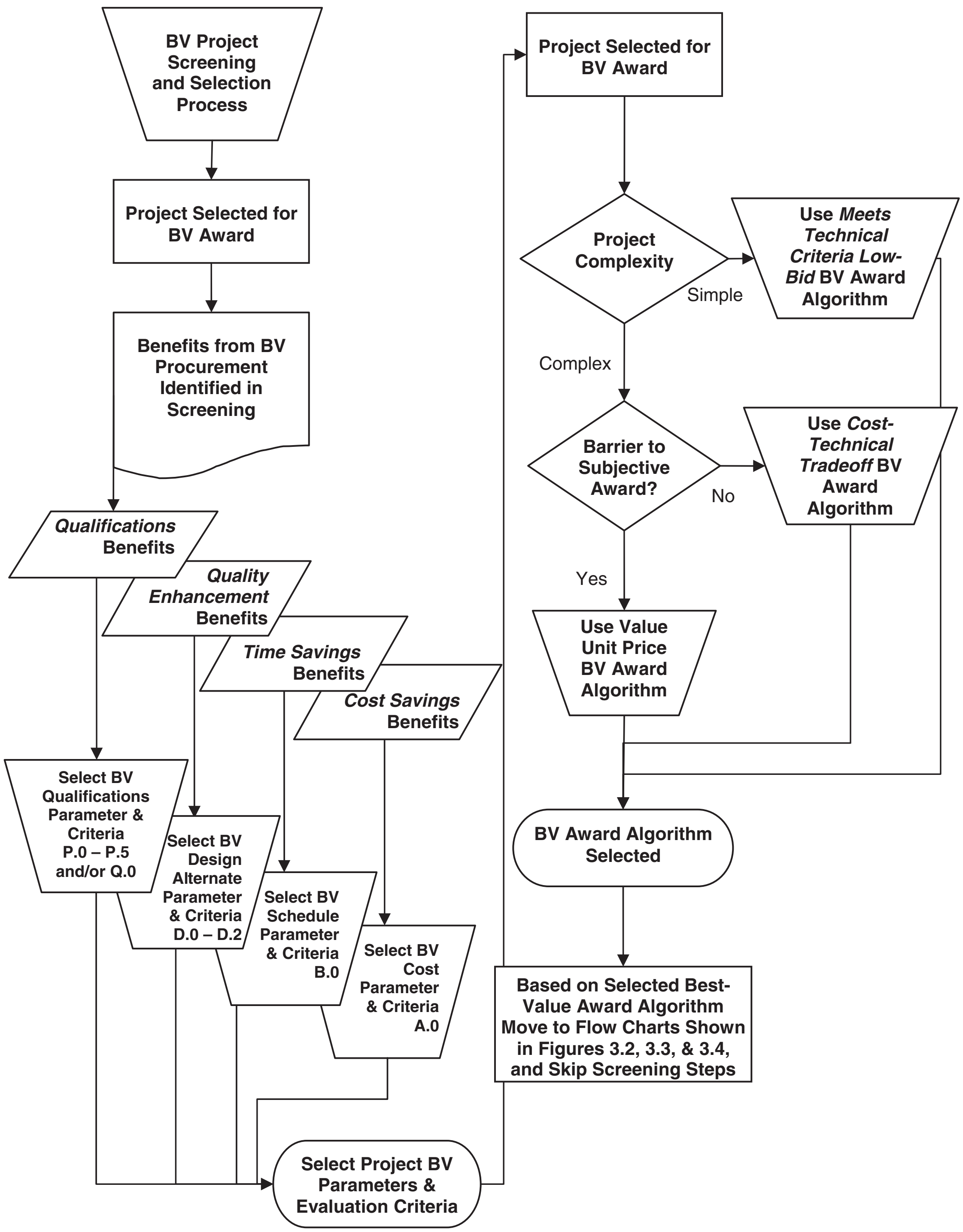


Figure 3.5. Implementing best-value procurement flowchart.

procurement. Note that Section 3.5 discusses the screening and selection process in detail.

In essence, the best-value procurement process involves a series of decisions that are constrained by the best-value procurement framework. It tracks through the following series of steps:

1. Having identified those potential benefits that may be accrued by delivering a project by best-value procurement, the owner then lists those benefits and identifies the specific best-value parameters that are appropriate to the project from the list of potential parameters shown in Table 3.2.
2. For each of the appropriate parameters, the relevant evaluation criteria are selected. There will always be a cost parameter with evaluation criteria in the final set. If the schedule is fixed by the agency, then no schedule parameter will be selected, but, if the contractor is allowed to propose some element of the schedule, then it will also be included. This set forms the foundation on which the remainder of the procurement is built.
3. Next, the best-value award algorithm is selected based on project characteristics. Project complexity must be considered because it will impact the choice of award algorithms.
4. If the project is a relatively simple and technically straightforward job, then the simplest best-value award algorithm, meet technical criteria—low bid, is a logical choice. If the owner is concerned about project quality, the process may involve prequalification or shortlisting or could allow the owner to factor in its own costs into the selection decision. The previously identified parameters and evaluation criteria make up the set that is published in the best-value solicitation (see Figure 3.2). A measurable standard is developed for each best-value evaluation criterion, and a satisficing ("go/no-go") rating system is established. The project is then advertised and awarded in accordance with the process described in Figure 3.2.
5. If the project's scope of work is judged to be complex, then the owner must decide whether it will use the cost-technical tradeoff or value unit price award algorithm. As previously stated, cost-technical tradeoff gives the owner maximum flexibility in its best-value award decision, and experience of federal agencies indicates that its use results in better decisions and also reduces the potential for bid protests based on improper application of the published evaluation plan. However, legislatures may be reluctant to allow agencies to use this algorithm due to the major paradigm shift from the conventional design-bid-build procurement process. For the same reason, agencies may be reluctant to use this process even if legal authorization exists. An owner that has authority to use this process and is interested in doing so would take the parameters and evaluation criteria identified in the screening process and develop appropriate evaluation standards for each criterion. A modified satisficing or adjectival rating system would then be established. The criteria associated with the qualifications and quality parameters would form the basis for the best-value RFQ. The remaining parameters and criteria would be published in the RFP.
6. The process would follow that shown in Figure 3.3. Once the Step 2 evaluation of those proposals that remain in the competitive range after Step 1 is completed, the selection panel would conduct the cost-technical tradeoff, could elect to proceed with discussions and final proposals followed by re-evaluation, and would select the proposal that offered the greatest value to the agency.
7. If there are legal, institutional, or political barriers to using cost-technical tradeoff on a relatively complex project, the logical alternative is value unit price. Development of this procurement is the same as described in the previous paragraph except that the owner must develop a formula to compute the best-value unit price. As previously stated, there are a number of possible formulae that have been successfully used by transportation agencies across the country that could be adopted or adapted by the procuring agency for this step. However, the research team believes that the weighted criteria formula shown in Table 3.3 is the most flexible approach to determining the best-value unit price, and allows the owner the ability to control most completely the relationship between the mathematical outcome and the project's requirements. Therefore, this formula is recommended. The impact of using the other formulae will be demonstrated in the next section of this report.
8. The process would follow that shown in Figure 3.4. Once the Step 2 evaluation is completed for those proposals that remain in the competitive range after Step 1, the evaluation panel would compute the value unit price and award the project to the proposal that best satisfied the formula's objective decision criterion. Again, the procurement process could include the opportunity for discussions and final proposals, if permitted by enabling legislation and deemed advisable by the procuring agency.

The final point concerning implementing the proposed best-value procurement method deals with the owner's learning curve. The research team's personal experience in applying best-value procurement techniques in the federal sector and with design-build best-value awards in state highway agencies leads it to believe that each agency will decide on an optimum process for delivering best-value projects only after a number of best-value projects are completed. Thus, it needs to be recognized that the procurement method proposed in this report provides a theoretical basis to which an agency can add its personal legislative and institutional constraints, thus producing a customized method that fits its market and its mission.

Illustrative Examples

This somewhat complex process is best illustrated by examples. Three examples are provided to allow the reader to see the dynamics of each of the proposed best-value award processes.

Meets Technical Criteria—Low-Bid Award Algorithm Example

Starting with the simplest award algorithm, meets technical criteria—low bid, a hypothetical chip seal project will be introduced. The project's details are as follows:

- The owner restricts the competition to prequalified chip seal contractors that have completed at least three previous projects in the state.
- Safety is to be measured using the standard that the firm must have a Workers' Compensation Insurance Rate Modifier of 1.00 or lower.
- The owner lists two types of allowable binder and aggregate combinations: AC15-5TR binder with precoated grade 3 aggregate and CRS-2P binder with uncoated grade 3 aggregate. The contractors must state in their proposal which combination they intend to use to be technically responsive.
- The owner requires that a quality management plan be submitted based on the contractor's binder-aggregate choice that complies with the minimum standards shown in the state standard specifications for chip seal projects.
- The owner will allow a maximum of 150 days for this job, and the contractor most propose its own detailed schedule for completing the project in the stipulated period. This schedule essentially consists of identifying the dates on which each of the major chip seal sections will be shot, because this project is not continuous and involves four different highways.

Table 3.6 shows the results of the technical criteria evaluation for five typical contractor proposals for this project. One can see that two of the five firms were eliminated for not having met one or more of the technical criteria. In both cases, their price proposal was returned unopened. Of the three remaining firms, Firm C had the lowest price proposal. Two points should be noted about allowing the competitors to select from two predetermined binder/aggregate combinations. First, it does not make this a design-build project. The agency is neither allowing the contractor to design the final product nor is it shifting any performance liability with the product selection. Second, the owner's engineer obviously felt that either of these alternatives would furnish a satisfactory product. By allowing the contractor to make the selection, the agency is creating an environment in which a contractor can base the bid and the schedule on the alternate with which it has the most, and perhaps the best, experience. This would be directly reflected in the bid price and the schedule.

The next two award algorithms require a more complex evaluation plan and a more involved evaluation process. Hence, a more detailed example has been developed to illustrate the dynamics of the cost-technical tradeoff and value unit price best-value award algorithms. An example project was found in the Florida DOT procurement policy guide (FDOT 1996). It furnishes enough basic information to

Table 3.6. Best-value evaluation results for hypothetical chip seal project with meets technical criteria—low-bid award algorithm.

Firm	Prequal.		Safety		Binder/Agg.		Quality Plan		Time	Price Proposal
	Proposed	GO/ NO GO	Proposed Modifier	GO/ NO-GO	Proposed	GO/ NO GO	Proposed	GO/ NO-GO	150 max	
A	3 projects	GO	0.97	GO	AC15-5TR w/precoat G3	GO	Meets specs	GO	150	$2,859,890
B	2 projects	NO GO	0.87	GO	AC15-5TR w/precoat G3	GO	Does not meet specs	NO-GO	150	Bid returned
C	9 projects	GO	0.91	GO	CRS-2P w/G3	GO	Meets specs	GO	150	$2,832,489
D	4 projects	GO	1.03	NO-GO	CRS-2P w/G3	GO	Meets specs	GO	150	Bid returned
E	3 projects	GO	0.95	GO	AC15-5TR w/precoat G3	GO	Meets specs	GO	150	$2,840,049

Firm C is the winner. Lowest bid with all GOs.

Table 3.7. Best-value selection on example project (FDOT 1996).

Firm	Technical Score	Time	Price Proposal
A	92	450	$11,880,000
B	86	460	10,950,000
C	76	500	9,850,000
D	74	500	9,760,000
E	68	500	9,700,000

allow the process to be demonstrated. The author will fill in hypothetical information where actual project information is not known. The project was a reconstruction of an existing suburban highway. The majority of the work is the reconstruction of the pavement. Table 3.7 shows the project proposal data that comes from the FDOT example project.

To furnish the input necessary to adequately demonstrate the proposed procurement processes, the following hypothetical project information is assumed:

- The DOT was willing to allow the contractors to propose the option of either recycling the millings from the existing asphalt pavement in the project mix or furnishing new hot mix asphaltic concrete pavement and stockpiling the millings for future use by the DOT. Accordingly, the contractor was allowed to propose the type of asphalt binder and a mix design that conformed to state specifications. The RFP stated that "recycling was preferred if quality could be maintained at a reasonable cost." This is considered a design alternate.
- Traffic control was an issue as this road was on the route to a major tourist attraction in the area. The DOT desired that disruption to traffic be minimized if possible. The proposed traffic control plan was to be furnished in the proposal.
- The maximum number of scheduled working days was 500. A daily user cost of $6,000 per day was specified for use in those best-value award algorithms where a value must be placed on time.
- The DOT was specifically concerned about the following qualifications issues: the qualifications of the quality control engineer, the qualifications of the superintendent, the number of similar projects the firm had successfully completed in the region using similar mix designs, the level of small business utilization, and the firm's safety record as measured by its Workers' Compensation Insurance Modifier.
- This project was screened and selected as a good candidate for best-value procurement because it seemed to have the potential to accrue benefits in the following areas:
  – The probability of success was enhanced by the selection of a highly competent and experienced contractor.
  – It had the potential for quality enhancements by competing pavement design components.
  – There was an opportunity that an innovative traffic control plan could accrue real time savings.
  – Work zone safety was a particular concern, and the DOT wanted to ensure that the successful contractor had a strong institutional safety program.
- The agency published the fact that a proposal must score a minimum of 70 points in the technical evaluation to be considered responsive. A minimally satisfactory proposal in each category would receive 50% of the available points.

The final scores and breakdown of the details of the technical score are shown in Table 3.8. At this point, there is no need to explain the reasons for the individual scores.

Table 3.8. Best-value selection on example project technical score breakdown.

Totals				Technical Score Breakdown					
Firm	Time	Price Proposal	Tech. Score (100)	Design Alternate (20)	Schedule (20)	Traffic Control Plan (20)	Quals. (20)	Past Performance (10)	Safety (10)
A	450	$11,880000	92	18	20	17	19	10	8
B	460	10,950,000	86	18	19	17	16	7	9
C	500	9,850,000	76	15	10	15	18	10	8
D	500	9,760,000	74	14	10	16	16	8	10
E	500	9,700,000	68	13	10	15	14	7	9

Table 3.9. Cost-technical tradeoff best-value selection on example project technical score/adjectival breakdown.

	Totals			Technical Score Breakdown					
Firm	Time	Price Proposal	Tech. Score (100)	Design Alternate (20)	Schedule (20)	Traffic Control Plan (20)	Quals. (20)	Past Performance (10)	Safety (10)
A	450	$11,880,000	92	18 best	20 best	17 best	19 best	10 best	8 good
B	460	10,950,000	86	18 best	19 2nd best	17 best	16	7	9 2nd best
C	500	9,850,000	76	15	10	15	18 2nd best	10 best	8 good
D	500	9,760,000	74	14	10	16 good	16 good	8 good	10 best
E	500	9,700,000	68 NR*	13	10	15	14	7	9 2nd best

*NR = not responsive

Cost-Technical Tradeoff Example

The proposed version of cost-technical tradeoff involves the qualitative determination of best value without a direct mathematical comparison of scores. Thus, the scoring results need to be broken out in a manner that facilitates the discussion of the merits of each proposal and the arrival at consensus regarding the best value. Table 3.9 demonstrates how the evaluation results can be organized in an adjectival manner. It essentially looks to determine which proposal had the best score in each category. It then identifies the second best score. To further amplify the results, any proposal that received 80% of the possible points is also called out as "good."

The results in Table 3.9 are then sorted from lowest responsive bidder. Firm E is eliminated because its technical score was lower than 70 points and is therefore considered not responsive. Table 3.10 shows the reorganized evaluation information.

At this point, the evaluation panel must come together and compare the cost of awarding based on a proposal that is rated higher than the lowest responsive bid. This can obviously go many ways and no attempt will be made at this point in the report to cover all the possible outcomes. However, looking at Table 3.10, one can arrive at several conclusions that would influence the evaluation panel's decision:

- Firm D, the lowest priced proposal, was satisfactory in all categories and furnished the best safety record and received "good" ratings in traffic control plan, qualifications, and past experience.
- Firm A is clearly the best proposal having been the best in 5 out of 6 categories. However, its price is $2,120,000 more than the low bid.
- For an additional $90,000, Firm C offers the best past performance, the second best qualifications, a good safety record, and a slightly better score than Firm D in the Design Alternate category. Finally, it furnishes the same schedule as Firm D.

Thus, one possible outcome is for the evaluation panel to decide that the enhanced proposal offered by Firm C is worth

Table 3.10. Cost-technical tradeoff best-value selection on example project adjectival comparison with price increment.

Firm	Price Proposal	Price Increment (over low bid)	Tech. Score (100)	Des Alt. (20)	Sched. (20)	TC Plan (20)	Quals. (20)	Past Perf. (10)	Safety (10)
D	$9,760,000	--	74	14	10	16 good	16 good	8 good	10 best
C	9,850,000	90,000	76	15	10	15	18 2nd best	10 best	8 good
B	10,950,000	1,190,000	86	18 best	19 2nd best	17 best	16	7	9 2nd best
A	11,880,000	2,120,000	92	18 best	20 best	17 best	19 best	10 best	8 good

an extra \$90,000 (less than a 1% increase), whereas the enhanced proposals offered by Firms A and B (22% and 12% increases over low bid, respectively) are not worth the additional quality indicated by the technical evaluation score. Thus, Firm C would be declared the best value and be awarded the contract. It must be noted that the use of this rationale would preclude awarding to the proposer submitting the higher priced proposals if the evaluation panel agreed that the additional factors in each proposal beyond the minimum were not worth the additional incremental cost.

Value Unit Price Example

A number of formulae are in use throughout the country for calculating a value unit price. For this example, the team uses the weighted criteria formula used by the Texas Turnpike Authority (TTA) in a recent best-value award (TTA 2001). In that evaluation plan, the following formulae was used:

$$\text{Total Score} = (\text{Adjusted Technical Score} \times 0.15) + (\text{Contract Bid Price Score} \times 0.85$$

$$\text{Adjusted Technical Score} = \frac{\text{Proposal Technical Score} \times 100}{\text{Lowest Bid Price Score}}$$

$$\text{Contract Bid Price Score} = \frac{100 - (\text{Proposal Bid Price Score} \times 100)}{\text{Lowest Bid Price Score}}$$

In this system, the price carries an effective weight of 85% and the technical score carries a corresponding weight of 15%. It is possible to use weights other than these values in the best-value award algorithm to compute the value unit price.

Table 3.11 shows the results of the value unit price calculation using the weighted criteria formula for three different weights. The first used the TTA specified weighting of 85% price and 15% technical. In this case, Firm D, the second low bidder, would be determined to be the best value because it had the highest adjusted total score. It can be seen in this system that one point of technical score was worth approximately \$100,000. If the weighting was modified so that price was equal to all other factors combined (a very common practice in federal procurements), Firm C becomes the best value. This is because the weighted value of the technical evaluation criteria became greater with respect to price. Finally, if one were to reverse the TTA specified weighting and give technical 85% of the total, Firm A, the high bidder, is awarded the contract. In this case, the agency is deciding that the value of the evaluated technical criteria justifies the increased cost.

This example illustrates two very important points about best-value procurement. First, the determination of the weights assigned to the various portions of the best-value parameters must be made carefully, with great thought as to the ultimate impact of those weightings in the final award decision. Secondly, discrete point values assigned to each evaluation criterion must take into consideration the actual value that the criterion brings to the project after award. In this case, where one point is worth \$100,000, the agency should review the scoring system point by point and ensure that each point reflects a commensurate return on investment.

3.5 Screening Criteria for Best-Value Procurement

Best-value procurement has obvious advantages, and some federal agencies employ it for 100% of their procurements. While some form of best-value procurement can theoretically be used on every project, certain projects will benefit more from its application. Conversely, there are instances when the benefits of the best-value system are outweighed by the benefits of open low-bid competition.

Establishing a process for selecting the most appropriate projects for best-value procurement has two distinct advantages. First, projects that are more appropriate will perform better, saving the taxpayers money while delivering higher quality projects. Second, as highway agencies begin to use best-value procurement, there will unquestionably be a learning curve for the agency and its industry partners. By selecting the most appropriate project for a best-value procurement, the agency can "flatten the learning curve" and help make the transition to a best-value culture smoother.

Table 3.11. Value unit price best-value selection on example using weighted criteria formula.

Evaluated Values				Adjusted Values 85% Price/15% Technical			50% Price/ 50% Technical	15% Price/ 85% Technical
Firm	Time	Price Proposal	Tech. Score	Adjusted Score	Adjusted Price	Total Score	Total Score	Total Score
A	450	\$11,880,000	92	100	78	80.90	88.76	96.63
B	460	10,950,000	86	93	87	88.07	90.30	92.52
C	500	9,850,000	76	83	98	96.08	90.53	84.99
D	500	9,760,000	74	80	99	96.54	89.91	83.28
E	500	9,700,000	68	74	100	96.09	86.96	77.83

The process of selecting projects for best-value procurement is intertwined with the process of selecting best-value parameters and evaluation criteria. Any project can use best-value selection, but the project's complexity, specialization, quality requirements, opportunities for innovation, and procurement risk will determine whether a best-value selection process is appropriate. Additionally, the agency's project goals and performance measures must be considered in the decision to select a project for a best-value procurement approach. For example, the use of a past experience/past performance evaluation criterion is appropriate when high precision or quality is considered critical, and the use of a project schedule evaluation is appropriate when user delay costs are a significant concern.

While significant project benefits may be generated through time savings, cost savings, and quality enhancements, agencies considering whether to use a best-value procurement methodology should keep in mind that such procurements may generate additional costs in the form of higher procurement costs or higher administrative costs. Agencies must determine whether the benefits of using best-value procurement outweigh the costs. Each project must be examined on an individual basis.

The primary objective for best-value procurement project selection can be summarized as follows:

> Select projects with characteristics that provide significant benefit from using an alternative form of procurement. Once identified, develop the evaluation plan and project scope to confirm that the benefits are real, the negative impacts are minimal, and the risks are manageable.

The best-value project screening criteria can be used in conjunction with the planning phase steps presented in *NCHRP Report 451*, Chapter 4, "Guidelines for Warranty, Multi-Parameter, and Best Value Contracting." *NCHRP Report 451* presents planning phase guidelines that detail the steps an owner should take to begin a best-value program and select a pilot project. Key steps presented in that report include

- Determine the agencies current level of experience with best value and
- Determine the motivation for implementing best value.

The guidelines presented in *NCHRP Report 451* make a few key recommendations. First, the report recommends that new users determine the motivation for implementing best value as well as review and understand best practices for best-value contracting. The report specifically addresses these two recommendations. Second, *NCHRP Report 451* recommends that low-to-moderately experienced users (one to five projects) obtain input from industry in deciding how to proceed and select pilot projects to test and measure the performance of the best-value system. Users are strongly recommended to refer to *NCHRP Report 451* concerning the implementation and evaluation of this second recommendation.

Cost versus Benefit

Best-value procurement is not currently the highway industry's standard way of doing business. The decision to use a non-traditional procurement for a particular project should be based on an analysis of the value to be added to the project, recognizing that the system may create additional costs such as increased agency staff time and industry proposal preparation time, as well as the possibility of higher initial construction prices (due to costs incurred by the contractor to achieve the best value) compared with traditional design-bid-build procurements. Best-value procurement can add significant value through cost savings, time savings or quality enhancement directly. Although best-value procurement allows the contracting agency to take the contractor's experience and reputation into account in the selection process, that capability should not be the sole basis for a decision to use the process, and the analysis that is the basis for the decision to use the procurement system should focus on projected added value.

The potential costs and benefits projected to result from a best-value process should align with the project goals, and those goals must be communicated to the contracting community for the procurement to be successful. One important early step in project planning is to determine the project goals. It should also be noted that changes in agency policies that have the effect of changing the predetermined project-specific goals will adversely impact the chances of project success. The decision to use best-value procurement should be based on projected benefits to the project. Again, best-value procurement is not currently the business paradigm in the U.S. highway industry, and for a decision to use this process to gain acceptance, it is advisable for agencies to communicate their reasons for using the system to industry and other interested parties. Similarly, to encourage competition and also to obtain responsive proposals meeting the agency's needs, the basis for making the best-value determination should be clearly stated in the procurement documents.

The remaining sections of this chapter elaborate on possible screening criteria for selecting projects for best-value procurement, starting with the potential costs and benefits associated with implementing this procurement methodology. Other criteria considered include opportunities for innovation, specialization requirements, and risks in procurement. Appendix F contains a flowchart and a best-value project selection tool intended to facilitate the decision-making process.

Potential Costs

Agency Staff Time

Where traditional procurement employs a responsibility standard for qualification of contractors (addressed through prequalification in some states and in others through review of qualifications after bids are received) and a project-specific evaluation of bids, best-value procurement requires a project-specific evaluation of contractor qualifications and price proposals. Best-value procurement may also involve a technical evaluation of proposals when the contractor's scope includes some element of design. These evaluations may require the agency to assemble a project-specific team to evaluate the offeror's proposals. The cost of developing the evaluation plan and implementing the evaluation process itself are added costs on each project. Staff training may also be an additional cost. Best-value procurement is similar to existing methods of a qualifications-based consultant selection. The staff must have training or experience in qualifications-based selection for the procurement to be successful. Additionally, when technical proposals are part of the procurement, the evaluators must have design review experience.

Industry Preparation Time

Depending on the nature of the project and process, best-value procurements can be costly and burdensome for the industry. Contractors who participate in traditional procurements typically pay for the costs of annual or periodic prequalification and bidding in their general overhead. Preparation of project-specific qualifications responses and technical proposals are not typically part of their overhead. Highway agencies must be conscious of what their best-value procurement requirements will cost the proposers, and they must strive to keep these costs to a minimum to maximize the level of competition. When using best-value procurement on complex design-build projects with significant proposal preparation costs, owners often include a proposal preparation stipend to offset the industry proposal costs (Smith and Ryan 2004). In some states, these stipends have been used as consideration for innovative concepts included in proposals submitted by the unsuccessful proposers. In best-value design-bid-build or smaller design-build procurements, stipends are typically not applied.

Potential Benefits

Cost Savings

Cost savings stemming from best-value procurement can be difficult to measure and predict at the time of procurement. By definition, best-value procurement can provide justification for choosing a proposal that is not the low bid, thereby increasing initial construction costs. Initial construction costs, potential cost growth after award, and life-cycle costs should all be considered in examining the potential best-value procurement cost savings. Initial construction cost savings will only be realized when there is an opportunity for contractors to save money through schedule compression, the application of innovative means and methods, or more constructible designs. Adding best-value selection criterion such as an exemplary safety record, past performance, and management plans may in fact add to the initial construction price. By nature, contractors with better qualifications are likely to spend more on safety and management practices. However, use of these evaluation factors may ultimately result in lower cost growth as a result of better management and fewer bidding errors. A best-value process may also include evaluation factors encouraging lower life-cycle costs through higher quality construction or through the inclusion of a life-cycle analysis in the best-value procurement solicitation.

Time Savings

Best-value procurement allows for the evaluation of time in procurement. Traditional procurements ask for prices based on fixed project start and finish dates. Best-value procurement can reward the contractor for bidding a shorter construction schedule, thus allowing the contractor to determine the optimum schedule with reference to its increased costs of accelerating the project. There is a potential for an increase in initial construction costs because of the accelerated schedule—although to some extent the increased costs of acceleration will be offset by the reduction in overhead. In addition, the bidder with a higher initial construction cost can be selected if the time savings is determined to be more valuable than the cost increase on the basis of user costs or agency overhead costs. However, it is also possible that the owner will receive both the lowest initial cost and the shortest schedule from the same contractor. In either case, if the agency is interested in accelerating the schedule, it must be willing to take steps to remove constraints that are likely to impact the critical path for the project.

Quality Enhancements

Quality benefits can be even more difficult to measure than cost or schedule benefits. Agencies should strive to include those quality enhancements that are easily convertible to a measurable dollar benefit, such as improved design resulting in lower operations and maintenance costs. While there is a belief that more stringent quality control plans, more comprehensive safety plans, better past performance, better personnel or better management plans will improve the project's safety record and result in higher quality construction, those benefits are difficult to correlate to specific performance outcomes. This does not mean that these items should not be included in a best-value procurement, it just means that agencies must apply these criteria prudently.

Key Project Characteristics to Consider

As previously stated, best-value procurement is not the highway industry's standard way of doing business. A wholesale change to best-value procurement in the highway industry is not feasible or prudent given the industry's long ties to the low-bid method. The choice to use best-value procurement should be made judiciously on a project-by-project basis. Key project characteristics should be considered when making the decision to determine whether best-value procurement is appropriate for a given project.

Agency Staff Capacity and Experience

Qualifications and availability of agency staff are a key project characteristic that must be examined when considering best-value procurement. As previously stated, best-value procurement can require more staff time and a different level of training and education than traditional procurements. Staff considerations are particularly important when the procurement requires an evaluation team or design review.

Market Capacity and Experience

Best-value procurement requires contractors to prepare proposals that include details of schedules, qualifications, management plans, and even designs. Contractors must have the capacity and skills to develop these proposals. Contractors that have only performed work for the agency based on a low-bid selection process will not have this experience and, therefore, will need to make a greater investment in responding to a best-value RFP. As contractors gain experience, this process will become less burdensome, but highway agencies must be cognizant of the level of effort required to respond to a best-value RFP when selecting projects for best-value contracting. Some best-value procurements, particularly those involving designs, will require that contractors carry different insurance or obtain different surety bonds. Market factors affecting the ability of contractors to obtain such insurance and bonds should also be considered when making this decision to use best-value procurement.

Project Complexity

Project complexity will impact the possible benefits resulting from best-value procurement. Project complexity primarily stems from technical complexity or management complexity. In either case, best-value projects can offer opportunities for added value because the contractor can bring its knowledge and expertise to the project. Complex projects seem to offer more opportunity for benefit from best-value procurement.

Relatively simple projects can also benefit from best-value procurement, but the benefits might not be as significant. Numerous federal agencies use best-value procurement projects with all levels of complexity, including simple projects. Benefits for such projects can be realized in areas such as past experience, quality plans, and safety. Drawbacks associated with use of best-value procurement for a simple project include the decreased opportunity for participation by smaller and less experienced contractors and the fact that best-value procurement can be administratively burdensome for the highway agency and the industry. Using best-value procurement on less complex projects should be tempered with sound judgment concerning its effects on open competition and the administrative burden on the procurement process itself.

Quality Requirements

Where low-bid methods typically only stipulate minimum quality requirements through contract specifications, best-value procurement allows for quality-related elements to be included as part of the competition. Quality management plans and tighter tolerance on materials or end products are two examples of items that can be factored into the evaluations. Through competition, higher quality may be achieved at the same or even lower costs. Furthermore, even though the initial costs may be higher, the life-cycle cost may ultimately be less than the life-cycle cost that would have resulted from a low-bid procurement process.

Opportunities for Innovation

Best-value procurement offers a framework for agencies to take advantage of innovative proposals from the industry. These innovations may result in cost savings, time savings, or even higher quality products. In their simplest form, these innovations may be contractor traffic maintenance plans or construction schedules. At the other end of the spectrum, the innovations may come in the form of design-build delivery with the industry completing more than 80% of the design. When projects have elements that can be precisely defined through measurable performance outcomes, they may be suitable for design-build delivery.

Specialization Requirements

Projects that require specialized equipment, knowledge of construction, or exclusive technology are ideally suited to best-value procurement. Specialized requirements occur when there are highly unique aspects to a project. Adding qualitative factors for these projects can result in higher quality projects or projects that require less rework due to contractor inexperience. Small but highly specialized contractors could likely see a benefit from best-value procurement. In fact, a number of the federal case studies conducted for this report used best-value procurement to speed the process of hiring disadvantaged businesses (DBEs). However, FHWA's current policy is that achievement of DBE goals or good faith efforts to achieve them should be considered as a pass/fail criterion and not considered in the best-value evaluation, although past performance with respect to use of DBEs could presumably be considered.

Risk in Procurement

A best-value procurement system can increase the likelihood that the contractor will successfully perform the work (known as performance risk). However, it also creates a risk relating to the ability of the evaluators to properly evaluate a contractor's proposal, known as proposal risk (Army Source Selection Guide 2001).

Each project will have characteristics that create risks in procurement. An attempt should be made to select projects with minimal best-value procurement risks. Additionally, selection of appropriate evaluation criteria can help to minimize these risks.

Best-Value Project Screening Decision Flowchart and Selection Tool

A flowchart is presented in Appendix F to describe the project screening process. Successful navigation of this decision flowchart allows the user to proceed to the next step in best-value procurement, which entails the actual selection of projects. There are a number of critical decisions in the planning stages of a project that must be made before a best-value procurement can commence. The flowchart allows for quick identification of the critical decision points and provides advice regarding how to proceed if fatal flaws to the process are discovered. A user may only need to refer to the decision flowchart on the first few projects because it primarily deals with organizational and political hurdles that must be overcome. Once these programmatic barriers have been overcome, the user will be able to "shortcut" the flowchart and proceed directly to the project selection tool. The project selection tool, also included in Appendix F, further guides the user's project selection process. Please note that the project selection tool is also available electronically at http://construction.colorado.edu/best-value.

3.6 Implementation Strategies

Even the best and most convincing research will not succeed in the implementation phase if it does not adequately address the concerns of the owner's organization and achieve industry support. For this to happen, all parties must perceive that a best-value procurement system will articulate common objectives; be advantageous to owners and bidders; and be legal, practical, impartial, and relatively simple to implement. Furthermore, the research results must be structured in a way to clearly and convincingly communicate the advantages (or disadvantages) of a particular approach. The first step is to identify and understand barriers to implementation and then devise effective strategies to overcome these barriers.

Legal and Regulatory Considerations

As described in Chapter 2, at both the federal and the state levels, legislation has moved toward increased acceptance of alternative procurement practices using best-value selection. However, the laws are far from uniform. Each agency must carefully examine its enabling authorization in determining how to proceed with a best-value procurement. In addition to reviewing the Model Code and statutes identified in Appendix B, agencies wishing to obtain general best-value legislation may want to review the enabling legislation allowing use of design-build for transportation projects. A survey of design-build legislation can be reviewed at http://www.nossaman.com/db30/cgi-bin/news/NCS_BJD_50%20State%20Survey%20of%20Design%20Build%20Authority_4.20.06.pdf.

The federal best-value process has been in place much longer than similar processes at the state level. The FAR 15, Contracting by Negotiation, sets forth best-value concepts under a competitive acquisition. Best value under the source selection process might entail the tradeoff of weighted factors or selection of the lowest-priced technically acceptable proposal. Excerpts from the FAR 15 are provided in Appendix B (FAR 2004). The FAR 15 process is available for all types of contracts. Many federal agencies have implemented competitive negotiation or design-build and have developed instructions or procedures for development and implementation of these methods. For example, the U.S. Postal Service, the U.S. Army Corps of Engineers, the Navy, the Department of Veterans Affairs, the Federal Bureau of Prisons, and other agencies have developed procedures and guidelines for source selection and design-build contracting applicable to their construction programs.

The federal government has imposed certain procurement restrictions on state and local agencies wishing to use federal-aid funds to pay for transportation infrastructure. For many years, federal law mandated that construction of federal-aid projects be undertaken "by contract awarded by competitive bidding" (see 23 U.S. Code § 112(b)), unless FHWA approved use of an alternative procurement process. FHWA's SEP-14 program has been the vehicle for such approvals. In 1998, TEA-21 created an exception to the general competitive bidding requirement, authorizing use of best-value procurements for federal-aid design-build contracts over a specified dollar amount (TEA-21 1998). In 2002, FHWA issued regulations establishing the procurement process to be followed for such projects, thus avoiding the need for agencies to obtain SEP-14 approval to use a best-value procurement process for such projects. FHWA's design-build rule includes best-value procurement requirements that are based on FAR 15. It should be noted that the competitive bidding requirement remains in effect with respect to federal-aid construction contracts that do not meet the TEA-21 definition of qualified design-build projects, unless FHWA approves an alternative process. It should also be noted that federal permission to use a best-value procurement process for federal-aid contracts does not constitute enabling authorization for state and local agencies wishing to use such a process. Enabling authorization must be provided by state and local legislative action.

On the state and local levels, until recently most agencies have been subject to legislatively imposed requirements that construction contracts be awarded to the lowest responsible bidder after the project is fully designed. These statutes do not expressly prohibit best-value selection, but are inconsistent with use of any selection factors other than responsibility of the bidder, responsiveness to the procurement requirements, and price. One question that has been the subject of argument and case law going both directions is whether A+B bidding is consistent with a statute requiring award to be made to the low bidder. The consensus in the industry (notwithstanding case law in at least one state to the contrary) is that cost-plus-time bidding is consistent with a requirement to award to the lowest responsible bidder.

During the past decade, a legislative trend has emerged to permit use of best-value procurement by state and local agencies for the reasons described in this report. Many agencies have been granted specific authority to procure design-build contracts on a best-value basis. In addition, the desire to unequivocally allow use of A+B bidding and to incorporate other best-value elements into the selection process for construction contracts has led to more general legislation allowing best-value procurement to be used in selecting any contractor provided the decision to use it can be justified. In 2000, after many years of research, analysis, and discussions, the ABA issued a revised Model Procurement Code that can be used as the basis for legislative changes. As described in Section 2.2, the Model Code allows use of a "competitive sealed bidding" process so that the project owner can award to the responsive bidder who provides the lowest priced bid (i.e., using the meets technical criteria—low-bid algorithm) or take costs outside of the bid price into account in making selection decisions with award made to the bidder who provides the proposal that results in the lowest cost to the agency (using the meets technical criteria—low cost algorithm). If the agency determines that competitive sealed bidding is impracticable, it can use a competitive sealed proposal process with any of the other six algorithms.

In drafting legislation for the purpose of allowing transportation agencies to use a best-value procurement process, the drafter must consider the needs of the public agencies and public policy considerations. On the one hand, public agencies procuring contracts on a best-value basis will need flexibility to adapt the procurement process for a wide variety of projects and circumstances. From a public policy perspective, however, it is advisable to include certain requirements to ensure that the selection decision will be made rationally and without favoritism, and as a result, the legislature will typically include requirements in enabling legislation regarding the procurement process to be followed. On one end of this legislative spectrum, a statute might grant contracting authority to the agency without imposing any restriction on procurement methodology. At the other end of the spectrum, legislation may impose requirements so cumbersome that it is unlikely the process will ever actually be used. In some cases, these requirements may be included in the original bill based on the author's belief that they will be helpful. In some cases, they may simply have been carried forward from a prior bill without further analysis. Often such requirements are the result of compromises necessary to obtain passage of the bill.

In the middle of the spectrum is legislation based on the Model Procurement Code published by the ABA. The Model Code has been used as the basis for legislation in a number of states and establishes a framework for best-value procurements consistent with public policies while allowing the agency significant flexibility to address its needs with respect to individual projects. It should be noted that most states have adopted separate enabling legislation for their DOTs. As a result, even though a particular state may have adopted legislation based on the Model Code, that authorization may not necessarily extend to the DOTs. Refer to Appendix B for a list of eleven states that may have best-value authority for construction contracts not using design-build. As previously noted, a number of states have adopted legislation specific to their DOTs allowing use of best value for design-build procurements, and some states have adopted best-value legislation for other types of contracts.

Institutional and Industry-Related Issues

As the transportation industry has gained more experience in the use of best-value selection within traditional low-bid, design-build, and negotiated procurements, concerns and questions have been raised by participants from the owner and industry perspectives that must be addressed before best-value procurement will be widely supported and implemented. Some of the issues relate to the procurement process itself while others address the effect of incorporating additional selection parameters (time, quality, or other factors) on construction:

- It is necessary to establish criteria and a decision-making process to determine if a project is a viable candidate for best-value procurement.
- If the best-value selection process is administratively burdensome, it will not sustain support from the owner organization tasked with administering it.
- If best-value procurement requirements are too time consuming and costly, it will discourage smaller or DBE contractors with limited resources from bidding and reduce competition.
- If the selection parameters are not clearly defined or are overly subjective, the owner risks that awards will be challenged, delaying or negating the award.
- It is necessary to determine appropriate pass/fail criteria or factors and to consider under what circumstances they should be used.
- Under best-value procurement, a higher initial cost for the same work procured under low bid will discourage widespread implementation unless the additional value received can be reasonably determined.
- The selection process must be structured to limit the number of qualified bidders, yet allow sufficient competition.
- Procedures must be established to maintain confidentiality and to document the evaluation process.
- Concerns regarding the subjectivity inherent in a best-value selection process make contractors reluctant to participate in best-value procurements.
- The use of alternate bids or design alternates in the context of competitive bidding in the United States is limited to specific material or equipment items, pre-engineered items, and specific construction processes rather than complex designs such as buildings or bridges.
- The Associated General Contractors of America has expressed a strong preference that highway agencies continue to award highway construction contracts on a low-bid basis.
- Accelerated schedules and extended overtime associated with some A+B projects challenge agency and contractor resources, raising concerns about reduced quality and safety.
- Multi-parameter or A+B bidding for time shifts more responsibility and risk for estimating time to the contractor. As a result, the owner may incur higher bid prices reflecting the more aggressive schedule or increase the risk of delay claims.
- Contractors have expressed concern that multi-parameter bidding may result in a contractor submitting unrealistically low numbers for time or high numbers for quality to be more competitive.
- Uncooperative third parties have the ability to “throw a monkey wrench” into plans to accelerate the project schedule. As a result, even though an innovative procurement methodology may result in an accelerated completion deadline, the accelerated schedule may be delayed.
- Some contractors have expressed concerns that warranty projects will tie up funds and reduce bonding capacity for extended durations.
- Industry organizations often have opposed warranties, because they would impose greater hardships and risk on small engineering and construction firms, because contractors would be held responsible for designs they did not create and because such firms have no control over future uses of the highway or other conditions that might give rise to a warranty claim.

Legal protests have arisen on best-value projects that involve one or more of the noted issues. These highlight pitfalls of implementation and serve as lessons learned to guide future implementation. The following case study, involving a recent federal best-value procurement, illustrates how an arguably subjective best-value selection criterion can raise concerns and potentially give rise to legal protests, delaying or derailing the procurement process.

The Butt Construction Case

A Protest was filed by Butt Construction Company, Inc., (Comptroller General No. B-284270, March 20, 2000) for the renovation of the Avionics Research Laboratory at Wright-Patterson Air Force Base using best-value selection (Scott and Geisen 2002). The RFP contemplated award to the firm offering the best value to the government. Price was given equal weighting with a combination of technical factors listed in order of importance as follows:

1. Qualifications and experience
2. Design and engineering
3. Project management

Five firms submitted proposals and were found to be in the competitive range. The technical evaluation panel scored the most significant technical factors in the proposals as shown in Table 3.12.

Offeror C had the top-rated technical proposal, but its price was $1.5 million higher than Monarch’s second ranked

Table 3.12. Comparison of technical scores.

Offeror	Technical Score		
	Qualifications/Experience	Design/Engineering	Total Score
Maximum Points	8,000	3,600	11,600
Butt	4,500	2,405	6,905
Monarch	5,380	2,120	7,500
Offeror A	5,090	2,060	7,150
Offeror B	4,090	1,825	5,915
Offeror C	5,380	2,475	7,855

technical proposal. Butt had the lowest price, but was ranked fourth in the most important technical area, qualifications/ experience. The panel concluded that Offeror C's technical proposal did not offer enough advantages over Monarch's technical proposal to justify award to C. The panel also found that the technical strengths of Monarch's proposal offset the $239,000 difference in price between Monarch and Butt. Monarch had demonstrated a significant amount of prior work experience and had completed several recent projects of similar scope, size, and complexity. Based on this evaluation, the panel recommended Monarch for award. The source selection authority agreed with the recommendation.

Butt challenged the agency's price/technical tradeoff, arguing that although Monarch's scores may have been higher, the evaluators did not find that these scores were indicative of technical superiority justifying the price premium. The Comptroller General rejected this argument, noting that source selection officials have broad discretion to determine the manner and extent of technical and price evaluation results under a negotiated procurement:

> In deciding between competing proposals, price/technical tradeoffs may be made; the propriety of such tradeoffs turns not on the difference in technical scores or ratings per se, but on whether the source selection official's judgment concerning the significance of that difference was reasonable and adequately justified in light of the RFP evaluation scheme. ...The discretion to determine whether the technical advantages associated with the higher-priced proposal are worth the price premium exists notwithstanding the fact that price is equal to or more important than other factors in the evaluation scheme.

Looking at the record of decision, the Comptroller General found that Monarch's experience was sufficient to justify the higher price and that the technically superior proposal inherently would result in superior performance.

This example highlights the issues faced by public sector owners attempting to move from a strictly lowest cost selection process to one evaluating price with other technical factors. While, in this particular case, the decision affirmed the selection committee's use of "broad discretion" in evaluating technical and price tradeoffs consistent with federal procurement rules, this discretion is often the source of disputes related to the process.

Similarly, controversy regarding the selection process may stem from the perception that adding parameters to the bid price representing the value of time or improved quality is a departure from competitive bidding or may increase project risks. Issues may also arise with respect to evaluation of bid alternates as part of a competitive bidding process as exemplified in the following case (Scott and Geisen 2002).

White Contracting Case

In September 2000, Massport solicited bids for the renovation of the Maurice H. Tobin Memorial Bridge in Boston. Massport invited bidders to submit alternative bids based on the use of "type 5" cement concrete and "silica fume" concrete, reserving the right to award the contract based on the alternative that was "in the best interests of Massport."

J.F. White Contracting Company was the low bidder for the type 5 cement at $6,443,912. DeMatteo was the low bidder for the silica fume concrete at $6,455,174. Massport selected the silica fume concrete alternative because of its superior anti-corrosive properties and awarded the contract to DeMatteo, even though its bid was higher. White filed suit seeking a preliminary injunction prohibiting Massport from proceeding with an award of the contract to any contractor other than White. White asserted that under Mass. Ann. Laws, Chapter 30, §39M (2000), it was entitled to an award of the contract because its bid on the type 5 concrete was lower than DeMatteo's bid on the silica fume concrete.

Mass. Ann. Laws, Chapter 30, §39M (2000), governing competitive bidding practices for public works contracts requires that every contract for construction and repair shall be awarded to "the lowest responsible and eligible bidder on the basis of competitive bids publicly opened and read." The purpose of this statement was to "create an open and honest competition with all bidders on an equal footing, and to enable the public contracting authority to obtain the lowest bidder."

The Superior Court judge denied White's request, on the merits of the claim "since all bidders were afforded full competition as to the two alternatives and there was no claim of improper favoritism." The Appeals Court affirmed the decision noting "there is no language in §39M which prohibits a public authority such as Massport from using the type of alternative bidding procedures at issue in this case, so long as it accepts the lowest bid for the alternative ultimately selected." The award to DeMatteo was acceptable because it was the lowest bidder on the silica fume concrete alternative. The Appeals Court found that Massport did not violate §39M in awarding the contract, fully defined both alternatives in the bid solicitation documents, and made it clear that "a bidder could be assured of an award of contract only if it submitted the lowest bid on both alternatives."

This case provides an example of a procurement process that gives the owner discretion to determine that the higher cost alternative is more advantageous, without any requirement to specifically quantify the cost benefit of that alternative in terms of reduced maintenance or other savings. Although no improper favoritism was proved in this case, it is apparent industry is concerned about the possibility of abuse in this type of process. A requirement for the owner to quantify the benefits in connection with the decision to select a particular alternate (or provide a life-cycle cost adjustment factor) would help to avoid the use of alternate bids as a means of circumventing the low-bid process. Another approach used by some owners is to have officials make the decision regarding selection of the alternative based on the prices provided, without knowing which bidder supplied which price.

Implementation Strategies

As part of a comprehensive implementation plan, the issues and questions raised by industry must be addressed. Past research addressed critical success factors for implementation of proposed contracting methods and quality-based rating systems. *NCHRP Report 451* contained guidelines for implementing three contracting methods. These guidelines addressed implementation in general terms. They cited the importance of senior management support, more up-front investment by the agency, communication, training, appropriate project selection, and industry buy-in. All of these factors are important contributors to the success of implementation. However, to develop workable implementation strategies, more specifics are needed regarding an approach for implementing best-value procurement within a traditional contracting environment, such as guidelines for legislative reform, sample best-value language, training tools, and steps to achieve industry acceptance.

Strategies prepared for particular procurement approaches that are not clearly defined will be speculative at best. However, based on success with moving innovative ideas, policies, and procurement and contracting approaches into practice, a number of strategies can be identified and discussed at this stage. Some of these strategies are identified in *NCHRP Report 451* and in the NCHRP Project 10-54 final report. The following elaborates on some of the steps that are likely to be necessary to move the results of this research into practice.

Step 1—Clearly communicate the results and products of the research and advantages of implementing it, and enlist champions to promote its use and test its effectiveness

The research results must address the relative advantages of best-value procurement and communicate these results to members of the implementing organizations and to industry as a whole. This report provides the background information needed for stakeholders to appreciate the advantages of best-value procurement, the challenges and concerns raised by industry related to its use, strategies to address these concerns, a decision framework for selectively implementing best-value legislative guidelines and model provisions. The research findings as a whole have shown that best-value procurement has resulted in improved performance and that industry perceptions to the contrary may reflect a lack of experience. Concerns regarding increased likelihood of protest can be countered by experience in the federal sector that the likelihood of a successful protest is reduced when the more advanced processes are used. Concerns regarding the additional burden placed on staff during the procurement process can be offset by the reduced burden on staff during the contract administration phase.

Implementers should also consider the following as part of implementation:

1. The implementation process presented in this report allows for maximum flexibility in the design of the best-value procurement system to accommodate the different types of projects and different experience levels of the agency and industry stakeholders. An agency implementing best-value procurement for the first time would be more inclined to select a system, for example a one-step meets technical criteria—low-bid system, more closely aligned with its traditional procurement process. With more experience, the agency might move to a more sophisticated or complex best-value model similar to the approaches used by the federal agencies with significant best-value experience. This flexible and graduated approach will increase the likelihood that agencies will experiment with best-value procurement.
2. The procurement policy should clearly require that the criteria used for technical evaluation, the weighting or

relative importance of each criterion (including price), the rating system, and the award algorithm be clearly defined in the procurement documents. This creates a level playing field, reduces the uncertainty related to the selection process, and focuses the proposers on what is most important to the agency.

3. As noted in the research findings, it is advisable to use selection criteria that are important, add value, and relate to desired performance. For example, if time performance is a critical criterion, proposers can be asked to provide a completion date that meets or beats the owner's estimated completion date. If the owner wishes to use past performance as a selection factor, it may wish to consider asking for information regarding specific performance measures in terms of issues such as cost control, rate of progress, quality in terms of degree of conformance with specifications or standards, and safety in terms of accidents or lost workdays. Selection criteria that include factors that are difficult to assess or do not directly relate to the performance goals of the agency result in procurements that are overly complex and should therefore be avoided.
4. Under low bid, or a one-step meets technical criteria—low-bid (cost) award process, it is often advantageous to establish pass/fail or minimum performance criteria to determine bidder responsibility and whether the bidder's technical proposal is responsive. Responsibility can be addressed through prequalification, whether through a blanket prequalification for multiple projects, or through prequalification/shortlisting as the first step of a two-step, best-value procurement. Pass/fail criteria relating to responsibility might include a specified number of years of specialized expertise, demonstrated quality levels for similar projects, and a minimum safety rating. Technical pass/fail criteria are tied to the responsiveness determination and could include matters such as provision of meeting a schedule or bettering certain milestones. It is also possible to require a bid to be within a competitive pricing range to be considered responsive.
5. When performing a best-value tradeoff analysis to justify award to other than the lowest priced offeror or other than the highest technically rated offeror, systematic comparisons of price and technical criteria should be conducted. The federal procurement model requires that the owner advise the proposers regarding the relative importance of the evaluation factors. Furthermore, the rationale for the decision, including benefits associated with the additional costs (or reduced costs), must be documented, although the tradeoffs that led to the decision are not required to be quantified.
6. It is useful to conduct pre-proposal conferences and debriefings to clarify potential ambiguities in the solicitation documents. Interested parties should be offered the opportunity to submit questions in advance of the proposal due date. Questions should be answered in writing and provided to all proposers. One or more pre-proposal meetings can be held to answer questions or clarify aspects of an RFP. For a best-value procurement involving the consideration of complex technical criteria, this initial opportunity to request clarification is even more critical. Additionally, it should be noted that the rules applicable to procurements by federal agencies require notification to unsuccessful offerors and allow for pre-or post-award debriefings if requested by the offeror. A debriefing is also strongly recommended for best-value procurement at the state and local levels as well to further clarify the basis for award, the selection process, and the rationale for eliminating the offeror, if this was not apparent in the written notification of contract award.
7. If the project complexity and objectives require a more intensive effort to respond to a best-value proposal, particularly one involving work product such as alternative designs or technical solutions, the agency should consider payment of a stipend. Although various owners choose to refer to the payment as stipend, stipulated fee, honorarium, and so forth, the basic premise is that the proposer will be partially compensated for its costs of preparing the proposal. There is no set range of values for this payment for work product fee. The amount of the fee can be established based on the project budget, the estimated proposal costs, the estimated construction costs, or some other basis. Payment of compensation to the responsive proposers can be an effective means of retaining contractor interest in the procurement and encourages preparation of quality proposals.

Step 2—Devise solutions to legal barriers and procurement regulations

Agencies interested in gaining the potential benefits from implementing best-value procurement must identify and analyze laws and rules affecting the agency that would limit or prevent its use. Depending on the results of the analysis, the implementation of a best-value procurement may start with crafting solutions to legal barriers. The trend toward greater use of best-value procurements has yielded a number of statutes and rules incorporating best-value concepts. The research team recommends that the Model Code and model regulations associated with the Model Code be used as the starting point. In theory, the fact that best-value procurement has been generally authorized for use by federal agencies and various state transportation agencies should make it easier to obtain legislation in the remaining states, but in practice it will probably be necessary to "reinvent the wheel" every time new legislation is desired, due to the need to educate the legislature regarding best practices in public procurement as well as the need to deal with interest groups that are opposed to any change in the existing procurement requirements, not to mention that decisions to vote for or against a particular bill are often wholly unrelated to the subject matter of the bill.

The first step in obtaining new legislative authorization is to develop draft language producing the desired result. This will entail review of the agency's existing authority as well as examples of comparable legislation passed in the state in question, and review of legislation in other states. The agency should enlist the aid of its attorneys in drafting the bill as well as involving its legislative liaison.

Once the proposed language passes muster within the agency, it will need to be submitted to a legislator for introduction. The language proposed by the agency will be reviewed by the legislator's staff and may be revised prior to introduction. The agency's legislative liaison will be responsible for obtaining information from staff and ensuring that any changes are reviewed by appropriate agency personnel. The proposed language could be introduced as a stand-alone bill, or could be appended to an existing bill involving a similar subject matter. In some cases, the proposed language may entirely replace the provisions in a previously proposed bill. The process for introducing, amending, and passing legislation varies from state to state, but will always involve opportunities for interested parties to propose modifications. Again, the agency's legislative liaison will need to pay close attention to proposed modifications and must ensure that any changes are reviewed by appropriate agency personnel. It may be advisable for agency staff to meet with interest groups seeking changes to the bill, particularly if they have the ability to "kill" the bill, to try to reach a compromise acceptable to the agency that will allow the legislation to proceed. The agency's legislative liaison will need to pay attention to the legislative calendar and take appropriate steps to ensure that all required actions relating to the bill are timely.

The process to be followed in adopting implementing regulations will be simpler since they do not require legislative approval (although it is likely that one or more politicians will be contacted by interest groups if they have any objection to the regulations). However, the same general concepts apply. Agency staff and attorneys will need to draft the regulations; following initial publication the agency will receive comments and decide how to address them; after the comment period ends, the agency will issue the final regulation. Specific procedures will vary state by state and agency by agency.

Widespread implementation of best-value procurement will require creative and flexible solutions to legal and procurement-related barriers. Appendix G includes a matrix identifying legal, regulatory, social, and business barriers, indicating the level at which each barrier must be addressed, possible solutions to each barrier, and an estimate of the probability that each barrier can be solved without legislative restructuring.

Step 3—Training

Training is an essential tool to formally communicate changes in policies to a wider audience as part of implementation. Training ideally should include owner and industry members in the process. The process should

- Introduce the basic concepts to agency and contractor personnel.
- Be concise and clearly communicate the new procedures and the relative benefits of implementing them to all stakeholders.
- Address methods of selecting projects, parameters, and best-value procurement systems.
- Provide guidance for evaluation and scoring of technical proposals. Ensure that there is a consistent scale for scoring and that all scoring officials understand the scale. A simple example of this concept is that all officials must agree that an average score is 50 out of 100 points or 70 out of 100 points when using a direct point scoring system.

Training has the added benefit of recruiting additional champions to further promote and implement the proposed changes. The summary results of the study can be incorporated into an introductory training package consisting of the training tool shown in Appendix H.

Step 4—Collaborate with industry in the implementation process

The successful implementation of best-value procurement practices must include industry participation and comment; thus, it is prudent to reach out to owner and industry members affected by the change, explain the proposed changes, and obtain their insights, concerns, and ideas regarding the process. There are a number of reasons for this. Primary among these is the recognition that there will always be opposition to change. For example, strong industry opposition exists with regard to certain innovative procurement practices. If stakeholders are serious about implementing the results of research, then the implementation plan must provide the implementers and champions with the tools they will need to push through change. These tools include collaboration with industry.

The research team has consulted with its advisory board, particularly members representing industry organizations, regarding strategies to build industry support. Their feedback included recommendations for agencies to incorporate the following into their best-value contracting programs:

1. Identification of common objectives and advantages for best-value procurement;
2. Analysis and allocation of risks in the procurement process;
3. Involvement of an owner and industry task force in the development and review of proposed legislation or proposed best-value procurement procedures; and
4. Involvement of owner and industry team in testing the new approach through a pilot or demonstration project.

Step 5—Pilot projects

Pilot projects are a proven tool for validating and fine-tuning new practices resulting from research. Using traditional projects as a benchmark, pilot projects or programs have been used extensively to measure the relative success of new procurement and contracting methods. The results of pilot projects, though in some cases difficult to attribute to one specific cause, have served to effectively promote the long-term implementation of new industry practices. It is recommended that an agency champion the use of best-value procurement through a pilot program, partner with industry in testing various best-value systems, and develop criteria to measure its relative success compared with traditional low-bid projects.

The project screening and selection tool developed for the implementation of best-value procurement can be used by agencies to identify those projects that will make good pilot test beds and will furnish the project performance metrics that can be used to evaluate the results of the local pilot project program against a baseline of traditional projects. It is essential for the agency to maintain a long-term commitment, providing ongoing technical and troubleshooting support, and adjust and revise procedures as appropriate to overcome recognized problems and pave the way for more widespread implementation. Typically, institutionalizing the process through the development of appropriate governmental and private support groups or associations, annual conventions or meetings, websites, and regular periodicals will facilitate long-term support.

3.7 Model Best-Value Specification

This model specification represents a framework for the development of best-value procurement specifications. This document should be considered a template. To integrate these specifications into a proposal, special care must be exercised to ensure compatibility with the agency's standard specifications, especially the General Provisions. For more complex procurements, it is highly advisable to include separate Instructions to Bidders instead of incorporating procurement and award requirements in the standard specifications. This model specification refers to the AASHTO Guide Specifications for Highway Construction (AASHTO 1998) where appropriate. Under each of these sections, options, insertions, or alternate approaches are italicized.

XXX.01 General/Description.

A. The Agency is using a best-value procurement procedure to select the Bidder that will be awarded the Contract. The selection process will take into account the price offering and other factors that the Agency considers essential to the successful performance of the work. In addition to price, best-value parameters will include [*insert additional best-value parameter(s) based on project objectives identified in the project screening process. Parameters may include time, qualifications, quality, design alternates, or some combination of these factors aligned with the project objectives.*]
B. Refer to Section XXX.05 for the Agency's evaluation plan, criteria, and selection method.
C. This procedure consists of a *[insert one-step or two-step]* procurement process. Refer to Sections XXX.03 and XXX.05 for detailed requirements.

XXX.02 Definitions and Terms. The following definitions are added to **Section 101.03 Definitions:**

A. *Best value*—a procurement process where price and other key factors are considered in the evaluation and selection process to minimize impacts and enhance the long-term performance and value of construction.
B. *Parameters*—categories describing the Agency's procurement objectives in terms of cost or time savings, qualifications, or quality enhancements. Parameters are expressed as cost, time, qualifications & performance, quality, and design alternates.
C. *Evaluation Criteria*—those factors associated with each best-value parameter that will add value to the procurement and will be used to systematically evaluate proposals as part of the evaluation plan.
D. *Rating Systems*—a decision system that measures how well an offeror's response meets the solicitation's requirements. The system ranges from a relatively simple satisficing or go/no-go decision to more complex adjectival and direct point scoring systems.
E. *Award Algorithm*—methods for combining parameters and evaluation rating systems into an award decision. Algorithms are described through a formula or a step-by-step decision process.

XXX.03 Preparing the Proposal. The following is added to the conditions listed in **Section 102.06**

If the Agency specifies a one-step process, submit a proposal consisting of *[insert description of the required process, evaluation criteria, rating system, and award algorithm]*. The proposal includes separate price and technical submissions. Submit price proposals on Agency-supplied forms. For technical proposals, submit a sealed package, containing concise written material (or drawings) that enables a clear understanding and evaluation of technical criteria. Legibility, clarity, and completeness of the responses are essential. Present the Technical Proposal such that the Agency can easily separate and evaluate each criterion. *[Insert specific requirements for technical responses, page limits, and format]*.

If the Agency specifies a two-step process, the Agency will issue a step-one Request for Qualifications (RFQ) including *[insert qualifications evaluation criteria, standards, and evaluation plan]*. Submit a Statement of Qualifications (SOQ) addressing the requirements of the RFQ. If determined to be fully responsive to the qualifications, the Agency will issue a step-two Request for Proposal (RFP) to the qualified bidders.

Considerations: If the proposal consists of price and other parameters expressed in terms of an equivalent price, as in the case of A+B bidding, the Agency will limit the submission to a price proposal form with an explanation of prices for Part B or other parameters. For A+B bidding, Part A is the total dollar amount of the unit price bids in the Bid Schedule and Part B is the number of calendar days that the Bidder will require to substantially complete the project multiplied by the Daily User Cost listed in this special provision. The Bidder shall enter this calendar day number on the Bid Schedule in the Proposal Form. The number of calendar days shall not exceed *[insert maximum number of days]* days or the bid will be considered non-responsive. The Agency will evaluate each bid as the sum of Parts A and B. The successful bid is the lowest combination of Parts A and B. The Agency will award the Contract in the amount specified in Part A of the bid. The B time will be the calendar-day time period specified in Part B of the bid.

XXX.04 Irregular Proposals. The following is added to the conditions listed in **Section 102.07 Irregular Proposals,** under which proposals are considered irregular and may be rejected.

A. The proposal fails to meet a minimum standard or pass/fail requirement.
B. When A+B bidding is specified, the proposed number of days bid to complete the project or listed contract segments is outside the range specified for the project or segment.

XXX.05 Consideration of Proposals. The following replaces **Section 103.01 Consideration of Proposals.**

The Agency will evaluate proposals based on *[describe best-value system including the specified evaluation criteria, award algorithm, and rating system. Refer to commentary for summary table describing evaluation criteria and award algorithms]*.

The Agency will select the successful proposer based on *[describe the evaluation plan and method of scoring using a mathematical combination of price and technical score, cost-technical tradeoff, or fixed-price best proposal. The specification must clearly document the evaluation process, and specify the method of scoring and computation or qualitative determination of the best-value proposal]*.

Considerations: The following are some considerations for Agency personnel when developing a best-value solicitation:

- The following table includes the recommended best-value award algorithm formulas. *[Please note that other award algorithms are possible. Consult the applicable statutes and procurement guidelines to determine if a particular award mechanism is required.]*

BV Award Algorithm	Algorithm	Variables
Meets Technical Criteria—Low Bid	If $T > T_{min}$, Award to P_{min} If $T < T_{min}$, Non-Responsive	T = Technical Score P = Project Price
Value Unit Price (Weighted Criteria)	$TS = W_1S_1 + W_2S_2 + \ldots + W_iS_i + W_{(i+1)}PS$ Award TS_{max}	TS = Total Score W_i = Weight of Factor i S_i = Score of Factor i PS = Price Score
Qualitative Cost-Technical Tradeoff	Similar to above, only no quantitative analysis of difference. Award to proposal that has best value in proposed scope.	Evaluation Panel reaches consensus as to which proposal is the best.

- The following table includes a recommended framework for combining evaluation criteria with an award algorithm and rating system.
- The criteria used for technical evaluation, the weighting or relative importance of each criterion (including price), the scoring system, and the award algorithm should be clearly defined in the solicitation documents. This creates a level playing field, reduces the uncertainty related to the selection process, and focuses the proposers on what is most important to the agency.
- Use selection criteria that are important, add value, and relate to desired performance. Selection criteria often include factors that are difficult to assess or do not directly relate to the performance goals of the agency. Use a project screening system to identify key selection criteria that add value to the procurement process.
- If performing a best-value tradeoff analysis to justify award to other than the lowest priced offeror or other than the highest technically rated offeror, conduct systematic comparisons of price and technical criteria. Furthermore, the rationale for the decision, including benefits associated with the additional costs (or reduced costs), must be documented, but need not quantify the tradeoffs that led to the decision.
- It is prudent to ask that interested parties submit questions in advance of the submission stage and hold a pre-proposal meeting to answer questions or clarify aspects of an RFP. For a best-value procurement involving the consideration of complex technical criteria, this initial clarification is even more critical. Additionally, federal law requires notification to unsuccessful offerors and allows for pre- or post-award debriefings if requested by the offeror. A debriefing is also strongly recommended for best-value procurement to further clarify the basis for award, the selection process, and the rationale for eliminating the offeror, if this was not apparent in the written notification of contract award.

Example 1: Meets Technical Criteria—Low Bid

The final award decision is based on price. Technical proposals are scored before any cost proposals are reviewed. The price proposal is opened only if technical proposal is above the minimum technical score. If it is below the technical score, the proposal is deemed non-responsive, and the price proposal is not considered. Award will be determined by the lowest priced, fully qualified offeror. A generic algorithm and example follow:

Algorithm: **If $T > T_{min}$, Award to P_{min}**
If $T < T_{min}$, Non-Responsive
T = Technical Score
P = Project Price

Award Algorithm / BV Parameter and Evaluation Criteria	Meets Technical Criteria—Low Bid or Low Cost	Value Unit Price (Weighted Criteria)	Cost-Technical Tradeoff (Qualitative)
Cost			
Cost: A.0	X	X	X
Time			
Schedule: B.0	X	X	X
Qualifications			
Prequalification: P.0	X		
Past Project Performance: P.1		X	X
Key Personnel Experience: P.2		X	X
Subcontractor Information: P.3		X	X
Project Management Plans: P.4		X	X
Safety Record/Plan: P.5	X	X	X
Quality			
Quality Management: Q.0	X	X	X
Design Alternates			
Design with Proposed Alternate: D.0		X	X
Technical Proposal Responsiveness: D.1	X		
Environmental Considerations: D.2		X	X
Rating System			
	Satisficing	Direct Point Scoring	Adjectival or Modified Satisficing

Meets Technical Criteria—Low-Bid Example

Offeror	Technical Score (60 maximum) (40 minimum)	Price Proposal
1	51	$1,400,000
2	53	$1,200,000
3	**44**	**$1,100,000**
4	39	NR

Example 2: Value Unit Price (Weighted Criteria)

In the value unit price algorithm, the technical proposal and the price proposal are evaluated individually. A weight is assigned to the price and each of the technical evaluation factors. The sum of these values becomes the total score. The offeror with the highest total score is selected. A generic algorithm and example follow:

Algorithm: $\mathbf{TS = W_1S_1 + W_2S_2 + ... + W_iS_i + W_{(i+1)}PS}$
Award $\mathbf{TS_{max}}$
TS = Total Score
W_i = Weight of Factor i
S_i = Score of Factor i
PS = Price Score

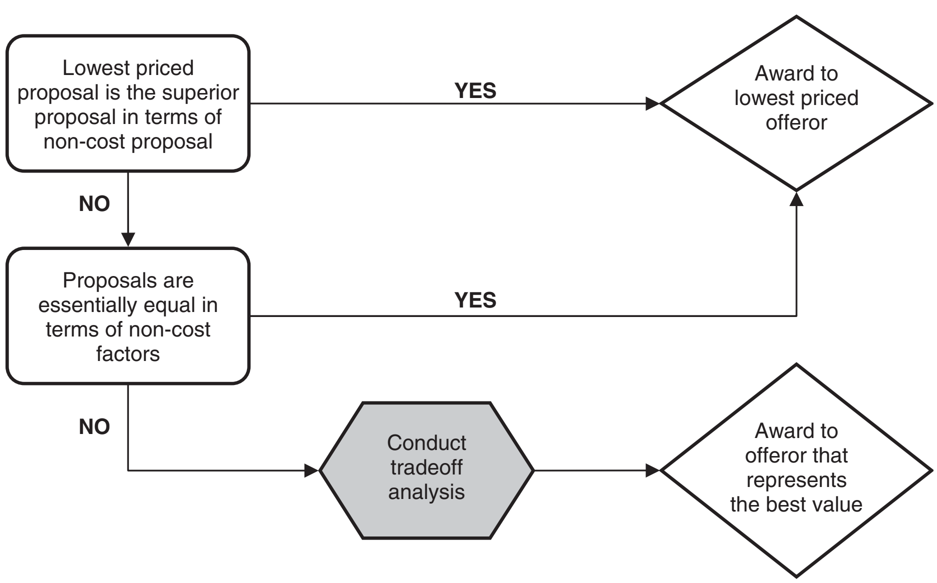
Example 3: Qualitative Cost-Technical Tradeoff

The qualitative cost-technical tradeoff is used by many federal agencies under the FAR. This method relies primarily on the judgment of the selection official and not on the evaluation ratings and scores (Army 2001). The final decision consists of an evaluation, comparative analysis, and tradeoff process that often require subjectivity and judgment on the part of the selecting official. The figure below depicts the qualitative cost-technical tradeoff algorithm as described in the Army Source Selection Guide (Army 2001).

The tradeoff analysis is not conducted solely with the ratings and scores alone. The selection official must analyze the differences between the competing proposals and make a rational decision based on the facts and circumstances of the

Value Unit Price Example

Offeror	Technical Score (60 maximum)	Price Proposal	Price Score (40 maximum)	Total Score (100 maximum)
1	51	$1,200,000	36	87
2	**53**	**$1,250,000**	**35**	**88**
3	44	$1,100,000	38	82
4	39	$1,000,000	40	79



specific acquisition. Two selection officials may not necessarily come to the same conclusion, but both must satisfy the following criteria:

- Represent the selection official's rational and independent judgment,
- Be based on a comparative analysis of the proposal, and
- Be consistent with the solicitation evaluation factors and subfactors.

3.8 Summary

The research team has developed practical criteria and processes for implementing best-value procurement for construction. The approach is to furnish a limited suite of possibilities that allows each agency to select the parts that best fit its individual needs and legislative constraints. Additionally, each project is unique and a given agency may want to use different best-value contracting systems for different kinds of projects. The research has further shown that to be successful, the selection of appropriate best-value projects is essential. There will be those projects that should not be procured using a best-value contract, and they should remain in the procurement realm defined by the lowest responsive bid. Thus, the coupling of the best-value project screening and selection tool to the best-value procurement system using the parameters, evaluation criteria, rating/scoring system, and award algorithm is both logical and essential to the successful implementation of best-value contracting for highway construction projects. Agencies should also be open to use of adjectival rating systems, based on recommendations from federal agencies that the best results are achieved with such a system.

Finally, the report recommends strategies to implement best-value procurement. These include legislative and regulatory guidelines, a graduated approach to implementation, suggested ways to collaborate with industry, suggested sample training tools, case studies of pilot projects, and a model specification.

CHAPTER 4

Conclusions and Suggested Research

4.1 Conclusions

Based on the findings and critical evaluation, some conclusions are made as follows:

- The literature, case study findings, and survey results indicate that many different approaches have been used for best-value parameters and criteria, rating systems, and award algorithms for construction projects. All of these approaches need to be carefully evaluated and considered for applicability to a traditional procurement process.
- The use of best-value procurement in the highway industry was limited to a relatively small number of projects—25 potential case studies were identified and many of these were design-build projects. The most frequently used selection strategies were meets technical criteria—low bid or A+B bidding, which suggests that the best-value selection strategies adopted by highway agencies were more closely aligned with the low-bid system.
- Initial performance results indicate that projects procured using the best-value method perform as well or better than traditional design-bid-build projects based on common performance measures.
- A best-value procurement system, particularly for an agency considering its use for the first time, should be flexible in terms of parameters chosen and evaluation system used, adapting to the needs of the specific project rather than using one approach for all highway construction projects.

In summary, a best-value system that is flexible in the selection of parameters and criteria, rating systems, and award algorithms will have the greatest likelihood to be successfully implemented in the context of a traditional low-bid system. For success of implementation, the project screening system will ensure that best value is applied to projects that will realize a significant benefit from the use of additional factors in the selection process. The final products of this research include the following:

1. A common definition and a conceptual framework for the use of best-value procurement methods for highway construction projects.
2. A baseline of projects and performance results against which performance outcomes for best-value highway projects will be measured.
3. A best-value procurement system that allows for flexibility in the choice of parameters and award methods.
4. An implementation plan that includes a project screening system for selecting candidate projects and a step-by-step process for selecting appropriate parameters, criteria, and award algorithms.
5. Strategies regarding developing legislation and procurement regulations for best-value procurement.
6. A model best-value specification to be used as a template for development of detailed specifications.
7. A compendium of case studies for best-value procurement in the highway construction industry.

Finally, the research team has recommended, as part of a long-term implementation strategy, that selected agencies champion the use of best-value procurement for pilot projects and use selected performance metrics to evaluate the results compared with similar projects using the traditional low-bid only procurement.

4.2 Suggested Research

The research in this study provides a practical implementation guide that is firmly based in best practices of public sector best-value procurement. However, the U.S. highway construction industry has relatively little experience with non-traditional procurement. Some of the best practices from this study are derived from best-value procurement in federal and state building sectors and international experience with best-value concepts where the system is more mature. The primary need for future research involves measurement and refinement of the best-value system in U.S. highway construction. The research team suggests the following topics be considered at the national and state levels:

- Conduct pilot studies to test the proposed best-value system. Each agency should test best-value procurement and measure its effectiveness within the agency. Pilot projects are an appropriate avenue for further refinement and testing of the process. The research component of these pilots involves the design for measurement metrics and testing procedures.
- Measure the performance of highway best-value projects on a national level and determine the cost, schedule, or quality implications of the system. Agencies need data to make good decisions. A long-term national study on the effectiveness of best-value procurement will allow agencies to make more informed decisions concerning the appropriateness of its use.
- Develop national or state baseline metrics for individual evaluation criteria. Many of the individual best-value procurement criteria would benefit from data pertaining to baseline measurement metrics. Past performance is an obvious candidate for historic baseline data, but personnel experience, life-cycle costs, and other criteria would benefit from historic databases for comparison as well.
- Prepare a User's Implementation Guide to Best-Value Procurement based on the results of this research and develop AASHTO best-value guide specifications for Highway Construction. The guide specifications will promote standard and consistent implementation of best-value procurement throughout the country.
- Create project selection criteria that are based on historic data specifically from highway projects. Due to the small number of best-value highway projects, the project selection criteria developed in this report had to be based on user judgment rather than statistically significant correlations to project characteristics. The selection system guides users to an informed decision using their own judgment rather than reliance on past performance data as originally proposed. It is possible that different users from the same highway agency will select different projects for best-value procurement from the project selection criteria contained in this report. As more best-value projects are completed in the highway sector, more project performance data will become available and more objective project selection models can be developed.

Much more research in best-value procurement is needed if the highway industry expects to change from the low-bid processes that are currently in use in the industry. This research is needed on a longitudinal basis so that the implications of its use can be measured objectively and accurately. The framework provided in this report provides a consistent model for the application of best-value procurement. This model allows for more significant research to be done in the future.

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APPENDIX A

Literature Review

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APPENDIX B

List of State Laws Allowing Use of Best-Value by Departments of Transportation; Excerpts from the Model Procurement Code, FAR, and State Statutes

This appendix provides a summary of various state statutes that may allow Departments of Transportation to implement best-value procurement for construction contracts. This list is followed by excerpts from ABA's Model Procurement Code and various statutes that may be of interest in developing legislation for DOT projects.

DOTs WITH BEST-VALUE PROCUREMENT AUTHORITY (EXCLUDING DESIGN-BUILD)

Note: The following chart identifies State Departments of Transportation that appear to have authority to use best-value procurements for construction contracts, based on a cursory review of state laws posted on the internet as of the date of the review. An in-depth legal analysis would be necessary in order to determine whether states should be added or deleted from this list. It should be noted that a number of states not listed below have adopted procurement codes based on the ABA Model Code. Such codes either specifically excluded the Department of Transportation or did not clearly include the Department of Transportation. States that have best-value authority only for design-build or construction management contracts are not listed.

State	*Citation*	*Procurement Process*
AK	ALASKA STAT. §§ 36.30.170 *et seq*.	**Commissioner of Transportation may allow innovative competitive procurement process based on a determination that it is advantageous to the state to achieve best value. (36.30.308)** Competitive sealed proposal process may be used if it is impractical to initially prepare a definitive purchase description to support an award based on price; in such case award would be made to proposer submitting “most advantageous” offer. Otherwise, competitive sealed bids. Commissioner has discretion to determine process for contracts under $100,000. Preference for local bidders.
DE	DEL. CODE ANN. tit. 29, § 6962(d)(13); tit. 2, § 2003	Tit. 29 § 6962(d)(13): Award “to the lowest responsive and responsible bidder, unless the agency elects to award on the basis of **best value**, in which case the election to award on the basis of best value shall be stated in the invitation to bid.” Prequalification is allowed. Additionally, award may be made to other than the low bidder if “the interest of the agency shall be better served by awarding the contract to another bidder.” Tit. 2, § 2003: Applicable to transportation projects using private sources of financing. Proposals to be evaluated and ranked based on selection criteria stipulated in the request for proposals; contract negotiated with the highest ranked proposer.
HI	HAW. REV. STAT. § 103D-301 *et seq*.	**Competitive sealed proposals allowed for construction for which competitive sealed bidding is not practicable or not advantageous to the State** (determination to be designated by rule or made by agency head in writing). Award to responsible offeror whose proposal is determined in writing to be the most advantageous taking into consideration price and the evaluation factors stated in the request for proposals. Otherwise contracts are to be awarded by competitive sealed bidding. Single step or multi-step bidding is allowed. Criteria to be considered must be stated in the invitation for bids and must be objectively measurable, such as discounts, transportation costs, and total or life-cycle costs.

State	*Citation*	*Procurement Process*
MD	MD. CODE ANN., STATE FIN. & PROC. §§ 13-102 *et seq.*	13-102 requires competitive sealed bidding for construction projects. Process may include **multi-step bidding**. (13-104 and 13-105 limit competitive sealed proposal process to human, social, cultural or educational services, and leases.) Standard Specifications provide for award to be made to the responsible and responsive bidder whose bid meets the requirements and evaluation criteria set forth in the invitation for bids, and is either the lowest bid price or the lowest evaluated bid price.
MN	MINN. STAT. ANN. §§ 161.32, 161.3410	161.32 sub. 1b: Trunk highway construction contracts to be awarded to the lowest responsible bidder, taking into consideration conformity with the specifications, the purpose for which the contract or purchase is intended, the status and capability of the vendor, and other considerations imposed in the call for bids. The commissioner may decide which is the lowest responsible bidder for all contracts and **may use the principles of life-cycle costing, when appropriate, in determining the lowest overall bid.** 161.3412 allows best value selection for design-build contracts notwithstanding the foregoing. May use either a two-step best value selection process or a low bid process, not to exceed 10% of DOT contracts each year.
MT	MONT. CODE ANN. § 60-2-111, 112, 135-137.	60-2-111: In general, competitive bidding required for contracts over $50,000, award to lowest responsible and responsive bidder. **600-2-112: Award by means other than competitive bidding is allowed if special circumstances so require and are specified in writing**. 60-2-135 *et seq*. establishes pilot program for design-build projects.
NH	N.H. REV. STAT. ANN. § 228:4(I)	**Competitive bidding required only for federally funded highway contracts.** Design-build may be used for certain types of projects not to exceed $1 million, selection to be based on objective standard, measurable criteria for evaluation.
NC	N.C. GEN. STAT. §§ 136-28.1; 136-28.11	136-28.1: **Contracts over $1,200,000 to be let to a responsible bidder after public advertising under rules and regulations to be made and published by the Department of Transportation**. Contracts under $1,200,000 to be awarded to the lowest responsible bidder (advertising not required). For contracts for repair of ferryboats, the Secretary may waive public advertising as well as soliciting of informal bids if he/she determines that the requirement for compatibility does not make public advertising feasible. 136-28.11: Allows use of design-build based on determination by the Department of Transportation that delivery of the projects must be expedited and that it is not in the public interest to comply with normal design and construction contracting procedures. Contracts to be "awarded on a basis to maximize participation, competition, and cost benefit."
OR	OR. REV. STAT. § 383.279A.050(3)(b) OR. REV. STAT. § 383.279C.335(3)(a) OR. REV. STAT. §§ 383.005 *et seq.*	The Director of the Department or a local contract review board may direct the use of **alternative contracting methods** relating to the operation, maintenance or construction of highways, bridges, etc. The Department may award any (tollway) contract under a competitive process or by private negotiation or any combination of competition and negotiation.

State	*Citation*	*Procurement Process*
RI	R.I. GEN. LAWS § 24-8-12 (DOT Contracts); ch. 37-2 (state Purchases)	24-8-12 Contracts – Advertising for bids. – All road construction or improvements made by the director of transportation shall be, and all repairs may be, performed by written contract, made by the department of administration in behalf of the state, and after advertisement, . . . **inviting sealed proposals** for the road construction or improvement, to be made under the supervision and subject to the approval of the department of administration, and in accordance with the plans and specifications of the department of transportation; and the advertisement shall state the time and place the plans and specifications may be examined, and when the proposals made in answer to the advertisement will be opened, and shall reserve the right of the department of administration to reject any and all proposals. Unclear whether ch. 37-2 applies to DOT contracts. § 37-2-18 allows **competitive sealed bidding** with award made on the basis of the lowest bid price or the lowest evaluated or responsive bid price (including objective measurable criteria identified in the invitation for bids). § 37-2-19 allows **competitive negotiation** based on regulations and determination that competitive sealed bidding is not practicable.
VA	VA. CODE ANN. §§ 2.2-4303, 2.2-4306 and 33.1-12	2.2-4303(D): construction contracts to be procured by **competitive sealed bidding** except that **competitive negotiation** may be used for highways upon a determination that bidding is either not practicable or not fiscally advantageous. 2.2-4301: Competitive sealed bidding definition states that award is to be made to the lowest responsive and responsible bidder, but also makes clear that requirements set forth in the invitation will be evaluated in determining acceptability, including special qualifications of potential contractors, life-cycle costing, value analysis, and any other criteria such as inspection, testing, quality, workmanship, delivery, and suitability for a particular purpose, which are helpful in determining acceptability. 2.2-4306: procedures for award of design-build and construction management contracts. Award to be based on objective criteria adopted by Commonwealth Transportation Board; objective criteria to include requirements for prequalification and competitive bidding.

EXCERPTS FROM THE MODEL PROCUREMENT CODE, FAR, AND STATE STATUTES

Model Procurement Code
Part B — Methods of Source Selection

§ Method of Source Selection.

Unless otherwise authorized by law, all [State] contracts shall be awarded by one of the following methods:

(a) Section 3-202 (Competitive Sealed Bidding);
(b) Section 3-203 (Competitive Sealed Proposals);
(c) Section 3-204 (Small Purchases);
(d) Section 3-205 (Sole Source Procurement);
(e) Section 3-206 (Emergency Procurement);
(f) Section 3-207 (Special Procurement);
(g) Section 3-205 (Architectural and Engineering Services);

COMMENTARY:

(1) With competitive sealed bidding as a starting point (Section 3-202), procurement officials are able to choose an appropriate source selection method to meet the circumstances of each procurement. Procurement officials should be able to freely select method, based on that official's discretion. Procurement officials should recognize the flexibility that the Code offers them when using the competitive sealed bidding method, such as product acceptability and multi-step process.

(2) The purpose of this Part is to provide procurement officials with adequate authority to conduct procurement transactions by fair and open competition under varying market conditions in order to satisfy public needs for supplies, services, and construction at the most economical prices.

(3) Fair and open competition is a basic tenet of public procurement. Such competition reduces the opportunity for favoritism and inspires public confidence that contracts are awarded equitably and economically. Since the marketplace is different for various supplies, services, and construction, this Code authorizes a variety of source selection techniques designed to provide the best competition for all types of procurement. It also permits less formal competitive procedures where the amount of the contact does not warrant the expense and time otherwise involved. Competitive sealed bidding (Section 3-202), competitive sealed proposals (Section 3-203), therefore, are recognized as valid competitive procurement methods when used in accordance with the criteria and conditions set forth in this Article.

(4) Subsection (d) lists sole source procurements (Section 3-205) as an exception to other methods only when it is determined in writing that there is only one source for the required supply service, or construction item.

(5) The statutory authorization in Section 3-201 to use competitive sealed bidding and competitive sealed proposals applies to four new project delivery methods identified in Article 5 of the 2000 Code: design-build, design-build-operate-maintain, when added to

the design-bid-build project delivery already authorized in the 1979 version of the Code, provide procurement officials with increased flexibility in the procurement of the design, construction, operation, maintenance, and finance of public infrastructure facilities. Article 5 continues to rely on the source selection methods of Article 3, while providing maximum flexibility to procurement officials to separate or integrate the design, construction, operation, maintenance, and finance functions.

§ 3-202 Competitive Sealed Bidding.

(1) *Conditions for Use.* Contracts shall be awarded by competitive sealed bidding except as otherwise provided in Section 3-201 (Method of Source Selection).

COMMENTARY:
Competitive sealed bidding does not include negotiations with bidders after the receipt and opening of bids. Award is to be made based strictly on the criteria set forth in Invitation for Bids.

(2) *Invitation for Bids*. An Invitation for Bids shall be issued and shall include a purchase description, and all contractual terms and conditions applicable to the procurement.

(3) *Public Notice*. Adequate public notice of the Invitation for Bids shall be given a reasonable time prior to the date set forth therein for the opening of bids, in accordance with regulations.

COMMENTARY:
Public notice required by this Subsection should be given sufficiently in advance of bid opening to permit potential bidders to prepare and submit their bids in a timely manner. Because the adequacy of notice will, as a practical matter, vary from locality to locality and procurement to procurement, no attempt is made in Subsection (3) to define statutorily either a prescribed method of notice or the duration of its publication. However, the regulations should provide criteria and general guidelines for the method and duration of public notice.

(4) *Bid Opening.* Bids shall be opened publicly in the presence of one or more witnesses at the time and place designated in the Invitation for Bids. The amount of each bid, and such other relevant information as may be specified by regulation, together with the name of each bidder shall be recorded; the record and each bid shall be open to public inspection.

(5) *Bid Acceptance and Bid Evaluation.* Bids shall be unconditionally accepted without alteration or correction, except as authorized in this Code. Bids shall be evaluated based on the requirements set forth in the Invitation for Bids, which may include criteria to determine acceptability such as inspection, testing, quality, workmanship, delivery, and suitability purpose. Those criteria that will affect the bid price and be considered in evaluation for award shall be objectively measurable, such as discounts, transportation costs, and total or life cycle costs. The

Invitation for Bids shall set forth the evaluation criteria to be used. No criteria may be used in bid evaluation that are not set forth in the Invitation for Bids.

COMMENTARY:

(1) The only provisions of this Code that allow alteration or correction of bids are found in Subsection (6) of this Section and Section 5-301(3) (Bid Security, Rejection of Bids for Noncompliance with Bid Security Requirements).

(2) This Subsection makes clear that judgment evaluations of products, particularly where bid samples or product description are submitted, may properly be used in determining whether a product proffered by a bidder meets the acceptability standards of the specific requirements for the procurement. Such judgmental evaluations as appearance, workmanship, finish, taste, and feel all may be taken into consideration under this Subsection. Additionally, the ability to make such determinations and to reject as nonresponsive any bid that does not meet the purchase description is inherent in the definition of responsive bidder in Section 3-107(7) (Definitions, Responsive Bidder).

(3) The bid evaluation may take into account not only acquisition costs of supplies, but the cost of their ownership which relates to the quality of the product, including life cycle factors such as maintainability and reliability. Any such criteria must be set forth in the Invitation for Bids to enable bidders to calculate how such criteria will affect their bid price.

(4) This Subsection does not permit a contract to be awarded to a bidder submitting a higher quality item than the minimum required by the purchase description unless that bidder also has the bid price evaluated lowest in accordance with the objective criteria set forth in the Invitation for Bids. Furthermore, this procedure does not permit discussions or negotiations with bidders after receipt and opening of bids.

(6) *Correction of Withdrawal of Bids; Cancellation of Awards.* Correction or withdrawal of inadvertently erroneous bids before or after award, or cancellation of awards or contracts based on such bid mistakes, shall be permitted in accordance with regulations. After bid opening, no changes in bid prices or other provisions of bids prejudicial to the interest of the [State] or fair competition shall be permitted. Except as provided by other regulation, all decisions to permit the correction or withdrawal of bids, or to cancel awards or contracts based on bid mistakes, shall be supported by a written determination made by the Chief Procurement Office or head of a Purchasing Agency.

COMMENTARY:

(1) Correction or withdrawal of bids before or after contract award requires careful consideration to maintain the integrity of the competitive bidding system, to assure fairness, and to avoid delays or poor contract performance. While bidders should be expected to be bound by their bids, circumstances frequently arise where correction or withdrawal of bids is proper and should be permitted.

(2) To maintain the integrity of the competitive sealed bidding system, a bidder should not be permitted to correct a bid mistake after bid opening that would cause such a bidder

to have the low bid unless the mistake is clearly evident from examining the bid document; for example, extension of unit prices or errors in addition.
(3) An otherwise low bidder should be permitted to correct a material mistake of fact in its bid, including price, when the intended bid is obvious from the bid document or is otherwise supported by proof that has evidentiary value. A low bidder should not be permitted to correct a bid for mistakes or errors in judgment.
(4) In lieu of bid correction, the [State] should permit a low bidder alleging a material mistake of fact to withdraw its bid when there is reasonable proof that a mistake was made and the intended bid cannot be ascertained with reasonable certainty.
(5) After bid opening an otherwise low bidder should not be permitted to delete exceptions to the bid conditions or specifications which affect price or substantive obligations; however, such bidder should be permitted the opportunity to furnish other information called for by the Invitation for Bids and not supplied due to oversight, so long as it does not affect responsiveness.
(6) A suspected bid mistake can give rise to a duty on the part of the [State] to request confirmation of a bid, and failure to do so can result in a nonbinding award, where there is an appearance of mistake. Therefore, the bidder should be asked to reconfirm the bid before award. In such instances, a bidder should be permitted to correct the bid or to withdraw it when the bidder acknowledges that a mistake was made.
(7) Correction of bid mistakes after award should be subject to the same proof as corrections before award with a further requirement that no correction be permitted that would cause the contract price to exceed the next low bid.
(8) Nothing in this Section is intended to prohibit the [State] from accepting a voluntary reduction in price from a low bidder after bid opening; provided that such reduction is not conditioned on, or results in, the modification or deletion of any conditions contained in the Invitation for Bids.

(7) *Award.* The contract shall be awarded with reasonable promptness by written notice to the lowest responsible and responsive bidder whose bid meets the requirements and criteria set forth in the Invitation for Bids. In the event all bids for a construction project exceed available funds as certified by the appropriate fiscal officer, and the low responsive and responsible bid does not exceed such funds by more than [five] percent, the Chief Procurement Officer, or the head of Purchasing Agency, is authorized in situations where time or economic considerations preclude resolicitation of work of a reduced scope to negotiate an adjustment of the bid price, including changes in the bid requirements, with the low responsive and responsible bidder, in order to bring the bid within the amount of available funds.

COMMENTARY:
(1) The successful bidder must be responsive as defined in Section 3-101(7) and responsible as defined in Section 3-101(6), and the bid must be the lowest bid determined under criteria set forth in the Invitation for Bids.
(2) This Subsection also provides authority to negotiate changes in construction project bid requirements with a low bidder in order to arrive at a price not in excess of available funds. It should be noted that even where the bids exceed the percentage limitation on

the discretionary authority to negotiate with the low bidder, if circumstances warrant an emergency determination, the procurement can proceed under Section 3-206 (Emergency Procurements).
(3) When all bids are determined to be unreasonable or the lowest bid on a construction project exceeds the amount specified in the Subsection, and the public need does not permit the time required to resolicit bids, then a contract may be awarded pursuant to the emergency authority in Section 3-206 (Emergency Procurements) in accordance with regulations.
(4) Note that the new definition of "written or in writing" in Section 1-301(26) permits awards to be issued electronically.

(8) *Multi-Step Sealed Bidding*. When it is considered impractical to initially prepare a purchase description to support an award based on price, an Invitation for Bids may be issued requesting the submission of unpriced offers to be followed by an Invitation for Bids limited to those bidders whose offers have been qualified under the criteria set forth in the first solicitation.

COMMENTARY:
To provide additional flexibility in meeting the designated public need, multi-step competitive sealed bidding is authorized.

§3-203 Competitive Sealed Proposals.

(1) *Conditions for Use.*
   (a) A contract may be entered into by competitive sealed proposals when the Chief Procurement Officer, the head of a Purchasing Agency, or a designee of either officer above the level of the Procurement Officer determines in writing, pursuant to regulations, that the use of competitive sealed bidding is either not practicable or not advantageous to the [State].
   (b) Regulations may provide that it is either not practicable or not advantageous to the [State] to procure specified types of supplies, services, or construction by competitive sealed bidding.
   (c) Contracts for the design-build, design-build-operate-maintain, or design-build-finance-operate-maintain project delivery methods specified in Article 5 shall be entered into by competitive sealed proposals, except as otherwise provided in Subsections (c), (d), (e), and (f) of Section 3-201 (Methods of Source Selection).

COMMENTARY:
(1) The competitive sealed proposal method (similar to competitive negotiation) is available for use when competitive sealed bidding is either not practicable or not advantageous. The competitive sealed proposal method is mandated for the project delivery methods described in Article 5: design-build, design-build-operate-maintain, and design-build-finance-operate-maintain.

(2) The competitive sealed bidding and competitive sealed proposal methods assure price and product competition. The use of functional or performance specifications is allowed under both methods to facilitate total or life cycle costs. The criteria to be used in the evaluation process under either method must be fully disclosed in the solicitation. Only criteria disclosed in the solicitation may be used to evaluate the items bid or proposed.

(3) These two methods of source selection differ in the following ways:

(a) Under competitive sealed bidding, judgmental factors may be used only to determine if the supply, service, or construction item bid meets the purchase description. Under competitive sealed proposals, judgmental factors may be used to determine not only if the items being offered meet the purchase description but may also be used to evaluate the relative merits of competing proposals. The effect of this different use of judgmental evaluation factors is that under competitive sealed bidding, once the judgmental evaluation is completed, award is made on a purely objective basis to the lowest responsible bidder. Under competitive sealed proposals, the quality of competing products or services may be compared and tradeoffs made between price and quality of the products or services offered (all as set forth in the solicitation). Award under competitive sealed proposals is then made to the responsible offeror whose proposal is most advantageous to the [State].

(b) Competitive sealed bidding and competitive sealed proposals also differ in that, under competitive sealed bidding, no change in bids is allowed once they have been opened, except for correction of errors in limited circumstances. The competitive sealed proposal method, on the other hand, permits discussions after proposals have been opened to allow clarification and changes in proposals provided that adequate precautions are taken to treat each offeror fairly and to ensure that information gleaned from competing proposals is not disclosed to other offerors.

(4) The words "practicable" and advantageous" are to be given ordinary dictionary meanings. In general, "practicable" denotes a situation which justifies a determination that a given factual result can occur. A typical determination would be whether there is sufficient time or information to prepare a specification suitable for competitive sealed bidding. "Advantageous" connotes a judgmental assessment of what is in the [State's] best interest. Illustrations include determining:

(a) whether to utilize a fixed-price or cost-type contract under the circumstances;

(b) whether quality, availability, or capability is overriding in relation to price in procurements for research and development, technical supplies, or services (for example, developing a traffic management system);

(c) whether the initial installation needs to be evaluated together with subsequent maintenance and service capabilities and what priority should be given these requirements in the best interests of the [State]: or

(d) whether the marketplace will respond better to a solicitation permitting not only a range of alternative proposals but evaluation and discussion of them before making the award (for example, computer software programs).

What is practicable (that is possible) may not necessarily be beneficial to the [State]. Consequently, both terms are used in the Section to avoid a possibly restrictive interpretation of the authority to use competitive sealed proposals. If local conditions require an enacting jurisdiction to reduce the proposed flexibility in choosing between competitive sealed bidding and competitive sealed proposals, the statutory determination under Subsection (1)(b) to use competitive sealed proposals should be confined to a determination that use of competitive sealed bidding is "not practicable."
(5) Whenever it is determined that it is practicable but not advantageous to use competitive sealed bidding, the basis for the determination should be specified with particularity.

(2) *Request for Proposals*. Proposals shall be solicited through a Request for Proposals.

(3) *Public Notice*. Adequate public notice of the Request for Proposals shall be given in the same manner as provided in Section 3-202(3) (Competitive Sealed Bidding, Public Notice).

(4) *Receipt of Proposals*. Proposals shall be opened so as to avoid disclosure of contents to competing offerors during the process of negotiation. A Register of Proposals shall be prepared in accordance with regulations, and shall be open for public inspection after contract award.

(5) *Evaluation Factors*. The Request for Proposals shall state the relative importance of price and other factors and subfactors, if any.

COMMENTARY:

Subsection (5) requires that the Request for Proposals ("RFP") set forth the relative importance of the factors and any subfactors, in addition to price, that will be considered in awarding the contract. A statement in the RFP of the specific weighting to be used by the jurisdiction for each factor and subfactor, while not required, is recommended so that all offerors will have sufficient guidance to prepare their proposals. The Subsection serves two purposes. First, a fair competition necessitates an understanding on the part of all competitors of the basis upon which award will be made. Second, a statement of the basis for award is also essential to ensure that the proposals will be as responsive as possible so that the jurisdiction can obtain the optimum benefits of the competitive solicitation. The requirement for disclosure of the relative importance of all evaluation factors and subfactors applies to the areas or items that will be separately evaluated and scores, e.g., the items listed on evaluation score sheets. The requirement does not extend to advance disclosure of the separate items or emphasis that are considered in the mental process of the evaluators in formulating their scores for the factors and subfactors that are described in the solicitation.

(6) *Discussion with Responsible Offerors and Revisions to Proposals*. As provided in the Request for Proposals, and under regulations, discussions may be conducted with responsible offerors who submit proposals determined to be reasonably susceptible of being selected for award for the purpose of clarification to ensure full understanding of, and responsiveness to, the solicitation requirements. Offerors shall be accorded fair and equal treatment with respect to any opportunity for discussion and revision of proposals, and such revisions may be permitted after submissions and prior to award for the purpose of obtaining best and

final offers. In conducting discussions, there shall be no disclosure of any information derived from proposals submitted by competing offerors.

COMMENTARY:

(1) Subsection (6) provides the procurement official an opportunity to make certain that offerors fully understand the solicitation requirements and provides offerors an opportunity to clarify proposals where necessary so as to ensure responsiveness to the solicitation. Price discussions can best be conducted when there is a mutual understanding of the contractual requirements. Clarifications are intended to promote exchanges between the [State] and an offeror that may occur when an award is contemplated without discussions, for example, to resolve minor or clerical errors or ambiguities in proposals.

(2) When discussions or negotiations are contemplated after the receipt of proposals which are expected to lead to the revision of proposals or to best and final offers, fair and equitable treatment of competitors dictates that negotiations be conducted in accordance with ethical business standards. Auction techniques shall be prohibited in discussions with offerors under the competitive sealed proposal method. There must be a cut-off for the submission of revised proposals and final offers. Both Subsection (4) and Subsection (6) are intended to provide that prices; technical solutions; unique technologies; innovative use of commercial items, design, construction, or operating techniques; or other aspects of proposals submitted by one offeror must not be disclosed to competing offerors. Safeguards against abuse in the conduct of negotiations must be strictly observed to maintain the essential integrity of the process. Procedures should be specified in regulations in order to achieve these objectives.

(7) *Award*. Award shall be made to the responsible offeror whose proposal conforms to the solicitation and is determined in writing to be the most advantageous to the [State] taking into consideration price and the evaluation factors set forth in the Request for Proposals. No other factors or criteria shall be used in the evaluation. The contract file shall contain the basis on which the award is made. Written notice of the award of a contract to the successful offeror shall be promptly given to all offerors.

COMMENTARY:

The file should show with particularity how the pertinent factors and criteria were applied in determining that the successful proposal is most advantageous to the [State] to assure offerors that their proposals were evaluated fairly and to minimize protests or litigation.

(8) *Debriefings*. The Procurement Officer is authorized to provide debriefings that furnish the basis for the source selection decision and contract award.

COMMENTARY:

Debriefings may be given orally, in writing, or by any other method acceptable to the Procurement Official. A post-award debriefing may include (a) the [State's] evaluation of significant weaknesses or deficiencies in the proposal, if applicable; (b) the overall evaluated cost or price (including unit prices) and technical rating, if applicable, of the successful offeror and the debriefed offeror; (c) the overall ranking of all proposals, when any such ranking was developed during the source selection; (d) a summary of the rationale for award; (e) reasonable responses to relevant questions about whether source selection procedures contained in the Request for Proposal and applicable law were followed. Post-award debriefings should not include point-by-point comparisons of the debriefed proposal with those of other offerors. Any debriefing should not reveal any information prohibited from disclosure by law, or exempt from release under the [applicable public records laws], including trade secrets, or privileged or confidential commercial or manufacturing information. A summary of any debriefing should be included in the contract file.

§3-204 Small Purchases.

Any procurement not exceeding the amount established by regulation may be made in accordance with small purchase procedures, provided, however, that procurement requirements shall not be artificially divided so as to constitute a small purchase under this Section.

COMMENTARY:
This Section recognizes that certain public purchases do not justify the administrative time and expense necessary for the conduct of competitive sealed bidding. Streamlined procedures, to be set forth in regulations, will make small purchases administratively simpler to complete and yet ensure competition. The appropriate dollar limitations for the use of these procedures are left to regulation within each enacting jurisdiction. Care must be taken to ensure that purchase requirements are not fragmented in order to fall within the authority contained in this Section, thus circumventing the source selection procedures required by either Section 3-202 (Competitive Sealed Bidding), or Section 3-203 (Competitive Sealed Proposals).

§3-205 Sole Source Procurement.

A contract may be awarded for a supply, service, or construction item without competition when, under regulations, the Chief Procurement Officer, the head of a Purchasing Agency, or a designee of either officer above the level of the Procurement Officer determines in writing that there is only one source for the required supply, service, or construction item.

COMMENTARY:
(1) This method of procurement involves no competition and should be utilized only when justified and necessary to serve [State] needs. This Code contemplates that the [Policy Officer] [Chief Procurement Officer] will promulgate regulations which establish standards applicable to procurement needs that may warrant award on a sole source basis.
(2) The power to authorize a sole source award is limited to the Chief Procurement Officer and the head of an agency with purchasing authority, or their designees above the level of Procurement Officer. The purpose in specifying these officials is to reflect an intent that such determinations will be made at a high level. The permission for these officials to authorize a designee to act for them should be subject to regulations.

§3-206 Emergency Procurements.

Notwithstanding any other provision of this Code, the Chief Procurement Officer, the head of a Purchasing Agency, or a designee of either officer may make or authorize others to make emergency procurements when there exists a threat to public health, welfare, or safety under emergency conditions as defined in regulations, provided that such emergency procurements shall be made with such competition as is practicable under the circumstances. A written determination of the basis for the emergency and for the selection of the particular contractor shall be included in the contract file.

COMMENTARY:
(1) This Section authorizes the procurement of supplies, services, or construction where the urgency of the need does not permit the delay involved in utilizing more formal competitive methods. This Code contemplates that the [Policy Officer] [Chief Procurement Officer] will promulgate regulations establishing standards for making emergency procurements and controlling delegations of authority by the Chief Procurement Officer or the head of a Purchasing Agency. Such regulations may limit the authority of such officials to delegate the authority to make procurements above designated dollar amounts.
(2) While in a particular emergency an award may be made without any competition, the intent of this Code is to require as much competition as practicable in a given situation. When the amount of the emergency procurement is within that adopted for Section 3-204 (Small Purchases), the competitive procedures prescribed under that Section should be used when feasible.
(3) Use of this Section may be justified because all bids submitted under the competitive sealed bid method are unreasonable, and there is no time to resolicit bids without endangering the public health, welfare, or safety. As with other emergency conditions, regulations will further define these circumstances, and any procurements conducted pursuant to this authority must be done so as to treat all bidders fairly and to promote such competition as is practicable under the circumstances.

§3-207 Special Procurements.

Notwithstanding any other provision of this Code, the Chief Procurement Officer or the head of a Purchasing Agency may with prior public notice initiate a procurement above the small purchase amount specified in Section 3-204 where the officer determines that an unusual or unique situation exists that makes the application of all requirements of competitive sealed bidding or competitive sealed proposals contrary to the public interest. Any special procurement under this Section shall be made with such competition as is practicable under that circumstance. A written determination of the basis for the procurement and for the selection of the particular contractor shall be included by the Chief Procurement Officer or the head of a Purchasing Agency in the contract file, and a report shall be made publicly available at least annually describing all such determinations made subsequent to the prior report.

COMMENTARY:
(1) This new Section 3-207 authorizes special procurements in very limited circumstances, where deviations from the strict requirements of the Code are necessary to

protect the interest of the [State]. It is based on the versions of the Code adopted by the States of Alaska and Arizona. See Alaska Statutes Section 36.30.308 (authorizing the use of an innovative procurement process under certain conditions to purchase new or unique state requirements, new technologies, or to achieve best-value) and Arizona Revised Statutes Section 41-2537 (authorizing, under emergency procurement authority, a waiver for competitive sealed bidding or competitive sealed proposals when doing so is in the State's best interests). To ensure proper safeguards, the 2000 Code contemplates that only the Chief Procurement Officer or the head of a Purchasing Agency will authorize each special procurement process, and document both the reasons therefore and the selection process followed. The second sentence of the Section confirms that those requirements of the competitive processes that can practicably be applied to such procurement will be applied.

(2) The 2000 Code revisions delete the original Section 3-207, entitled "Competitive Selection Procedures for Services Specified in Section 2-302." Generally, the original Section specified that certain services—those exempted from direct or delegated procurement authority of the Chief Procurement Officer under Section 2-302—could be purchased through a procurement method in which price was not an evaluation factor. Revisions to Section 2-302 have reduced the need for the original Section 3-207. In addition, the experience of purchasing professionals has been that services may be effectively procured through the Code's other source selection methods. Where enacting jurisdictions have adapted the original Section 3-207 to cover all "professional services," the term has been difficult to define.

(3) The purchasing method used to buy any service should be determined based on such factors as the reasons the services are needed and the dollar amount involved. By eliminating the original Section 3-207, the 2000 revision ensures that the Code does not dictate only one method for purchasing services, and that a full array of factors, not just the type of service alone, is the basis for the source selection method used.

Excerpts from Federal Acquisition Regulation (FAR), Part 15

48 C.F.R. § 15.100 Scope of subpart.

This subpart describes some of the acquisition processes and techniques that may be used to design competitive acquisition strategies suitable for the specific circumstances of the acquisition.

48 C.F.R. § 15.101 Best-Value continuum.

An agency can obtain best-value in negotiated acquisitions by using any one or a combination of source selection approaches. In different types of acquisitions, the relative importance of cost or price may vary. For example, in acquisitions where the requirement is clearly definable and the risk of unsuccessful contract performance is minimal, cost or price may play a dominant role in source selection. The less definitive the requirement, the more development work required, or the greater the performance risk, the more technical or past performance considerations may play a dominant role in source selection.

48 C.F.R. § 15.101-1 Tradeoff process.

(a) A tradeoff process is appropriate when it may be in the best interest of the Government to consider award to other than the lowest priced offeror or other than the highest technically rated offeror.

(b) When using a tradeoff process, the following apply:

(1) All evaluation factors and significant subfactors that will affect contract award and their relative importance shall be clearly stated in the solicitation; and

(2) The solicitation shall state whether all evaluation factors other than cost or price, when combined, are significantly more important than, approximately equal to, or significantly less important than cost or price.

(c) This process permits tradeoffs among cost or price and non-cost factors and allows the Government to accept other than the lowest priced proposal. The perceived benefits of the higher priced proposal shall merit the additional cost, and the rationale for tradeoffs must be documented in the file in accordance with 15.406.

48 C.F.R. § 15.101-2 Lowest price technically acceptable source selection process.

(a) The lowest price technically acceptable source selection process is appropriate when best-value is expected to result from selection of the technically acceptable proposal with the lowest evaluated price.

(b) When using the lowest price technically acceptable process, the following apply:

(1) The evaluation factors and significant subfactors that establish the requirements of acceptability shall be set forth in the solicitation. Solicitations shall specify that award will be made on the basis of the lowest evaluated price of proposals meeting or exceeding the acceptability standards for non-cost factors. If the contracting officer documents the file pursuant to 15.304(c)(3)(iv), past performance need not be an

evaluation factor in lowest price technically acceptable source selections. If the ontracting officer elects to consider past performance as an evaluation factor, it shall be evaluated in accordance with 15.305. However, the comparative assessment in 15.305(a)(2)(i) does not apply. If the contracting officer determines that a small business' past performance is not acceptable, the matter shall be referred to the Small Business Administration for a Certificate of Competency determination, in accordance with the procedures contained in Subpart 19.6 and 15 USC. 637(b)(7)).

(2) Tradeoffs are not permitted.

(3) Proposals are evaluated for acceptability but not ranked using the non-cost/price factors.

(4) Exchanges may occur (see 15.306).

48 C.F.R. § 15.102 Oral presentations.

(a) Oral presentations by offerors as requested by the Government may substitute for, or augment, written information. Use of oral presentations as a substitute for portions of a proposal can be effective in streamlining the source selection process. Oral presentations may occur at any time in the acquisition process, and are subject to the same restrictions as written information, regarding timing (see 15.208) and content (see 15.306). Oral presentations provide an opportunity for dialogue among the parties. Pre-recorded videotaped presentations that lack real-time interactive dialogue are not considered oral presentations for the purposes of this section, although they may be included in offeror submissions, when appropriate.

(b) The solicitation may require each offeror to submit part of its proposal through oral presentations. However, certifications, representations, and a signed offer sheet (including any exceptions to the Government's terms and conditions) shall be submitted in writing.

(c) Information pertaining to areas such as an offeror's capability, past performance, work plans or approaches, staffing resources, transition plans, or sample tasks (or other types of tests) may be suitable for oral presentations. In deciding what information to obtain through an oral presentation, consider the following:

(1) The Government's ability to adequately evaluate the information;

(2) The need to incorporate any information into the resultant contract;

(3) The impact on the efficiency of the acquisition; and

(4) The impact (including cost) on small businesses. In considering the costs of oral presentations, contracting officers should also consider alternatives to on-site oral presentations (e.g., teleconferencing, video teleconferencing).

(d) When oral presentations are required, the solicitation shall provide offerors with sufficient information to prepare them. Accordingly, the solicitation may describe

(1) The types of information to be presented orally and the associated evaluation factors that will be used;

(2) The qualifications for personnel that will be required to provide the oral presentation(s);

(3) The requirements for, and any limitations and/or prohibitions on, the use of written material or other media to supplement the oral presentations;

(4) The location, date, and time for the oral presentations;

(5) The restrictions governing the time permitted for each oral presentation; and

(6) The scope and content of exchanges that may occur between the Government's participants and the offeror's representatives as part of the oral presentations, including whether or not discussions (see 15.306(d)) will be permitted during oral presentations.

(e) The contracting officer shall maintain a record of oral presentations to document what the Government relied upon in making the source selection decision. The method and level of detail of the record (e.g., videotaping, audio tape recording, written record, Government notes, copies of offeror briefing slides or presentation notes) shall be at the discretion of the source selection authority. A copy of the record placed in the file may be provided to the offeror.

(f) When an oral presentation includes information that the parties intend to include in the contract as material terms or conditions, the information shall be put in writing. Incorporation by reference of oral statements is not permitted.

(g) If, during an oral presentation, the Government conducts discussions (see 15.306(d)), the Government must comply with 15.306 and 15.307.

SELECTED STATE STATUTES
REGARDING BEST-VALUE CONTRACTING

<u>COLORADO:</u>

Excerpts from the Colorado Revised Statutes:

TITLE 24 GOVERNMENT — STATE
ARTICLE 103 Source Selection and Contract Formation
PART 2 METHODS OF SOURCE SELECTION

24-103-202.3. Competitive sealed best-value bidding.

(1) When, pursuant to rules, the state purchasing director, the head of a purchasing agency, or a designee of either officer who is in a higher ranking employment position than a procurement officer determines in writing that the use of competitive sealed best-value bidding is advantageous to the state, a contract may be entered into by competitive sealed best-value bidding.

(2) An invitation for bids under competitive sealed best-value bidding shall be made in the same manner as provided in section 24-103-202 (2), (3), and (4).

(3) (a) The state purchasing director or the head of a purchasing agency may allow a bidder to submit prices for enhancements, options, or alternatives to the base bid for a commodity or service that will result in a product or service to the state having the best-value at the lowest cost. The invitation for bids for competitive sealed best-value bidding must clearly state the purchase description of the commodity or service being solicited and the types of enhancements, options, or alternatives that may be bid; except that the functional specifications integral to the commodity or service may not be reduced.

(b) Prices for enhancements, options, or alternatives to the bid may be evaluated by the state purchasing director or the head of a purchasing agency to determine whether the total of the bid price and the prices for enhancements, options, or alternatives provide a contract with the best-value at the lowest cost to the state. This evaluation shall be made utilizing the rules of the executive director of the department of personnel promulgated pursuant to paragraph (d) of this subsection (3).

(c) A contract may be awarded to a bidder where the total amount of a bid price and the prices for enhancements, options, or alternatives of the bidder exceed the total amount of the bid price and the prices for enhancements, options, or alternatives of another bidder if it is determined pursuant to paragraph (b) of this subsection (3) that the higher total amount provides a contract with the best-value at the lowest cost to the state.

(d) The executive director of the department of personnel shall promulgate rules to be utilized by the state purchasing director or the head of a purchasing agency in making the evaluation pursuant to paragraph (b) of this subsection (3). The rules shall provide:

(I) Criteria for objectively measuring prices for enhancements, options, or alternatives to a bid, including relevant formulas or guidelines;

(II) Criteria for objectively determining whether the prices for enhancements, options, or alternatives provide the best-value at the lowest cost to the state.

(4) The contract shall be awarded with reasonable promptness by written notice to the low responsible bidder whose bid meets the requirements and criteria set forth in the invitation for bids except as otherwise provided for certain low tie bids under section 24-103-202.5.

TITLE 43 TRANSPORTATION
ARTICLE 1. General and Administrative
PART 14 DESIGN-BUILD CONTRACTS

***43-1-1402.* Definitions.**

As used in this part 14:

(1) "Adjusted score design-build contract process" means a process to award contracts based on the lowest adjusted score of proposals submitted to the department.

(2) "Best-Value" means the overall maximum value of a proposal to the department after considering all of the evaluation factors described in the specifications for the transportation project or the request for proposals, including but not limited to the time needed for performance of the contract, innovative design approaches, the scope and quality of the work, work management, aesthetics, project control, and the total cost of the transportation project.

(3) "Design-build contract" means the procurement of both the design and the construction of a transportation project in a single contract with a single design-build firm or a combination of such firms that are capable of providing the necessary design and construction services.

(4) "Design-build firm" means any company, firm, partnership, corporation, association, joint venture, or other entity permitted by law to practice engineering, architecture, or construction contracting in the state of Colorado.

. . .

(5) "Transportation project" means any project that the department is authorized by law to undertake including but not limited to a highway, tollway, bridge, mass transit, intelligent transportation system, traffic management, traveler information services, or any other project for transportation purposes.

. . .

***43-1-1406.* General procedures.**

(1) The department shall describe in the specifications for the transportation project the particular design-build contract and selection procedures to be used in awarding such contract, including but are not limited to the following:

(a) A scope of work statement that defines the transportation project and provides prospective design-build firms with sufficient information regarding the department's requirements for the transportation project;

(b) If the department uses an adjusted score design-build contract process to select a design-build firm, a scope of work statement is needed that is flexible and that identifies the end result that the department wants to achieve. The department may determine the adjustment factors and methods it will use to adjust scores and shall state such factors and methods in the specifications for the transportation project. The department may also provide a general concept of the transportation project to potential design-build firms. Adjusted score design-build procedures shall consist of the following two phases:

(I) In the first phase, the department shall issue a request for qualifications within the time specified in section 43-1-1405 to solicit proposals that include information on the design-build firm's qualifications and its technical approach to the proposed transportation project. The department shall include appropriate evaluation factors in the request for qualifications, including the factors set forth in section 24-30-1403 (2), C.R.S. The department shall not include cost-related or price-related factors in the request for qualifications. In accordance with the time requirements specified in the department's rules, the department shall develop a short list of the highest qualified design-build firms from the proposals submitted in response to the request for qualifications.

(II) In the second phase, the department shall issue a request for proposals to the design-build firms included on the short list developed pursuant to subparagraph (I) of this paragraph (b) in accordance with the time requirements specified in the department's rules. The request for proposals shall include:

(A) A request to separately submit a sealed technical proposal and a sealed cost proposal for the transportation project;

(B) The required content of the technical proposal to be submitted by the design-build firm, including design concepts for the transportation project, the proposed solutions to the requirements addressed in the department's scope of work statement, or both;

(C) Any other evaluation factors the department considers appropriate, including the estimated cost of the transportation project; and

(D) Any formula the department determines is appropriate to adjust the total score of a design-build firm's proposal.

(2) Except as provided in this subsection (2), the department shall allow the preference to Colorado residents provided in section 8-19-101, C.R.S., in awarding an adjusted score design-build contract pursuant to this part 14. In evaluating and selecting a proposal for a design-build contract under this part 14, the department shall assign greater value to a proposal in proportion to the extent such proposal commits to using Colorado residents to perform work on the transportation project. If, however, the department determines that compliance with this subsection (2) may cause the denial of federal moneys that would otherwise be available for the transportation project or if such compliance would otherwise be inconsistent with the requirements of federal law, the department shall suspend the preference granted under this subsection (2) only to the extent necessary to prevent denial of federal moneys or to eliminate the inconsistency with federal law.

(3) The department may use any basis for awarding a design-build contract pursuant to this part 14 that it deems appropriate so long as the basis for awarding such contract is adequately described in the specifications for the transportation project or the

request for proposals. Such basis may include awarding a contract to the design-build firm whose proposal provides the best-value to the department.

(4) The department may cancel any request for qualifications, request for proposals, or other solicitation issued pursuant to this part 14 or may reject any or all proposals in whole or in part when the department determines that such cancellation or rejection is in the best interest of the department.

(5) If the department awards a design-build contract pursuant to this part 14, the department shall execute a design-build contract with the successful design-build firm and shall give notice to said firm to commence work on the transportation project.

DELAWARE:

Excerpts from the Delaware Code:

Title 29 State Government
PART VI Budget, Fiscal, Procurement and Contracting Regulations
CHAPTER 69 STATE PROCUREMENT
Subchapter IV. Public Works Contracting
[as amended by 73 Del. Laws 41 (2001)]

29 Del. C. § 6962. **Large public works contract procedures.**

(a) *Applicability* .--- Any state contract for which an agency is a party and for which the probable cost is greater than the amount set by the Contracting and Purchasing Advisory Council pursuant to 29 Del. C. § 6913 of this title for small public works contracts shall be subject to the provisions of this section.

(b) *Advertising requirements.*

. . .

(c) *Bidder prequalification requirements* . --- (1) An agency may require any potential contractor proposing to bid on a public works contract to complete a questionnaire containing any or all of the following information for the purposes of prequalification:

a. The most recent audited financial statement and/or financial statement review, as provided by a certified public accountant, containing a complete statement of that proposing contractor's financial ability and standing to complete the work specified in the invitation to bid;

b. The proposing contractor's experience on other public works or private projects, including but not limited to, the size, complexity and scope of the firm's prior projects;

c. The supply of labor available to the proposing contractor to complete the project, including but not limited to, the labor supply ratio as defined by 29 Del. C. § 6902 (10) of this title;

d. Performance reviews of the proposing contractor on previously awarded public works or private construction projects within the last 10 years;

e. Civil judgments and/or criminal history of the proposing contractor's principals;

f. Any debarment or suspension by any government agency;

g. Any revocation or suspension of a license; or

h. Any bankruptcy files or proceedings.

(2) If the agency is not satisfied with the sufficiency of the answers to the questionnaire of the financial statement, the agency may refuse to furnish to the firm the plans and specifications for the work and that firm's bid may be disregarded.

(3) No action of any nature shall lie against any agency or its employees because if actions prescribed in subsections (c)(1) and (2) of this section.

(d) *Bid specifications and plans requirements.* --- (1) *Preparation of plans and specifications and approvals.* --- . . .

(2) Based upon the proposing contractor's answers to the prequalification for any 1 of the following specified reasons:

a. Insufficient financial ability to perform the contract;
b. Inadequate experience to undertake the project;
c. Documented failure to perform on prior public or private construction contracts, including but not limited to, final adjudication of admission of violations of prevailing wage laws in Delaware or any other state;
d. Prior judgments for breach of contract that indicate the proposing contractor may not be capable of performing the work or completing the project;
e. Criminal convictions for fraud, misrepresentation or theft related to contract procurement;
f. Inadequate labor supply available to complete the project in a timely manner;
g. Previous debarment or suspension of the contractor by any government agency that indicates the proposing contractor may not be capable of performing the work or completing the project;
h. Previous revocation or suspension of a license that indicates the proposing contractor may not be capable of performing the work or completing the project;
i. Previous bankruptcy proceedings that indicate the proposing contractor may not be capable of performing the work or completing the project; or
j. Failure to provide prequalification information.

(3) Denial of prequalification shall be in writing and shall be sent to the contractor within 5 working days of such decision. The agency may refuse to provide any contractor disqualified under this section the plans and specifications for the project. An agency receiving a bid from a contractor disqualified under this section shall not consider such bid.

(4) Any contractor disqualified pursuant to subsections (c)(1), (c)(2) and (c)(3) of this section may review such decision with the agency head. No action in law or equity shall lie against any agency or its employees if the contractor does not first review the decision with the agency head. To the extent the contractor brings an action challenging a decision pursuant to subsections (c)(1), (c)(2) and (c)(3) of this section after such review by the agency head, the Court shall afford great weight to the decision of the agency head and shall not overturn such decision unless the contractor proves clear and convincing evidence that such decision was arbitrary and capricious.

. . .

(13) *Bid Evaluation, contract award and executive procedure.* --- a. The contracting agency shall award any public works contract within 30 days of the bid opening to the lowest responsive and responsible bidder, unless the agency elects to award on the basis of best-value, in which case the election to award on the basis of best-value shall be stated in the invitation to bid. Any public school district and its board shall award public works contracts in accordance with this section's requirements except it shall award the contract within 60 days of the bid opening.

Each bid on any public works contract must be deemed responsive by the agency to be considered for award. A responsive bid shall conform in all material respects to the requirements and criteria set forth in the contract plans and specifications.

An agency shall determine that each bidder on any public works contract is responsible before awarding the contract. Factors to be considered in determining the responsibility of a bidder include

1. The bidder's financial, physical, personnel or other resources including subcontracts;

2. The bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations or prevailing wage laws in Delaware or any other state;

3. The bidder's written safety plan;

4. Whether the bidder is qualified legally to contract with the State;

5. Whether the bidder supplied all necessary information concerning its responsibility; and,

6. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria shall be set forth in the invitation to bid and is otherwise in conformity with State and/or federal law.

If an agency determines that a bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis of determination. A copy of the determination shall be sent to the affected bidder within 5 working days of said determination. The final determination shall be made part of the procurement file.

If the agency elects to award on the basis of best-value, the agency must determine that the successful bidder is responsive and responsible, as defined in this subsection. The determination of best-value shall be based upon objective criteria that have been communicated to the bidders in the invitation to bid. The following objective criteria shall be assigned a weight consistent with the following:

(1) Price --- must be at least 70% but no more than 90%; and

(2) Schedule --- must be at least 10% but no more than 30%; and

A weighted average stated in the invitation to bid shall be applied to each criterion according to its importance to each project. The agency shall rank the bidder according to the established criteria and award to the highest ranked bidder. Every state agency and school district shall, on a yearly basis, file a report with every member of the General Assembly and the Governor that states which projects were bid under best-value and what contractor was awarded each contract.

(14) *Suspension and debarment.* --- Any contractor who fails to perform a public works contract or complete a public works project within the time schedule established by the agency in the invitation to bid, may be subject to suspension or debarment for 1 or more of the following reasons:

a. Failure to supply the adequate labor supply ration for the project;

b. Inadequate financial resources; or

c. Poor performance on the project.

…

(70 Del. Laws, c. 601, § 9; 70 Del. Laws, c. 186, § 1; 72 Del. Laws, c. 258 § 77.)

KENTUCKY:

Excerpts from the Kentucky Revised Statutes:

Kentucky Model Procurement Code
CHAPTER 45A

45A.080. Competitive sealed bidding.

(1) Contracts exceeding the amount provided by KRS 45A.100 shall be awarded by competitive sealed bidding unless it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is not practicable shall include

(a) Whether specifications can be prepared that permit award on the basis of best-value; and

(b) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed biding.

(2) The invitation for bids shall state that awards shall be made on the basis of best-value. In any contract which is awarded under an invitation to bid which requires delivery by a specified date and imposes a penalty for late delivery, if the delivery is late, the contractor shall be given the opportunity to present evidence that the cause of the delay was beyond his control. If it is the opinion of the purchasing officer that there is sufficient justification for delayed delivery, the purchasing officer may adjust or waive any penalty that is provided for in the contract.

(3) Adequate public notice of the invitation for bids shall be given a sufficient time prior to the date set forth for the opening of bids. The notice may include posting on the Internet or publication in a newspaper or newspapers of general circulation in the state as determined by the secretary of the Finance and Administration Cabinet not less than seven (7) days before the date set for the opening of the bids. The provisions of this subsection shall also apply to price contracts and purchase contracts of state institutions of higher education.

(4) Bids shall be opened publicly at the time and place designated in the invitation for bids. At the time the bids are opened, the purchasing agency shall announce the agency's engineer's estimate, if applicable, and make it a part of the agency records pertaining to the letting of any contract for which bids were received. Each bid, together with the name of the bidder and the agency's engineer's estimate, shall be recorded and be open to public inspection. Electronic bid opening and posting of the required information for public viewing shall satisfy the requirements of this subsection.

(5) The contract shall be awarded by written notice to the responsive and responsible bidder whose bid offers the best-value.

(6) Correction or withdrawal of bids shall be allowed only to the extent permitted by regulations issued by the secretary.

(Enact. Acts 1978, ch. 110. § 17, effective January 1, 1979; 1979 (Ex. Sess.), ch. 9. § 1, effective February 10, 1979; 1982, ch. 282, § 1, effective July 15, 1982; 1994, ch. 278, § 1, effective July 15, 1994; 1996, ch. 60, § 2, effective July 15, 1996; 1997 (1st Ex. Sess.), ch. 4, § 27, effective May 30, 1997; 1998, ch. 120, § 10, effective July 15, 1998; 2000, ch. 509 § 1, effective July 14, 2000.)

45A.070. Definitions for KRS 45A.070 to 45A.165. As used in KRS 45A.070 to 45A.165, unless the context in which they are used clearly requires a different meaning:

. . .

(3) "Best-Value" means a procurement in which the decision is based on the primary objective of meeting the specific business requirements and best interests of the Commonwealth. These decisions shall be based on objective and quantifiable criteria that shall include price and that have been communicated to the offerors as set forth in the invitation for bids.

. . .

(Enact. Act 1978, ch. 110, § 15, effective January 1, 1979; 1990, ch. 496, § 3, effective July 13, 1990; 1997 (1st Ex. Sess.), ch. 4, § 26, effective May 30, 1997).

NEW JERSEY:

Excerpts from New Jersey Statutes:

TITLE 34 LABOR AND WORKMEN'S COMPENSATION
CHAPTER 1B PROMOTION OF BUSINESS AND INDUSTRY

34:1B-5.7. Preparation of separate plans, specifications; bids.

52.a. In undertaking any school facilities projects where the cost of construction, reconstruction, rehabilitation of improvement will exceed $25,000, the authority may prepare, or cause to be prepared, separate plans and specifications for (1) the plumbing and gas fitting and all work and materials kindred thereto, (2) the steam and hot water heating and ventilating apparatus, steam power plants and all work and materials kindred thereto, (3) the electrical work, (4) structural steel and miscellaneous iron work and materials, and (5) all general construction, which shall include all other work and materials required to complete the building.

b. The authority shall advertise and receive (1) separate bids for each of the branches of work specified in subsection a. of this section; or (2) bids for all the work and materials required to complete the school facilities project to be included in a single overall contract, in which case there shall be set forth in the bid the name or names of all subcontractors to whom the bidder will subcontract for the furnishing of any of the work and materials specified in branches (1) through (4) in subsection a. of this section; or (3) both.

c. Contracts shall be awarded as follows: (1) if bids are received in accordance with paragraph (1) of subsection b. of this section, the authority shall determine the responsible bidder for each branch whose bid, conforming to the invitation for bids, will be most advantageous to the authority, price and other factors considered; (2) if bids are received in accordance with paragraph (2) of subsection b. of this section, the authority shall determine the responsible bidder for the single overall contract whose bid, conforming to the invitation for bids, will be the most advantageous to the authority, price and other factors considered; or (3) if bids are received in accordance with paragraph (3) of subsection b. of this section, the authority shall award separate contracts for each branch of work specified in subsection a. of this section if the sum total of the amounts bid by the responsible bidders for each branch, as determined pursuant to paragraph (1) of this subsection, is less than the amount bid by the responsible bidder for all of the work and materials, as determined pursuant to paragraph (2) of this subsection; but if the sum total of the amounts bid by the responsible bidder for each branch, as determined pursuant to paragraph (1) of this subsection is not less than the amount bid by the responsible bidder for all of the work and materials, as determined pursuant to paragraph (2) of this subsection, the authority shall award a single over-all contract to the responsible bidder for all of the work and materials as determined pursuant to paragraph (2) of this subsection.

d. For the purposes of this section, "other factors" means the evaluation by the authority of the ability of the single contractor or the abilities of the multiple contractors to complete the contract in accordance with its requirements and includes requirements relating to the experience and qualifications of the contractor or contractors and their key personnel in projects of similar type and complexity; the performance of the contractor or contractors on prior contracts with the authority or the State; the experience and capability of the contractor or contractors and their key personnel in respect to any special technologies, techniques or expertise that the project may require; the contractor's understanding of the means and methods needed to complete the project on time and within budget; the timetable to complete the project; the contractor's plan for quality assurance and control; and other similar types of factors. The "other factors" to be considered in evaluating bids and the weights assigned to price and these "other factors" shall be determined by the authority prior to the advertisement for bids for school facilities projects. In its evaluation of bids, the consideration given to price by the authority shall be at least equal to the consideration given to the combination of all "other factors."

e. The authority shall require from all contractors to which it awards contracts pursuant to P.L. 2000, c. 72 (C. 18A:7G-1 et al.), the delivery of a payment performance bond issued in accordance with N.J.S. 2A:44-143 et seq.

f. The authority shall adopt regulations to implement this section which shall include, but not be limited to, the procedural requirements for (1) the evaluation and weighting of price and "other factors" in the awarding of contracts and (2) the appealing of a prequalification classification and rating, a bid rejection, and a contract award recommendation.

g. Each evaluation committee selected by the authority to review and evaluate bids shall, at a minimum, contain a representative from the district in which the school facilities project is located if such district elects to participate.

(L. 2000, c. 72 § 52).

TITLE 27 HIGHWAYS
SUBTITLE 8 PUBLIC TRANSPORTATION
CHAPTER 25 NEW JERSEY PUBLIC TRANSPORTATION ACT OF 1979

27:25-11. Purchases, contractors or agreements; award; advertisement for bids; exemptions; bid bond; qualification of bidders.

11.a. All purchases, contracts or agreements pursuant to this act shall be made or awarded directly by the corporation, except as otherwise provided in this act, only after public advertisement for bids therefor, in the manner provided in this act, notwithstanding the provisions to the contrary of P.L. 1948, c. 92 (C. 52:18A-1 et seq.) and chapters 25, 32, 33, 34 and 35 of Title 52 of the Revised Statutes.

. . .

c. The corporation may reject any or all bids not in accord with the advertisement of specifications, or may reject any or all bids if the price of the work materials is excessively above the estimate cost or when the corporation shall determine that it is in the public interest to do so. The corporation shall prepare a list of the bids, including any rejected and the cause therefor. The corporation may accept bids containing minor informalities. Awards shall be made by the corporation with reasonable promptness by written notice to

(1) the responsible bidder whose bid, conforming to the invitation for bids, will be the most advantageous to the State, price and other factors considered, for contracts other than contracts for the construction or improvement of capital facilities or

(2) the lowest responsible bidder for contracts for the construction or improvement of capital facilities. The provisions of this paragraph shall not limit the corporation's right to extend, add or resume suspended work on any project. Nor shall the provisions of this paragraph apply to the procurement process for design-build projects or design-build, maintain and operate projects. Those projects shall be bid and contracts awarded in accordance with applicable regulations promulgated by the corporation. Nor shall the provisions of this paragraph affect the corporation's minority and women's business enterprise program, equal employment opportunity program or any affirmative action program.

. . .

f. The corporation shall determine the terms and conditions of the various types of agreements or contracts, including provisions for adequate security, the time and amount or percentage of each payment thereon and the amount to be withheld pending completion of the contract, and it shall issue and publish rules and regulations concerning such terms and conditions, standard contract forms and such other rules and regulations concerning purchasing or procurement, not inconsistent with any applicable law, as it may deem advisable to promote competition and to protect the public interest.

. . .

h. The corporation shall require that all persons proposing to submit bids on improvements to capital facilities and equipment shall first be classified by the corporation as to the character or amount or both of the work on which they shall be qualified to submit bids. Bids shall be accepted only from persons qualified in accordance with such classification.

(L. 1979, c. 150, § 11; amended 1993, c. 313, § 2; 1996, c. 104; 2000, c. 128.)

APPENDIX C

Questionnaires

Appendix C of the research agency's final report is not published herein. For a limited time, copies are available for loan on request to NCHRP.

APPENDIX D

Best-Value Case Studies

Case Study Index

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4. Swedish Highway Administration Asphalt Paving Bids	A.0 + P.1 + P.2 + P.4 + D.0	Weighted Criteria	Direct Point Scoring
5. Alaska DOT Interchange	A.0 + A.1 + P.0 + P.4 + D.1	Weighted Criteria	Direct Point Scoring
6. University of Nebraska Cleanroom	B.0 + P.0 + P.2 + P.4 + D.1	Fixed Price—Best Proposal	Direct Point Scoring
7. U.S. Army Corps of Engineers Dam	A.0 + B.0 + P.1 + P.2 + P.3 + P.4	Qualitative Cost-Technical Tradeoff	Satisficing and Adjectival Rating
8. Spanish Road Association Asphaltic Paving and Highway Maintenance	A.0 + B.0 + P.1 + P.2 + P.3 + P.4	Weighted Criteria	Direct Point Scoring
9. Minnesota DOT Highway	A.0 + B.0 + P.0 + P.1 + Q.0 + D.1	Meets Technical Criteria—Low Bid	Satisficing
10. Missouri DOT Bridge Seismic Isolation System	A.0 + A.1 + B.0 + P.1 + P.3 + Q.0 + D.0	Meets Technical Criteria—Low Bid	Satisficing
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16. RFP Form of the Government of Ontario	A.0 + P.0 + P.2 + D.1 + Q.4	Adjusted Bid	Direct Point Scoring
17. RFP Form of the Government of the Yukon	A.0 + B.0 + P.1 + P.2 + D.1 + Q.3	Weighted Criteria	Direct Point Scoring
18. Model Contract Document in England	A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4	Weighted Criteria	Direct Point Scoring
19. Forth Road Bridge Toll Equipment Replacement Project in Scotland	A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4	Weighted Criteria	Direct Point Scoring
20. Valuascollege Project in the Netherlands	A.0 + P.1 + P.2 + P.4 + Q.3 + Q.4 + D.0 + D.1	Weighted Criteria	Adjectival Rating

Case 1—Air Force Base Pedestrian Bridge

Project Information

United States Air Force

Improve Military Family Housing Area Safety

McConnell Air Force Base, Kansas

Project Number PRQE 98-9129

Project Description

The project entails the construction of a pedestrian bridge from military family housing across Rock Road to McConnell AFB Kansas.

Best-Value Parameters

BV = A.0 + P.1

Best-Value Award Algo rithm

Qualitative Cost-Technical Tradeoff
This is a competitive best-value source selection in which competing offerors' past and present performance history will be evaluated on a basis approximately equal to cost or price considerations … The evaluation process shall proceed as follows:

A. Initially offers shall be ranked according to price, including the option prices. The price evaluation will document for the offers evaluated, the completeness and reasonableness of the proposed price for each line item including options.

B. Using questionnaires, the contracting officer shall seek performance information on the lowest priced technically acceptable offerors (usually the lowest five to seven) based on (1) the references provided by the offeror and (2) data independently obtained from other Government and commercial sources. Generally, the contracting officer shall not seek information on the evaluated higher priced offers unless it is determined none of the lower offers are acceptable for award. The purpose of the past performance evaluation is to allow the Government to assess the offeror's ability to perform the project described in this RFP, based on the offeror's demonstrated present and past performance.

C. If the lowest priced evaluated offer is judged to have an exceptional performance risk rating, that offer represents the best-value for the Government and the evaluation process stops at this point. Award shall be made to that offeror without further consideration of any other offers.

D. The Government reserves the right to award a contract to other than the lowest priced offer if that offeror is judged to have a performance risk rating of "very good" or lower.

In that event, the contracting officer shall make an integrated assessment best-value award decision.

E. Offerors are cautioned to submit sufficient information and in the format specified in Section L. Offerors may be asked to clarify aspects of their proposal (i.e., the relevance of past performance information) or respond to adverse past performance information to which the offeror has not previously had an opportunity to respond. This type of communication or that which is conducted to resolve minor or clerical errors will not constitute discussion. The contracting officer reserves the right to award a contract without the opportunity for proposal revision.

Best-Value Evaluation Criteria

Price

Past Performance

Best-Value Evaluation Rating System

Adjectival Rating
The assessment process will result in an overall risk rating of

- Exceptional,
- Very good,
- Satisfactory,
- None,
- Marginal, or
- Unsatisfactory.

Offerors with no relevant past or present performance history shall receive the rating “none,” meaning the rating is treated neither favorably no unfavorably.

Case 2—NASA Johnson Space Center Tunnel System

Project Information

National Aeronautics and Space Administration (NASA)

Johnson Space Center, Tunnel System
Houston Texas

RFO # 9-BJ33-T13-0-03P

Project Description

This project is a continuing upgrade to the Johnson Space Center tunnel system (Phase 111—Utility Tunnel System Modifications). The Government estimated price range of this project is between $1,000,000 and $5,000,000.

Best-Value Parameters

BV = A.0 + P.0 + P.1

Best-Value Award Algorithm

Qualitative Cost-Technical Tradeoff
This procurement shall be conducted under the Small Business Competitiveness Demonstration Program utilizing Best-Value Selection (BVS), which seeks to select an offer based on the best combination of price and qualitative merit of the offers submitted and reduce the administrative burden on the Offerors and the Government. BVS takes advantage of the lower complexity of Mid-Range procurements and pre-defines the value characteristics which will serve as the discriminators among the offers.

BVS evaluation is based on the premise that, if all offers are of approximately equal qualitative merit, award will be made to the Offeror with the lowest evaluated price (fixed-price contracts). However, the Government will consider awarding to an Offeror with higher qualitative merit if the difference in price is commensurate with added value. Conversely, the Government will consider making award to an Offeror whose proposal has lower qualitative merit if the price (or cost) differential between it and other proposals warrants doing so.

Step One - An initial evaluation will be performed to determine if all required information has been provided and the Offeror has made a reasonable attempt to present an acceptable offer.

Step Two - All acceptable offers will be evaluated against the specifications in the model contract and the value characteristic listed above.

Each Offeror will be evaluated on its past performance, and that of its significant subcontractors or teaming partners, if any, under existing or prior contracts for similar projects. Past performance information will be used to assess the extent to which contract objectives (including technical, management, safety/quality control, cost, and small disadvantaged subcontracting goals) have been achieved on related projects.

Best-Value Evaluation Criteria

Price

Past Performance

Best-Value Evaluation Rating System

Adjectival Rating
The evaluation team will assign one of the following adjective ratings for each past performance questionnaire/survey received.

Excellent - Of exceptional merit; exemplary performance in a timely, efficient, and economical manner. Performance which, in addition to fully satisfying contract and/or customer requirements, features above-average innovation or efficiency and rare or nonexistent deficiencies.

Very Good - Very effective performance, which is fully responsive to contract or customer requirements, accomplished in a timely, efficient and economical manner; for the most part, only minor deficiencies; deficiencies do not affect overall performance.

Good - Effective performance, fully responsive to contract requirements, reportable deficiencies, but with little identifiable effect on overall performance.

Satisfactory - Meets or slightly exceeds minimum contract requirements, reportable deficiencies, but with little identifiable effect on overall performance.

Poor/Unsatisfactory - Performance does not meet minimum acceptable standards, fails to meet contract requirements and/or customer expectations and which includes deficiencies that impact other areas of work performance.

Case 3—U.S. Army Corps of Engineers Canal

Project Information

U.S. Army Corps of Engineers

Hurricane Protection Project of West Algiers Canal

Jefferson Parish, Louisiana

Solicitation # DACW29-02-R-0017

Project Description

The work consists of fabricating, transporting, setting down, and ballasting a float-in sector gate structure consisting of a pile founded reinforced concrete (post-tensioned) monolith structure with structural steel sector gates; constructing a casting facility for the fabrication of the float-in structure (a graving site is provided, the Contractor can elect to use an alternative site or facility); driving a sheet pile cutoff wall below water and accurately excavating within the cutoff wall area; constructing floodwalls (cantilever 1-walls and pile founded inverted T-walls); dredging, constructing guidewalls, pile clusters and dolphins; and placing stone for erosion control and all other incidental work.

Best-Value Parameters

BV = A.0 + P.1 + P.2 + P.4

Best-Value Award Algorithm

Qualitative Cost-Technical Tradeoff

The Government will select the offer that represents the best-value to the Government by using the tradeoff process described in FAR Part 15. This process permits tradeoffs between price and technical merit/quality and allows the Government to accept other than the lowest priced offer. The award decision will be based on a comparative assessment of proposals against all source selection criteria in the solicitation.

All non-cost (i.e., technical) evaluation factors, when combined are approximately equal to price. The Government is concerned with striking the most advantageous balance between Technical Merit (i.e., quality) and cost to the Government (i.e., price). The degree of importance of price could become greater depending upon the equality of the proposals for the non-price technical evaluation factors. Where competing technical proposals are determined to be substantially equal, price could become the controlling factor.

Best-Value Evaluation Criteria

Price

Past Performance

Personnel Experience

Project Management Plans

Technical Approach

Best-Value Evaluation Rating System

Not stated.

Case 4—Swedish Highway Administration Asphalt Paving Bids

Project Information

Asphaltic Paving Bids

VÄGVERKET—Swedish Highway Administration

Region Mitt, Sweden

Project Description

The best-value procurement method described was used on all asphalt resurfacing projects in the Mitt Region of Sweden in the calendar year 2001.

Best-Value Parameters

BV = A.0 + P.1 + P.2 + P.4 + D.0

Best-Value Award Algorithm

Weighted Criteria
The best-value selection system is based on a 75 point score for price and a 51 point score for the technical aspects of the proposal as translated below.

Price Proposal

0-75	Bid amount for main proposal

Points for bid amounts by contractors under consideration are given on a diminishing scale starting at 75 points for the lowest bid to 0 points for twice the amount of the lowest bid.

Technical Proposal

0-4	Main bid and alternative bids/proposals
0-1	The contractor submits a clean bid for the desired product
0-3	The contractor offers interesting/relevant side proposals/side bids
0-12	Offering organization with references
0-5	Main organization (primary project team management plan)
0-5	Additional organization (secondary project team management plan)
0-2	In charge of marking
0-5	Quality (for mass groups)
0-3	Measures
0-2	Control methods
0-5	Quality of pavement operation plans
0-4	Environment—environmentally adjusted work methods

Best-Value Evaluation Criteria

Price

Past Performance

Personnel Experience

Project Management Plans

Alternate bids

Best-Value Evaluation Rating System

Direct Point Scoring
A direct scoring method is used as noted in the description of the best-value algorithm above.

Case 5—Alaska DOT Interchange

Project Information

Alaska Department of Transportation

Glenn Parks Interchange
Anchorage, Alaska

53065/NH-I-OA1-5(1)

Project Description

Located 40 miles north of Anchorage, the Glenn-Parks Interchange project provides two lanes of continuous flow in each direction and completes the final phase of interchange construction for the Glenn Highway from Eklutna to Parks Highway. The project entails construction of overpasses over the Alaska Railroad.

Best-Value Parameters

BV = A.0 + A.1 + P.0 + P.4 + D.1

Best-Value Award Algorithm

Weighted Criteria
Short-listed firms prepare and submit technical and price proposals. The price proposals are submitted following the evaluation of the technical proposals.

All technical scores are normalized using the following formula:

$$\textit{Normalized Technical Proposal Score (NTPS)} = \frac{\textit{(Proposer's Technical Proposal Score)}}{\textit{(Highest Technical Proposal Score)}}$$

All fixed price is normalized using the following formula:

$$\textit{Normalized Fixed Price (NFPS)} = \frac{\textit{(Lowest Fixed Price)}}{\textit{(Proposer's Fixed Price)}}$$

A final score is then determined using the following formula:

Final Score = [(0.25 x NTPS) + (0.75 x NFPS)] x 100

The Proposer with the highest score is awarded the contract.

Best-Value Evaluation Criteria

Price
Project Approach Plan
Technical Solutions
Environmental Work Plan
Project Staffing Plan

Enhancements to Minimize Life-cycle Costs

Best-Value Evaluation Rating System

Direct Point Scoring
All items were scored on a direct point scoring system totaling 100 points.

Case 6—University of Nebraska Cleanroom

Project Information

University of Nebraska

Walter Scott Engineering Center—Class I Cleanroom
Lincoln, Nebraska

Project Number C086P121

Project Description

The proposed project consists of the design and construction of an approximately 385 net square foot Class I cleanroom, 198 square feet of Class 10 cleanroom and all associated HVAC and electrical systems required for cleanroom operation. The construction will also include additional support and office areas.

Best-Value Parameters

BV = B.0 + P.0 + P.2 + P.4 + D.1

Best-Value Award Algorithm

Fixed Price—Best Proposal
The evaluation committee will review all proposals received and each committee member will rank each proposal based on the Evaluation Criteria. The scores as determined by each evaluation committee member will be averaged to determine the evaluation score for each Design/Build Firm.

Best-Value Evaluation Criteria

Schedule
Qualifications
Project Personnel
Management Plan
Technical Design

Best-Value Evaluation Rating System

Direct Point Scoring
Final score is an average of the evaluation committee scores.

Case 7—U.S. Army Corps of Engineers Dam

Project Information

U.S. Army Corps of Engineers

Olmsted Dam
Olmsted, IL

DACW27-02-R-0014

Project Description

The project consists of five tainter gate bays, with hydraulic operated tainter gates, navigable pass, two-boat abutments, four isolation joints founded on pipe piles, and placement of scour protection. The dam is to be built using in-the-wet construction techniques. The estimated cost range of the project is $250,000,000 to $500,000,000. This project is being procured under source selection procurement method. Proposal submittal requirements and evaluation factors are described in Sections 00115 and 00130. The selected proposal will become a part of the contract upon award.

Best-Value Parameters

BV = A.0 + B.0 + P.1 + P.2 + P.3 + P.4

Best-Value Award Algo rithm

Qualitative Cost-Technical Tradeo ff

A Source Selection Evaluation Board (SSEB), comprised of representatives of the U.S. Army Corps of Engineers, will evaluate the proposals. The Board will consist of two parts—a Technical Evaluation Board (TEB) and a Price Evaluation Board (PEB). The number and identities of offerors are not revealed to anyone who is not involved in the evaluation and award process or to other offerors. Proposals will be evaluated based on the factors described herein, and the basis of award is the Tradeoff Process.

The evaluation process essentially consists of four parts: proposal compliance review and responsibility determination, technical/quality evaluation, price evaluation, and cost/technical tradeoff analysis.

Best-Value Evaluation Criteria

Price
Schedule
Past Performance
Personnel Experience
Subcontractor Information
Management Approach
Safety

Small Business

Best-Value Evaluation Rating System

Satisficing and Adjectival Rating

The TEB will evaluate and rate those proposals passing the first review. Proposals will be evaluated against the RFP requirements. Some factors will be rated using an adjectival-based system. Others will be rated on a "go, no-go" basis.

Case 8—Spanish Road Association Asphaltic Paving and Highway Maintenance

Project Information

Asphaltic Paving and Highway Maintenance

Spanish Road Association
Madrid, Spain

Project Description

The project involved a five-year performance contract for the maintenance of highways including asphalt paving, stripping, landscaping, emergency response, etc.

Best-Value Parameters

BV = A.0 + B.0 + P.1 + P.2 + P.3 + P.4

Best-Value Award Algorithm

Weighted Criteria
The criteria considered for award included economic offer and quality of the technical solution. The weights used were 30% and 70%, respectively.

Global Score
The global score (PG) of every offer was defined as:

$$PG=0.7(PT) + 0.3\ (PE)$$

Where,

PT: Technical Score
PE: Economic Score

The bidder with the highest Global Score will be defined as potential awarded.

Technical Score
The maximum technical score is 100 points.

Economic Score
The economic offer, PE, is determined from the N economic offers in the following way:

1) For each responsive offer, scores are calculated based on a linear interpolation between points P1 and P2. These points are defined as follows:

   P1: the point corresponding to the lowest priced proposal, to which a maximum score of 100 points is assigned
   P2: the point corresponding to the solicitation budget, to which the minimum score would be applied. The minimum score is calculated as follows:

Minimum score = 100 x lowest price / Solicitation Budget

If only one economic offer were received, its PE would directly be 100 points.

In the exceptional case of every economic offer having the same price, the DOT would assign a PE of 100 points to each offer.

2) The average and standard deviation of the economic offers are calculated in the manner described below. Variables are defined as follows:

BM = Average of economic scores, with every economic offer numbered from 1 to n

σ = Standard deviation

Of_i = Economic offer i, with i defined as an integer from 1 to n

P.L. = Solicitation budget

BO_i = percent respect P.L.

$$BO_i = \left[1 - \frac{Of_i}{P.L.}\right] \times 100$$

$$BM = \frac{\sum_{i=1}^{n} BO_i}{n}$$

$$\sigma = \left[\frac{\sum_{1=1}^{n} (BO_i)^2 - n(BM)^2}{n}\right]^{1/2}$$

3) With the values BM and σ, the next step is filtering the economic offer by the next formula:

$$\left|BO_j - BM\right| \leq \sigma$$

Now, j is an integer, generic, from 1 to n’ ($0 < n' \leq n$).

$$BO_j = \left[1 - \frac{Of_j}{P.L.}\right] \times 100$$

Best-Value Evaluation Criteria

Price
Technical approach
Management plan
Facilities and equipment

Best-Value Evaluation Rating System

Direct Point Scoring

A direct scoring method is used as noted in the description of the best-value algorithm above.

Case 9—Minnesota DOT Highway

Project Information

Minnesota Department of Transportation

T.H. 100 Duluth Street
Golden Valley, Minnesota

State Project 2735-172

Project Description

This project generally consists of grading, surfacing, ponds, noise walls and retaining walls, signals, lighting, signing, and Bridge 27283 on T.H. 100 from 0.19 mile south of Duluth Street to just south of Bassett Creek of Duluth Street in Golden Valley. The Project also contains work on Duluth Street, known as CSAH 6, from Lilac Drive to 0.15 miles east of T.H. 100. The Project also includes the construction of a fully designed pedestrian bridge just south of Bassett Creek.

The preliminary estimate of the design-build project (in 2001 U.S. dollars) is between $15 and $20 million. The duration of the design-build portion of the project is anticipated to be approximately two years.

Best-Value Parameters

BV = A.0 + B.0 + P.0 + P.1 +Q.0 + D.1

Best-Value Award Algorithm

Meets Technical Criteria—Low Bid
Under the low bid selection process being used for this project, Mn/DOT will award the design-build contract to the short-listed proposer whose technical proposal is responsive to the RFP technical requirements as determined by the TRC and whose price proposal is the lowest bid. The proposers technical and price proposals will become contract documents.

After the proposal submittal deadline has passed, but before the public bid opening, the technical proposal package and price proposal package submitted by each short-listed proposer will be separated. The price proposal packages will not be opened, but will be kept stored in a locked container until the public bid opening. Using this process, no price proposal will be opened until the TRC reviews all technical proposals and determines whether each technical proposal is either responsive or non-responsive.

Technical proposal packages will be opened so that proposals can be distributed to the TRC and other technical staff if necessary. The TRC will examine each proposal, discuss the contents of each, and determine whether each proposal complies with the objective requirements of the RFP and is responsive. The TRC will not rank or score any of the technical proposals.

If the TRC determines that a technical proposal does not comply with or satisfy any of the objective requirements of the RFP, that proposal will be considered non-responsive. The price proposal corresponding to a non-responsive technical proposal will not be opened at the public bid opening, but will be returned unopened, along with the non-responsive technical proposal, to the proposer. A proposer that submits a non-responsible technical proposal will not be eligible to receive any stipend. Mn/DOT will open the price proposals corresponding to the technical proposals that the TRC has determined to be responsive.

Best-Value Evaluation Criteria

Price
Schedule
Qualifications
Technical Design
Warranty

Best-Value Evaluation Rating System

Satisficing
Proposals are evaluated as responsive or non-responsive. RFP states that there is no scoring or ranking of proposals. They are only evaluated for responsiveness to technical criteria.

Case 10—Missouri DOT Bridge Seismic Isolation System

Project Information

Missouri Department of Transportation

Retrofit Seismic Isolation System for Bridges No. 15017, A15172, and A15231; US 40/Interstate I-64;
St. Louis City, Missouri

Project Number J6I0985B

Project Description

The proposed project consists of the design, testing, fabrication, and certification of the installation of a Seismic Isolation System for existing structures. The contractor can propose design alternates that meet state specifications. The construction will also include installation of bent column steel casings, retrofit of selected foundations, retrofit of selected cross frames, installation of force transmitters, and PTFE sliding bearing assemblies.

Best-Value Parameters

BV = A.0 + A.1 + B.0 + P.1 + P.3 + Q.0 + D.0

Best-Value Award Algorithm

Meets Technical Criteria—Low Bid
The selection panel will review the qualifications, schedule, and technical information and assign one of the following classifications to each bidder: Qualified to Bid or Not Qualified to Bid. Public opening of the bids identified as Qualified to Bid will be held, and the award will be made to the lowest responsible bidder.

Best-Value Evaluation Criteria

Price
Life-cycle Cost
Past Project Performance
Subcontracting Plan
DBE Utilization
Schedule
Warranty (10 year minimum)
Technical Design Alternate

Best-Value Evaluation Rating System

Satisficing

Each proposal rated as responsive or non-responsive to RFP evaluation criteria.

Price proposal to contain bid price for design, fabrication and installation plus warranty and contain an Added Cost Worksheet that contains the sum of Present Values for initial installation, routine inspection, and routine maintenance costs for the life of the proposed warranty. Total Cost shall be determined by the selection panel as the summation of the proposed cost of the isolation system and the published estimated costs for installation of isolation system, delays and inconvenience to the motoring public due to construction related activity, and maintaining the retrofitted structure.

Case 11—Washington State DOT Interchange

Project Information

Washington Department of Transportation

SR 500 Thurston Way Interchange
Vancouver, Washington

Project Description

The SR 500 Thurston Way Interchange in Vancouver, WA, is a redevelopment of the "at grade" interchange of SR 500 and Thurston Way located in the southwest region of WSDOT. The project lies between the SR 500 Andresen Road Interchange and the SR 500 I-205 Interchange, in a tight corridor that creates many challenges and opportunities for innovative approaches to the logistical transportation concerns of the area. Traffic volumes on the mainline, the proximity of the main entrance to Vancouver Mall, and another plaza on the south side, along with challenging weave requirements, made this project demanding for traffic control. This is a design-build project.

Best-Value Parameters

BV = A.0 + B.0 + B.2 + P.0 + P.1 + P.2 + P.4 + Q.0 + Q.4

Best-Value Award Algorithm

Adjusted Score

Evaluation of the Technical Components represents a design review, and selecting a proposal represents acceptance of the proposed design as well as the proposed construction process. Upon receipt of the Best and Final Proposals (BAFPs), the Price Components will be put in a locked vault until the public opening. Personnel from Office of Contract Services (OCS) Contract Ad & Award and OCS Consultant Services will make an initial determination as to whether the BAFP is responsive without opening the Price Component.

The scoring begins with each Technical Evaluation Team (TET) member reading relevant areas of the Technical Component individually to gain an understanding of the subject matter, then determining a preliminary raw score for each area they are responsible for. Concurrent with this phase, the Proposal Evaluation Board (PEB) members will read all Technical Components individually, to gain a basic understanding of each. The TET members will then complete their evaluation, adjust the raw scores and add to their draft summary. During this phase of the evaluation, the TET members will also list any minor defects in the BAFPs. The raw scores, draft summary, and list of minor defects for each BAFP will be transmitted to the PEB for review; the Evaluation Process Manager will coordinate this transmittal.

After review of the raw scores, draft summary, and minor defects by the PEB, the TET members will meet individually with the PEB members, for discussion of each technical area. Using pre-established weighting criteria, and best professional judgment as needed in some areas, the PEB then develops final scores for each technical area. The weighted raw scores are then combined using a pre-determined formula to arrive at a composite Technical Solution score. The PEB will review the list of minor defects, discuss and agree upon changes with TET, and transmit this list to the Evaluation Process Manager. The recommendations are then presented to the Selecting Official (SO).

At this point, the Price component of the BAFP is publicly opened and combined with the Technical Component score as follows:

$$\textbf{Total Score} = \frac{\textit{(Technical Score x 10,000,000)}}{\text{Bid Price (\$)}}$$

Best-Value Evaluation Criteria

Price
Key Personnel
Management Plan
Schedule
Technical Solution

Best-Value Evaluation Rating System

Direct Point Scoring
All items were scored on a direct point scoring system totaling 1,000 points.

- Management = 100
- Schedule = 100
- Technical Solution = 800

Case 12—U.S. Army Corps Air Freight Terminal/Airfield

Project Information

Multi-Modal Transportation Terminal Development

U.S. Army Corps of Engineers, New York District
New York, New York

Project Description

Design-build air-freight terminal: building renovation/construction. Including paving, interface with air, ground, and rail. McGuire AFB, New Jersey.

Best-Value Parameters

BV = A.0 + B.0 + P.1 + P.2 + P.3 + P.4 + Q.0 + Q.4 + D.0

Best-Value Award Algorithm

Meets Technical Criteria—Low Bid
This is a best-value, lowest priced, technically acceptable, one-step solicitation for the design and construction of the airfreight terminal. The government will award a firm fixed-price contract to the responsible offeror with the lowest priced proposal response who has no red rating in any factors (see below).

Best-Value Evaluation Criteria

Price
Schedule
Past Performance
Personnel Performance
Management Plans
Technical Approach
Quality Management Plan
Subcontracting Plan
Small Business Utilization
Warranty Management

Best-Value Evaluation Rating System

Modified Satisficing

Color Rating Definition:
Green/Acceptable: The proposal essentially satisfies the standards; minor weaknesses, even if not corrected, do not render this proposal/factor unacceptable.

Yellow/Marginal: Reasonably susceptible to becoming acceptable. The proposal/factor fails to adequately satisfy the standards. However, significant weaknesses/deficiencies can be corrected through exchanges. Weaknesses/Deficiencies are such that failure to correct may render this major proposal/factor unacceptable.

Red/Unsatisfactory: The proposal fails to meet stated criteria and is not capable of becoming acceptable without major revisions.

Case 13—U.S. Forest Service Highway

Project Information

U.S. Forest Service

Coffman Cove Highway Project

Solicitation No.R10-01-17, April 26, 2001

Project Description

The Project consists of upgrading an approximately 4.8 km (3.0 mi) segment of single-lane logging road to a double-lane public highway. Work includes grading, drainage, base, aggregate surfacing, and other work. Additionally, work includes maintaining 30 km (18 mi) of single-lane bypass road. This project is a separate phase of construction on the FH44 project, which includes reconstruction of approximately 20 miles.

Best-Value Parameters

BV = A.0 + B.0 + B.2 + P.0 + P.1 + P.2 + P.3 + P.4 + Q.4 + D.1

Best-Value Award Algorithm

Quantitative Cost-Technical Tradeoff

The technical score will be determined by each Board member first determining a numerical rating for each evaluation criteria in the Technical Proposal. The consensus method will then be used by the Board to determine a final numerical rating for each evaluation criteria. The revised numerical ratings will then be summed to determine the overall technical score for each Offeror's Technical Proposal. The maximum possible overall technical score is 1,000 for each proposal.

After the overall technical scores are assigned, the Price Proposals will be opened. A best-value cost-technical tradeoff will be determined as follows:

1. The proposals will first be ranked in order of price (Contract Bid Price plus Contract Administration Cost), starting with the lowest price. The following is an example of the initial ranking according to price:

Offeror	Contract Bid Price Plus Contract Admin. Cost*	Overall Technical Score
C	$5,600,000	845
D	$5,905,000	912
A	$6,300,000	880
B	$6,470,000	965

* Contract Admin Cost = Contract Days x $1,400/day

A cost-technical tradeoff will then be performed by comparing the top two (2) initially ranked proposals. A Price Increment (P.I.) and a Technical Score Increment (T.I.) will be computed by the following equations:

$$\text{P.I.} = (\text{Price}_{\text{Offeror D}} - \text{Price}_{\text{Offeror C}}) \div (\text{Price}_{\text{Offeror C}}) \times 100\%$$

$$= (5{,}905{,}000 - 5{,}600{,}000) \div (5{,}600{,}000) \times 100\%$$

$$= 5.45\%$$

$$\text{T.I.} = (\text{Tech. Score}_{\text{Offeror D}} - \text{Tech. Score}_{\text{Offeror C}}) \div (\text{Tech. Score}_{\text{Offeror C}}) \times 100\%$$

$$= (912 - 845) \div (845) \times 100\%$$

$$= 7.93\%$$

The T.I. over P.I. ratio will then be examined. If the ratio is greater than one (1), as in this example, than the second-ranked Offeror (D) is considered to provide a greater value to the Government:

$$\text{T.I.} \div \text{P.I.} = 7.93\% \div 5.45\% = 1.46$$

$1.46 > 1.00$; therefore, Offeror D is considered to provide a greater value (Technical Increment outweighs the Price Increment).

Offeror D is retained for the next step, while Offeror C is eliminated.

If the T.I. over P.I. ratio had been less than one (1), then Offeror C would have been considered to provide a greater value to the Government.

2. A cost-technical tradeoff will then be performed by comparing the higher-ranked proposal from Step No. 2 above (Offeror D) to the next proposal listed in the initial ranking chart (Offeror A). A P.I. and T.I. will be computed similar to the above:

$$\text{P.I.} = (\text{Price}_{\text{Offeror A}} - \text{Price}_{\text{Offeror D}}) \div (\text{Price}_{\text{Offeror D}}) \times 100\%$$
$$= (6{,}300{,}000 - 5{,}905{,}000) \div (5{,}905{,}000) \times 100\%$$
$$= 6.69\%$$

$$\text{T.I.} = (\text{Tech. Score}_{\text{Offeror A}} - \text{Tech. Score}_{\text{Offeror D}}) \div (\text{Tech. Score}_{\text{Offeror D}}) \times 100\%$$

$$= (880 - 912) \div (912) \times 100\%$$
$$= -3.51\%$$

The T.I. over P.I. ratio will then be examined:

$$\text{T.I.} \div \text{P.I.} = -3.51\% \div 6.69\% = -0.52$$

Since the ratio in this example is less than one (1), Offeror D continues to be considered as providing a greater value to the Government. In this case, the Technical Increment decreased while the Price Increment increased. Offeror D is retained for the next step, while Offeror A is eliminated.

3. Lastly, a cost-technical tradeoff will be performed by comparing the higher-ranked proposal from Step No. 3 above (Offeror D) with the next proposal listed in the initial ranking chart (Offeror B). A P.I. and T.I. will be computed similar to the above:

$$\text{P.I.} = (\text{Price}_{\text{Offeror B}} - \text{Price}_{\text{Offeror D}}) \div (\text{Price}_{\text{Offeror D}}) \times 100\%$$
$$= (6{,}470{,}000 - 5{,}905{,}000) \div (5{,}905{,}000) \times 100\%$$
$$= 9.57\%$$

$$\text{T.I.} = (\text{Tech. Score}_{\text{Offeror B}} - \text{Tech. Score}_{\text{Offeror D}}) \div (\text{Tech. Score}_{\text{Offeror D}}) \times 100\%$$
$$= (965 - 912) \div (912) \times 100\%$$
$$= 5.81\%$$

The T.I. over P.I. ratio will then be examined:

$$\text{T.I.} \div \text{P.I.} = 5.81\% \div 9.57\% = 0.61$$

Since the ratio in this example is less than one (1), Offeror D continues to be considered to provide a greater value to the Government. In this case, the Technical Increment did not outweigh the Price Increment. Offeror D is retained, while Offeror B is eliminated.

The proposal offering the best-value to the Government (Offeror D in the above example) will be forwarded to the Selection Official.

Best-Value Evaluation Criteria

Price
Schedule
Past Project Performance
Key Personnel
Subcontracting Plan
Small Business Utilization Plan
Project Management Plan
Quality Management Plan

Environmental Protection Approach
Schedule
Technical Solution

Best-Value Evaluation Rating System

Direct Point Scoring
All items were scored on a direct point scoring system totaling 1,000 points.

Case 14—Maine DOT Bridge

Project Information

Bath/Woolwich Bridge Project

Maine Department of Transportation
Augusta, Maine

Project Description

The Bath-Woolwich Bridge is a bridge that spans the Kennebec River between the City of Bath and the Town of Woolwich near the existing Carlton Bridge, together with the Bath approach to the bridge. The project consists of the design and construction of a trapezoidal concrete box girder bridge.

Best-Value Parameters

BV = A.0 + A.1 + B.0 + B.2 + P.0 + P.4 + Q.0 + Q.2 + Q.3 + Q.4 + D.1

Best-Value Award Algo rithm

Adjusted Bid
The Value Quotient = Price/Score.

This formula is generically known as the adjusted bid method. The department publicly opens and reads responsive lump sum price proposals and divides each price by the score of that firm's design-build proposal, yielding an overall value rating for each firm. The department shall award the contract to the firm with the lowest responsive overall value rating. The department's award decision is final and is not subject to review or appeal. The request for proposals may provide for the payment of a stipend upon specified terms to unsuccessful firms that submit responsive proposals.

Best-Value Evaluation Criteria

Price
Lifecycle Cost
Schedule
Maintenance of Traffic
Management Plan
Quality of Construction
Technical Solution

Best-Value Evaluation Rating System

Direct Scoring
A direct scoring method is used as noted in the description of the best-value algorithm above. The following scale was used on the evaluation.

Raw Score Definition

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
|							|			|
Marginal							Average			Exceptional

Case 15—Sea to Sky Highway Improvement Project: Sunset Beach to Lions Bay

Project Information

Ministry of Transportation

Victoria, British Columbia, Canada
Contract No. 09902 WP2

Project Description

The scope of work is to re-align and widen Highway 99 to four lanes from Sunset Beach to Lions Bay in Canada. The total length is 6.9 km. This work is a part of Sea to Sky Highway Improvement Project, a project having a total estimated capital cost of $600 million. The whole project will be completed by 2009 and will meet the population growth and travel demands until 2020, with additional improvements phased in as required over approximately 20 years.

Best-Value Parameters

BV = A.0 + B.0 + B.2 + Q.3 + Q.4 + P.0 + P.1 + P.2 + P.4 + D.1

Best-Value Award Algorithm

Meets Technical Criteria—Low Bid

Evaluation of Proposals will be conducted by a committee formed by the Ministry and other representatives. The proposal evaluation consists of three steps: transmittal package evaluation, technical proposal pass/fail evaluation, and price envelope evaluation.

Transmittal Package Evaluation (Step 1): The transmittal package includes proposal cover letter, proposal security, consent of surety, and insurance undertaking. Each document will be opened and evaluated to determine whether each proposer has met the requirements.

Technical Proposal Pass/Fail Evaluation (Step 2): If the proposers pass the first evaluation, technical proposals will be opened and subject to an initial pass/fail evaluation to determine whether each proposer has, in the sole opinion of the Ministry, consistently demonstrated an overall approach, which is considered by the Ministry to meet the purpose, intent, and the terms of this RFP. All price envelopes will remain sealed until the second step has been finalized.

Price Envelope Evaluation (Step 3): In the final step, the proposal with the lowest contract price will be deemed to be the preferred proposal. Then, the Ministry may enter into discussions with that proposer to clarify any outstanding issues and to identify and finalize those portions of the proposal, including negotiation of any changes, which will form part of the agreement. If the Ministry determines, in its sole discretion, that discussions are unsuccessful, the Ministry may, in its sole discretion, enter into discussions with the proposer of the next lowest contract price, cancel this RFP process, or elect to not award a contract.

Best-Value Evaluation Criteria

Price
Schedule
Key Personnel
Core Team Organization/Structure
Coordination
Highway, Structure Design Report
Quality Management System
Construction Methodology
Traffic Management Plan
Environment Management Plan
Construction Method
Safety Plan

Best-Value Evaluation Rating System

Satisficing
Transmittal packages are evaluated as yes or no. A "no" on any administrative requirement will result in a proposal being subject to disqualification. In addition, technical proposals are evaluated as pass or fail. A "fail" on any technical proposal evaluation criterion will result in a proposal being subject to disqualification.

Case 16—RFP Form of the Government of Ontario

Information

Government of the Ontario

Maintenance Office, Construction and Operations Branch, Ministry of Transportation
St. Catharines, Ontario, Canada

Best-Value Parameters

BV = A.0 + P.0 + P.2 + D.1 + Q.4

Best-Value Award Algorithm

Adjusted Bid
A three-envelope system is applied.

Phase 1 Financial Pre-Qualification (Envelope 1): The first phase of the assessment process will evaluate the contents of Envelope 1 to determine whether the proposer has the financial capability to support and perform operations throughout the term of the contract.

Phase 2 Work Plan (Envelope 2): In this phase, the Ministry will assess the contents of Envelope 2 and the proposer's work plan to determine how the work will be completed and whether the proposal meets the mandatory technical requirements of the maintenance special provisions and the RFP. The weighting of the key components provides the weighting and the minimum requirement that must be achieved. Failure to meet the minimum will result in an unsatisfactory proposal that will not be assessed further. In addition, the proposal must also meet the overall minimum score of 70 or the proposal will not be assessed further.

Phase 3 Price Analysis (Envelope 3): The Ministry will assess the contents of Envelope 3 for only those proposers achieving at least the required minimum scores for the work plan. Each proposer's actual bid price will be adjusted for evaluation purposes.

1 Proposal Factor Adjustment (PFA)

   PFA = [(107-A)/37 x .05] x Annual Lump Sum Price

   Where A = score of the proponent's Work Plan, and 37 is the difference between the maximum score of 107 and the minimum overall requirement of 70

2 Total Evaluated Bid Price

3 Total Evaluated Bid Price = Annual Lump Sum Price + PFA

Best-Value Evaluation Criteria

Price
Staffing plan – accountability, qualifications and numbers
Winter and non-winter maintenance strategy
Quality control
Training and staff skills
Communication
Innovation/Enhanced deliverables

Best-Value Evaluation Rating System

Direct Point Scoring
All items except Innovation/Enhanced Deliverables are scored on a direct point scoring system totaling 100 points. If the minimum requirements are met, Innovation/Enhanced Deliverables will then be included in a proposer's total points prior to the calculation of the proposal adjustment factor.

Case 17—RFP Form of the Government of the Yukon

Information

Government of the Yukon

Contract Service, Ministry of Transportation
Whitehorse, Yukon, Canada

Best-Value Parameters

BV = A.0 + B.0 + P.1 + P.2 + D.1 + Q.3

Best-Value Award Algorithm

Weighted Criteria
The Government of the Yukon employs a two-envelope submission process. The white price envelope is enclosed in the large, green tender envelope.

After the closing date, the green, tender envelopes will be opened and separated with the proposal being forwarded to the project manager for the evaluation. The white price envelopes will be retained in safe keeping until the technical evaluation is complete.

When the technical evaluation is complete, those proposals that meet or exceed the minimum acceptable score identified will have the white price envelope opened. Price will then be scored according to the evaluation criteria.

Best-Value Evaluation Criteria

Price
Experience with similar contracts
Qualifications
Schedule
Knowledge of local technical conditions, environmental, cultural or other special requirements
Construction methods
Yukon content: knowledge of Yukon, Yukon resident, Yukon resources

Best-Value Evaluation Rating System

Direct Point Scoring
All items are scored on a direct point scoring system totaling 1,200 points.

1) Qualification & Experience = 300
2) Methodology = 250
3) Scheduling/Workplan = 150
4) Yukon Content = 200
5) Price = 300

Proposals scoring less than 475 points on the items 1) + 2) + 3) will be considered technically unacceptable, and the price envelope will be returned to the proposer unopened.

Lowest price proposal = 300 points

# of points awarded to proposals other than lowest price proposal:

(lowest price/proposal price) x 300 points

Case 18—Model Contract Documents in England

Project Information

Highways Agency

Federated House, London Road
Dorking, Surrey RH4 1SZ

Note: This is a model contract document for design-build contracts in England from May of 2000.

Best-Value Parameters

BV = A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4

Best-Value Award Algorithm

Weighted Criteria
The Highways Agency in England applies a two-envelope submission process. The offer must be submitted in two parts, consisting of a "Quality Submission" contained in Envelope A and a "Financial Submission" contained in Envelope B. The highest scored proposal from quality assessment will be awarded a mark of 100, with all other proposals scored pro-rata. Any tenderer whose pro-rata score is less than 60 or who is awarded zero against any of the items will have its Financial Submission returned unopened. The initial financial ranking of compliant tenders will be based on the tendered price. The lowest tendered total will be given 100 marks and all other totals will have one mark deducted for each percentage point by which the total exceeds that of the lowest. Percentage calculations will be to one decimal point.

Best-Value Evaluation Criteria

Price
Technical proposals for structures, layout, drainage, earthworks
Quality plans
Traffic management, health and safety
Environmental proposals
Innovation
Construction methods
Commitment to partnering
Key personnel
Staff training
Subcontractors
Customer care/public relations

Best-Value Evaluation Rating System

Direct Point Scoring
An evaluation committee will evaluate the proposal. Proposals will be evaluated only on the information provided prior to tender closing.

Case 19—Forth Road Bridge Toll Equipment Replacement Project in Scotland

Project Information

Forth Estuary Transport Authority

Forth Road Bridge Administration Offices
South Queensferry, West Lothian EH30 9SF

Project Description

The toll registration equipment in use at the Forth Road Bridge was installed in 1991, since which time the original manufacturer went out of business. Although some serviceable spares were recovered in the move to one-way 7-lane tolling in 1997, some vital components are in short supply, and the facility is exposed to an increasing possibility of catastrophic failure and consequent revenue loss. The work is divided into two Phases, which are referenced throughout the documents as:

- Phase 1 : Design, construction, installation and commissioning of new toll equipment and toll plaza improvements; and
- Phase 2 : Maintenance of the toll plaza equipment and systems for five years following the completion of Phase 1.

Best-Value Parameters

BV = A.0 + B.2 + P.1 + P.2 + P.3 + D.1 + Q.3 + Q.4

Best-Value Award Algorithm

Weighted Criteria
A two-envelope submission process is applied. The tender must be submitted in two parts, comprising a "Quality Submission" contained in Envelope A and a "Financial Submission" contained in Envelope B.

The quality threshold below which tenders will be returned to the tenderer with the Commercial Submission (Envelope B) unopened is 50 out of the available weighted mark of 100 or a zero mark against any one quality sub-question.

Team, Organization and management: 50

Implementation: 50

The lowest estimated total will be awarded a score of 100. Other tenders will be allocated a score on the basis of a reduction of 5 units of score for each percentage point that their notional total estimated final Price for Work Done to Date is higher than the lowest.

Example: Score of Second Lowest = 100 – [(Second Lowest – Lowest) x 100 / Lowest] x 5

The final tender assessment will be based on a weighting of the final quality score and final commercial score in the ratio 80:20 respectively.

Best-Value Evaluation Criteria

Price
Organization and management
Operation and working arrangements
Informal partnering
Key staff and experience
Quality plans
Project program
FETA and public interface
Open book accounting
Construction methodology
Health and safety

Best-Value Evaluation Rating System

Direct Point Scoring
An evaluation panel will evaluate the proposal. Proposals will be evaluated only on the information provided prior to tender closing. The following are the standard marks for quality questions.

Standard	Service Delivery Level	Mark
Very high standard	Proposals likely to exceed all delivery targets	10
Good Standard	Proposals likely to meet all delivery targets and exceed some delivery targets	8-9
Acceptable standard	Workable proposals likely to achieve all or most delivery targets	5-7
Poor standard	Significant reservations on service delivery targets but not sufficient to warrant exclusion of bid	1-4
Not acceptable	Bid excluded from further consideration	0

Case 20—Valuascollege Project in the Netherlands

Project Information

Onderwijsgemeenschap Venlo & Omstreken
t.a.v. de heer ir. P.W.G. Maas
Hogeweg 26a Postbus 270
5911 EB Venlo 5900 AG Venlo

Best-Value Parameters

BV = A.0 + P.1 + P.2 + P.4 + Q.3 + Q.4 + D.0 + D.1

Best-Value Award Algorithm

Weighted Criteria
All tenderers should give a presentation about their vision on the sketch design and the action plan in the presence of the selection committee. After presentations by five tenderers, an evaluation matrix will be established based on the submitted fee and the technical aspects. In the eventual evaluation, the weighting ratio of the submitted price and the quality is 40% : 60%.

Best-Value Evaluation Criteria

Price
Past Performance
Key Staff
Project Coordination
Management/Organization Plan
Construction Method
Design Alternate/Experience
Quality Management

Best-Value Evaluation Rating System

Adjectival Rating
The comparison will be carried out by means of the matrix shown below. After comparing one proposal to another, +1, 0, or -1 will be scored: If A is better than B on Quality, A will be given +1. The total score will be the sum of each score. Two evaluation matrices will be made for comparing.

X	A	B	C	D	E	score
A	X					
B		X				
C			X			
D				X		
E					X	

APPENDIX E

Advisory Board Survey

Appendix E of the research agency's final report is not published herein. For a limited time, copies are available for loan on request to NCHRP.

APPENDIX F

Best-Value Project Screening Decision Flowchart and Selection Tool

Figure F.1, Figure F.2, and the selection tool have been prepared to provide owners with a systematic approach to the screening and selection of projects suitable for best-value procurement. The decision flowchart primarily addresses programmatic and project barriers to best-value procurement. Once the organizational and political obstacles to the use of best-value procurement are overcome, users may skip this first step and proceed directly to the project selection tool. This tool will generate a single score that rates the project's compatibility with the best-value procurement process. Note that an automated web-based version of this decision and project selection process, called the "Best-Value Selector," can be found on the University of Colorado's website at http://construction.colorado.edu/best-value.

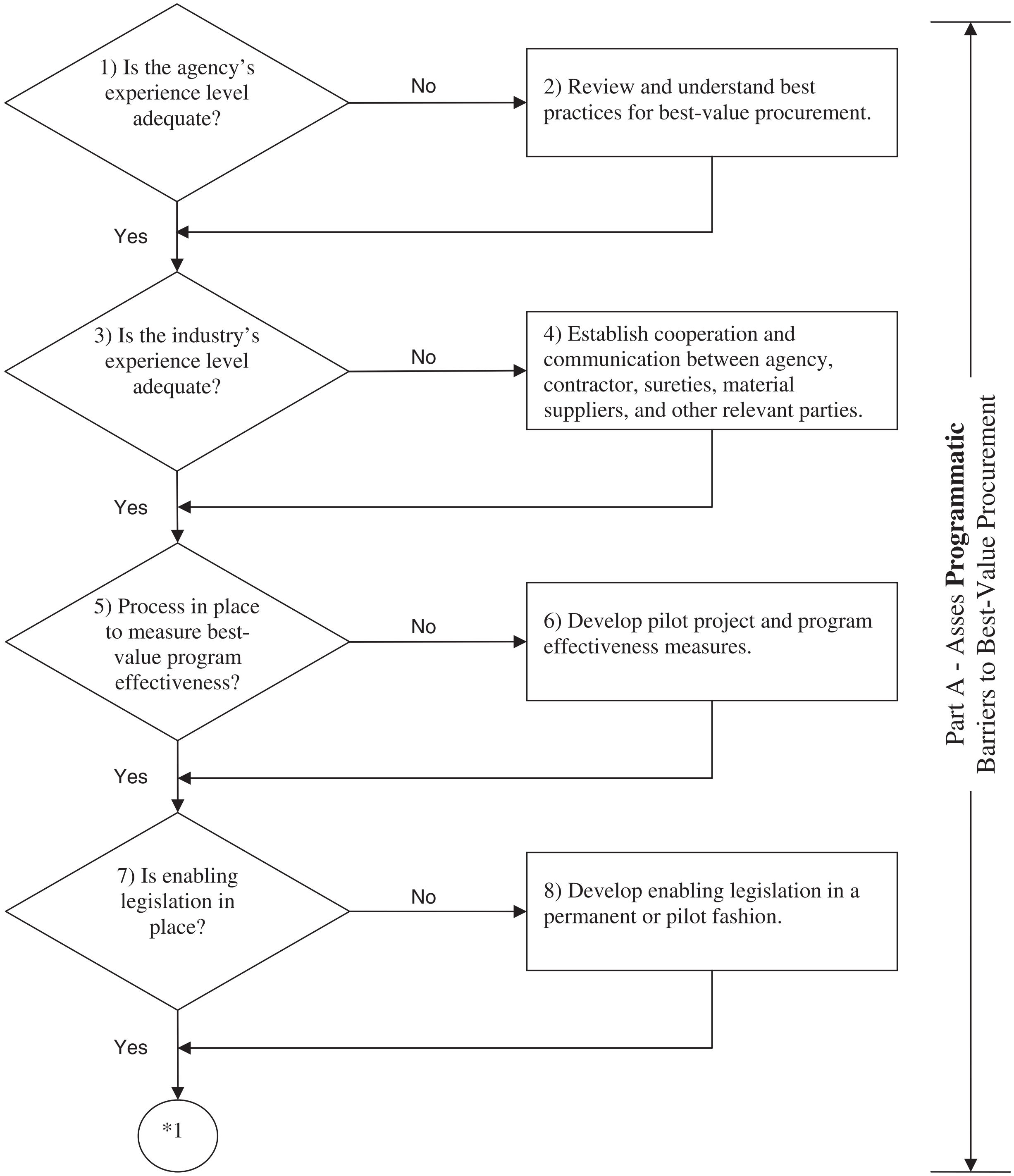


Figure F.1. Part A: assess programmatic barriers to best-value procurement.

1) *Is the agency's experience level adequate?*

- Do agency employees understand the challenges and advantages of best-value procurement and how it changes the standard procurement process?
- Is internal and external cultural resistance to shifting from low-bid award insurmountable?

2) *Review and understand best practices for best-value procurement.*

- Review this report.
- Review *NCHRP Report 451*.
- Review best-value policy documentation statistics, case studies from other federal and state agencies.
- Review FAR Part 15.1 Source Selection Process and Techniques.

3) *Is the industry's experience level adequate?*

- Will contractors have experience in responding to qualifications-based procurements?
- Will contractors be able to meet bonding and insurance requirements for the procurement?
- If the procurement requires any special relationships between contractors, designers, testing agencies, material suppliers, or other relevant parties, are they in place or can they be achieved by the industry?

4) *Establish cooperation and communication between agency, contractor, sureties, material suppliers, and other relevant parties.*

- Reference *NCHRP Report 451*.
- Identify and contact affected parties.
- Educate affected parties.

- Enter into partnering relationships with stakeholders to allow best-value procurement to be effectively implemented.

5) *Process in place to measure best-value program effectiveness?*

- Are funds and staffing available to develop and maintain measures of program effectiveness?
- Can existing project performance metrics be used with best value or will new metrics need to be developed?

6) *Develop pilot project and program effectiveness measures.*

- Reference *NCHRP Report 451*.
- Evaluate quality of final product, risk distribution, project cost, and any other motivating factors for selecting best-value.
- Solicit feedback from contractors, sureties, and other interested parties, as well as from state and FHWA personnel.

7) *Is enabling legislation in place?*

- Is best-value procurement allowed under current legislation, or is legislation in place for a pilot program?

8) *Develop enabling legislation in a permanent or pilot fashion.*

- Reference Section 3.6 of this report.
- Reference *NCHRP Report 451*.

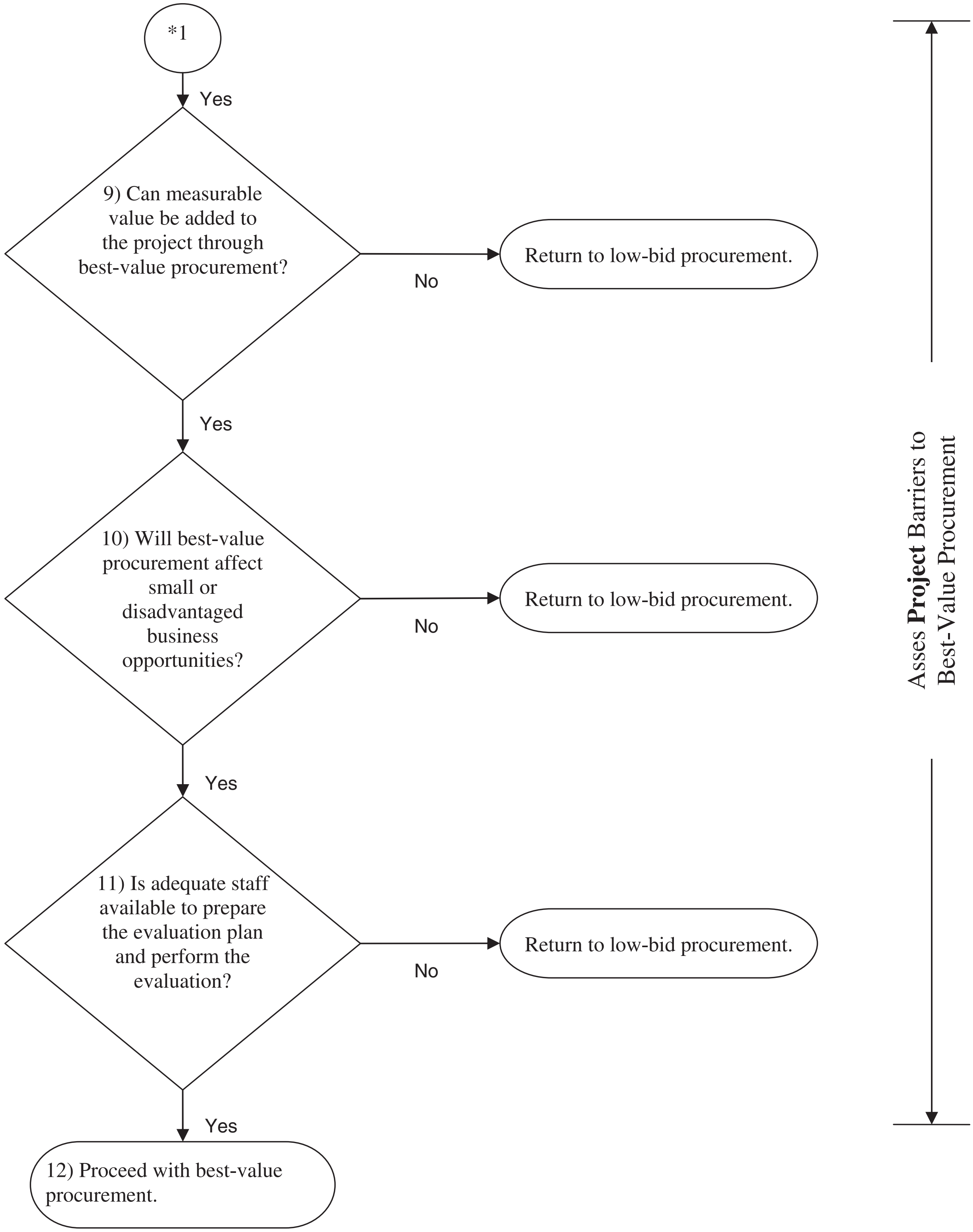


Figure F.2. Part B: assess project barriers to best-value procurement.

9) *Can measurable value be added to the project through best-value procurement?*

- Will measurable value be added to the project in one or more of the following areas?
  - Qualification Benefits
    - More experienced personnel.
    - Demonstrated record of contractor's successful past performance.
    - Improved safety experience and plan.
    - Improved subcontracting plan.
    - Small and disadvantaged business enterprise goals met or exceeded, or evidence of good faith efforts provided.
    - Improved project management plan.
  - Quality Enhancement Benefits
    - Higher quality in materials.
    - Higher quality in construction.
    - Higher quality in management.
  - Cost Savings Benefits
    - Lower life-cycle costs.
    - Lower first cost through contractor innovation.
    - Reduction in cost growth.
  - Schedule Savings Benefits
    - Shorter schedule through competition.
    - Shorter schedule through innovation.
    - Reduction in schedule growth.

10) *Will best-value procurement affect small or disadvantaged business opportunities?*

- Will procurement adversely impact small or disadvantaged business competition?
- Is the pool of available small or disadvantaged businesses adequate to provide ample competition for this procurement?

11) *Is adequate staff available to prepare the evaluation plan and perform the evaluation?*

- Have agency employees previously written a best-value evaluation plan or received adequate training?
- If an evaluation team will be required, is experienced staff available to participate? This is particularly important if the procurement involves design proposals.
- Will consultants be needed to fill agency personnel gaps in specialized areas?

12) *Proceed with best-value procurement.*

- Reference Section 3.4 of this report.

Best-Value Project Selection Tool

The following project selection tool provides guidance when considering projects for best-value procurement. The tool produces a single score that rates its applicability to the best-value process. The tool can be used on a single project, but it is perhaps most useful when comparing multiple projects in a program.

Step 1: Develop Pool of Candidate Best-Value Projects

Gather a pool of projects that might be considered for best-value projects. Ideally, a procurement method selection should be made when projects are in the conceptual stages of planning. This will allow the evaluation plan to emphasize the overall project goal and allow for the most added value from the contractors during selection. However, this is not always practical. If a project is in the later stages of development, best-value procurement can be used, but only if measurable benefits can be achieved from the system.

Step 2: Score Best-Value Project Candidates

Answer the following questions by checking the appropriate box below each question and write the number of points associated with that answer next to the questions. Provide subtotal scores where required.

1) General Project Characteristics

The following project characteristic questions relate to the general technical project characteristics including project development, technical complexity, schedule complexity and specialized components.

1a)	*Where is the project in the project development process?* ❑ (2 pts) The project is at the detailed or final engineering stage (30% or greater design) ❑ (4 pts) The project is at the preliminary engineering stage (5%-30% design) ❑ (6 pts) The project is at the conceptual engineering/environmental stage (1-5% design) ❑ (8 pts) The project is at the program and planning stage (1% design or less)	Score ______
1b)	*What is the level of technical complexity on the project?* ❑ (2 pts) The project is relatively simple ❑ (4 pts) The project has some minor technically complex components ❑ (6 pts) The project has numerous technically complex components ❑ (8 pts) The project is extremely complex or requires new and previously untried technology and/or means and methods	Score ______
1c)	*What is the level of schedule complexity on the project?* ❑ (2 pts) The project's schedule is relatively simple ❑ (4 pts) The project has some minor scheduling complexity ❑ (6 pts) The project has major complex scheduling components ❑ (8 pts) The project's schedule is extremely complex	Score ______

1d)	*Does the project require any highly specialized or proprietary components?* ❑ (1 pt) The project contains no specialized or proprietary components ❑ (2 pts) The project has some minor specialized or proprietary components ❑ (3 pts) The project has a majority of specialized or proprietary components ❑ (4 pts) The project comprises solely specialized or proprietary components	Score ______
Project Characteristics Subtotal (Total questions 1a-1d)		*Score* _____

2) Best-Value Risks

The following questions relate to potential problems stemming from best-value procurement including limiting small or disadvantaged businesses and the potential for contractor protests to the procurement.

2a)	*Will best-value procurement limit competition among available small or disadvantaged businesses on this project as compared with a typical design-bid-build procurement for the same project?* ❑ (0 pts) Less than typical ❑ (2 pts) Typical ❑ (4 pts) More than typical ❑ (8 pts) Much more than typical	Score ______
2b)	*What is the potential for contractors to successfully protest a best-value selection on this project as compared with a typical design-bid-build procurement for the same project?* ❑ (0 pts) Less than typical ❑ (2 pts) Typical ❑ (4 pts) More than typical ❑ (8 pts) Much more than typical	Score ______
Best-Value Risk Subtotal (Sum questions 2a and 2b)		*Score* ______

Note: If the answer to either question 2a or 2b is “much more than typical,” the project should not be considered as a best-value candidate.

3) Best-Value Objectives

The following questions relate to the objectives for implementing best-value including benefits to qualifications, quality enhancements, cost savings and schedule savings. While four possible objectives are listed, all four need not be present to make a good best-value candidate. It is possible that a project may be more appropriate for best-value procurement if it has just one objective that aligns well with the procurement system.

Part 1 — Assess Best-Value Objectives

3a)	*Qualifications benefits—How important is selecting a contractor with a record for high quality performance to the project's success?* ❑ (0 pts) Not an objective for choosing best-value procurement ❑ (2 pts) No more than typical ❑ (4 pts) Somewhat more than typical ❑ (6 pts) Much more than typical ❑ (8 pts) Absolutely critical	Score ______
3b)	*Quality enhancement benefits—How important are higher quality standards to the project's success?* ❑ (0 pts) Not an objective for choosing best-value procurement ❑ (2 pts) No more than typical ❑ (4 pts) Somewhat more than typical ❑ (6 pts) Much more than typical ❑ (8 pts) Absolutely critical	Score ______
3c)	*Cost savings benefits—How important is reducing costs to the project's success?* ❑ (0 pts) Not an objective for choosing best-value procurement ❑ (2 pts) No more than typical ❑ (4 pts) Somewhat more than typical ❑ (6 pts) Much more than typical ❑ (8 pts) Absolutely critical	Score ______
3d)	*Schedule benefits—How important is reducing the schedule to the project's success?* ❑ (0 pts) Not an objective for choosing best-value procurement ❑ (2 pts) No more than typical ❑ (4 pts) Somewhat more than typical ❑ (6 pts) Much more than typical ❑ (8 pts) Absolutely critical	Score ______

Note: If questions 3a through 3d are all answered "not an *objective* for using best-value procurement" or "no more than typical," the project should not be considered as a best-value candidate.

Part 2 — Weight Best-Value Objectives

Count the number of objectives with a "0" score and use the following factors to calculate the final weight of the best-value objectives.

1	No scores of "0" assessed in questions 3a-3d
1.33	One score of "0" assessed in questions 3a-3d
2	Two scores of "0" assessed in questions 3a-3d
4	Three scores of "0" assessed in questions 3a-3d
*	Four scores of "0" assessed in questions 3a-3d

* Do not consider for best-value procurement.

Calculate the final weights and scores for the best-value objectives.

Question	Score		Weight Adjustment		Adjusted Total
3a) Adjusted Qualifications Score	_______ Score 3a	x	_______ Weight Adj. from Table	=	_______
3b) Adjusted Quality Enhancement Score	_______ Score 3b	x	_______ Weight Adj. from Table	=	_______
3c) Adjusted Cost Savings Score	_______ Score 3c	x	_______ Weight Adj. from Table	=	_______
3d) Adjusted Schedule Savings Score	_______ Score 3d	x	_______ Weight Adj. from Table	=	_______

4) Potential Benefits Resulting from Best-Value

The following questions relate to the potential benefits of using best-value procurement. Separate sections are provided for benefits of qualification, quality enhancements, cost savings and time savings. Provide a subtotal at the end of each section.

4a) Qualification Benefits

Will contractors have a wide variance in experience for this project? Score _______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Will there be opportunities for higher safety planning standards on this project? Score _______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Will the contractor have opportunities to add significant value to the team through the selection of special subcontractors on this project? Score _______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Are there opportunities for the contractor to create innovative or exemplary management plans on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Qualification Benefits Subtotal (sum all questions in 4a then divide by 4) *Subtotal 4a* _____

4b) Quality Enhancement Benefits

Will there be opportunities for contractors to provide higher quality materials than normally specified by the state on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Could there be a significant variance in construction quality between contractors on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Could there be a significant variance in construction management techniques between contractors on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Quality Enhancements Benefits Subtotal (sum all questions in 4b then divide by 3) *Subtotal 4b* _____

4c) Cost Savings Benefits

Will there be opportunities for contractors to provide products or designs with lower lifecycle costs than specified by the state on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Will there be opportunities for contractors to provide products or designs with lower initial construction costs than specified by the state on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Is this project susceptible to growth after award? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Cost Savings Benefits Subtotal (sum all questions in 4c then divide by 3) *Subtotal 4c* ______

4d) Schedule Savings Benefits

Will there be opportunities for a shorter schedule if the contractors bid an end date for the project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Will there be opportunities for contractors to reduce the project schedule through innovative designs or construction sequencing on this project? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Is this project susceptible to schedule growth after award? Score ______

- ❑ (0 pts) Less than typical
- ❑ (2 pts) Typical
- ❑ (4 pts) More than typical
- ❑ (8 pts) Much more than typical

Schedule Savings Benefits Subtotal (sum all questions in 4d then divide by 3) *Subtotal 4d* ______

5) *Total Project Score*

Complete the scoring sheet from the totals asked in questions 1 through 4.

Question	**Score**		**Weight**		**Total**
Project Characteristic Score	______ Subtotal 1	x	1	=	______
Best-Value Risk Score	______ Subtotal 2	x	-1	=	______
Qualifications Score	______ Subtotal 4a	x	______ Adj. Weight 3a	=	______
Quality Enhancement Score	______ Subtotal 4b	x	______ Adj. Weight 3b	=	______
Cost Savings Score	______ Subtotal 4c	x	______ Adj. Weight 3c	=	______
Schedule Savings Score	______ Subtotal 4d	x	______ Adj. Weight 3d	=	______

Total Score *(sum right column)* ______

Step 3: Examine Projects Individually or as Group

Based upon the project score, projects can be examined individually using the following table.

Score	Relative Rating
Above 67	Excellent best-value project candidate
33 to 66	Good best-value project candidate
Below 33	Marginal best-value project candidate

If a project receives an excellent or good rating, the project should be procured using one of the best-value methods outlined in Section 3.4 of this report. As agencies first begin to employ best-value, projects with excellent ratings should be considered. A project receiving a marginal rating might still be considered a candidate, but attention must be paid to those areas in which the project received low scores.

Given the subjective nature of the scoring system, it is perhaps best used when comparing multiple projects under consideration for best-value. Multiple projects within a group of candidates can be scored and those receiving the highest rating should be selected.

APPENDIX G

Barriers and Solutions to Implementation of Best-Value Process

Barriers	Description	Level to address	Possible solutions	Probability of solution without legislative restructuring	Comments
Competitive bidding requirement applicable to federal-aid construction contractors	23 U.S.C. § 112(b) requires use of competitive bidding for federal-aid construction contracts FHWA regulations track federal legislative requirements	Congress or FHWA	Revise federal statute or adopt rules allowing alternative procurement process	Either the law or regulations must be changed, or both	23 U.S.C. § 112(b) allows the Secretary to approve alternatives to competitive bidding. FHWA has determined that A+B bidding is permissible based on this authority and should therefore be able to permit other best-value concepts to be generally used without a statutory modification.
State law	Laws in many states require construction work to be competitively bid, subject to certain exceptions	Individual state legislatures	Revise state law as necessary	To be determined state by state	States have adopted laws permitting use of best-value procurement based on the MPC
State regulations		Individual states	Revise regulations as necessary	To be determined state by state	Regulations implementing statutory requirements cannot be modified unless underlying law is changed
Local law	Local agency charters/ ordinances often require construction work to be competitively bid, subject to certain exceptions	Governing bodies or individual agencies	Revise local law as necessary	To be determined agency by agency	In some states charter cities may have the ability to use best-value procurement despite general legislation requiring competitive bidding, under the "home rule."
Local regulations	Regulations typically track legislative requirements	Individual agencies	Revise regulation as necessary	To be determined agency by agency	
Resistance to change within transportation agency	Belief that low-bid system works well; culture of avoiding discretionary procurement decisions; difficulties associated with changing paradigms in general	Agency management and staff	Training; communication regarding successes; participation in workshops; sessions at TRB, AASHTO, ARTBA and other conferences	N/A	
Level of investment required for startup	Investment in staff training; acknowledgment that initial projects will not be easy	Agency management	Acknowledge that investment is necessary	N/A	

Barriers	Description	Level to address	Possible solutions	Probability of solution without legislative restructuring	Comments
Opposition by contractors	Many contractors have a preference for low-bid procurement, some due to concerns regarding favoritism, others due to belief that past performance requirements will lock them out of best-value contracting due to lack of experience or because their past performance will be problematic	Agency and contractor management	Build safeguards into the process to avoid opportunities for favoritism; continue using low-bid procurements to allow contractors an entrée; involve industry representatives in development of the process	N/A	
Small contractor opposition	Many small contractors believe that they will be locked out of best-value contracting	Agency and contractor management	Build safeguards into the process to ensure an appropriate mix of large and small contracts; continue using low-bid procurements to allow contractors an entrée; involve industry representatives in development of the process	N/A	
Opposition by engineering firms	Engineering firms may object to design-build and other types of contracts that modify their traditional role in development of public works projects	Agency management and engineering firm management	Education regarding benefits of best-value contracting; communicate to engineering firms that this approach will not adversely impact contracting opportunities for them	N/A	

Barriers	Description	Level to address	Possible solutions	Probability of solution without legislative restructuring	Comments
Opposition by unions	Unions may object to level of discretion involved in the selection process, and may be concerned that the process will allow owners to select non-union contractors	Agency management and union management	Education regarding benefits of best-value contracting; build safeguards into the process to avoid opportunities for favoritism	N/A	Unions may ask for provisions to be added to legislation to protect labor, including requirements for prequalification relating to past performance in areas of concern to labor interests. However, from a public policy standpoint there does not appear to be any reason why different rules should apply to best-value contracts and low-bid contracts in determining whether a contractor is responsible, and it would therefore be more appropriate for such requests to be addressed in the context of general modifications to procurement requirements for public works contracts, rather than addressing them as an add-on to best-value legislation.

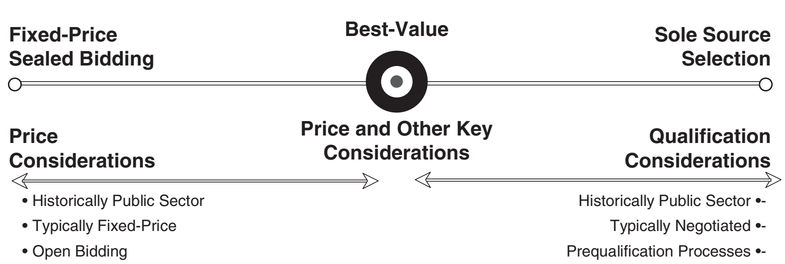
APPENDIX H

Training Tool

Overview

- Background and Industry Trends
- Methods
- Implementation

Procurement Methods



Best-Value Definition

A procurement process where price and other key factors are considered in the evaluation and selection process to enhance the long-term performance and value of construction.

Industry and Legislative Trends

- Private Sector Negotiated Procurements
- FAR Part 15 Contracting By Negotiation
- Revised ABA Model Procurement Code (MPC 2000)

Industry and Legislative Trends (cont'd)

- Various State Statutes Addressing Best-Value
- Federal Agency Best-Value Procurement Experience
  - Navy
  - Army
  - U.S. Postal Service
  - Veterans Administration
  - Federal Bureau of Prisons

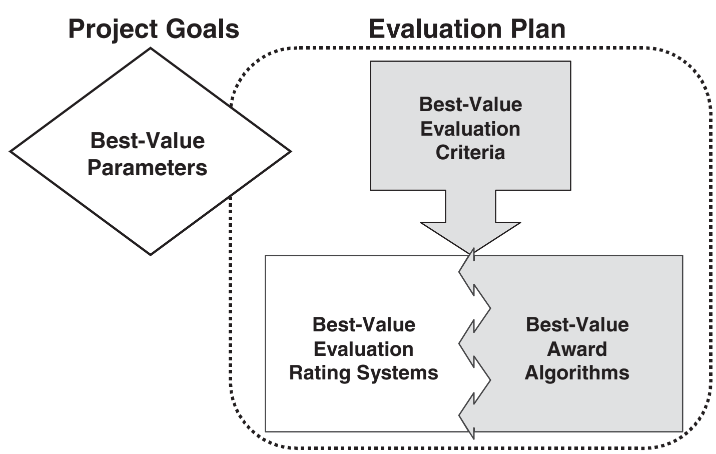
Use in Highway Industry

- 41 transportation agencies surveyed
- 27 had experience with best-value procurement
- 2 planning to use it

Perceived Best-Value Advantages

- Reduction in cost growth
- Fewer life-cycle costs
- Time savings
- Innovation
- Quality
- Reduced procurement risk

Best-Value Concepts



The Best-Value Parameters

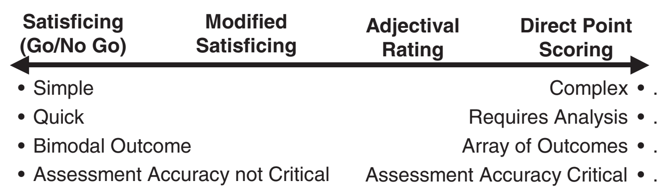
Best-Value = A.x + B.x + P.x + Q.x + C.x

Where: A = Cost
B = Time
P = Performance & Qualifications
Q = Quality Management
C = Construction Alternates
x = Weighting

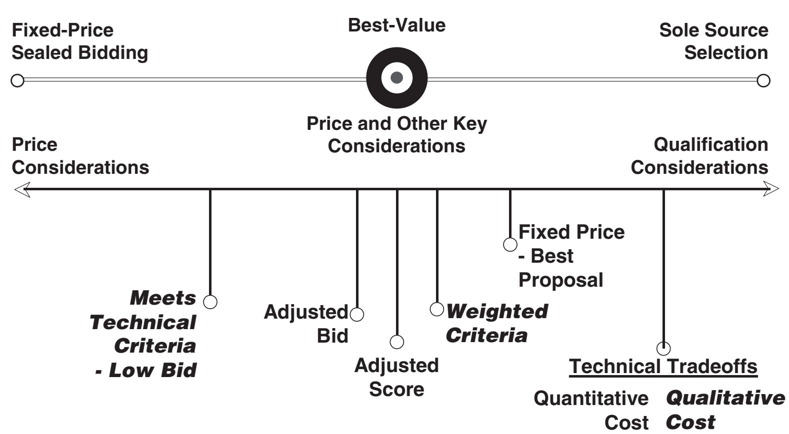
Case Study Results

Evaluation Criteria	BV Parameter	# of Contracts Used (50)
Price Evaluation	A.0	42
Project Schedule Evaluation	B.0	19
Financial & Bonding Requirements	P.0	35
Past Experience/Performance	P.1	44
Safety Record (or plan)	P.1	25
Key Personnel & Qualifications	P.2	41
Utilization of Small Business	P.3	30
Subcontractor Evaluation/Plan	P.3	29
Management/Organization Plan	P.4	31
Quality Management	Q.4	27
Proposed Design Alternate	D.0	26
Technical Proposal Responsiveness	D.1	37
Environmental Considerations	D.1	25

Best-Value Evaluation Rating Systems



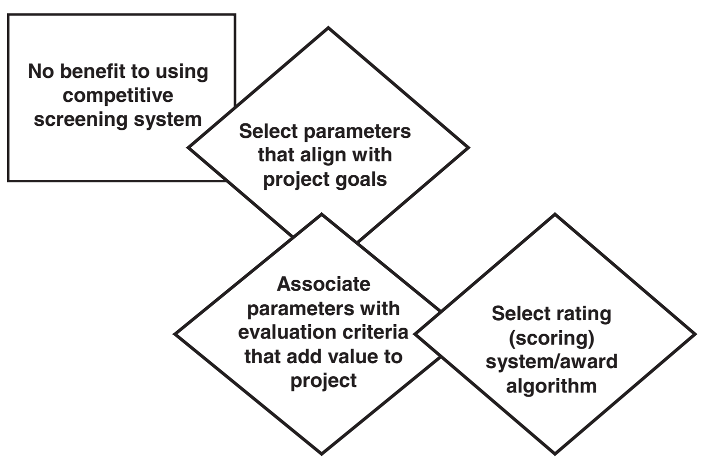
Best-Value Award Algorithms



Best-Value Framework

Award Algorithm / BV Parameter Evaluation Criteria	Meets Technical Criteria - Low Bid	Cost-Technical Trade-off (Qualitative)	Value Unit Price	Remarks
Cost				
Cost: A.0	X	X	X	
Time				
Schedule: B.0	X	X	X	
Qualifications				
Prequalification: P.0	X			
Past Project Performance: P.1		X	X	
Key Personnel Experience: P.2		X	X	
Subcontractor Information: P.3		X	X	
Project Management Plans: P.4		X	X	
Safety Record/Plan: P.5	X	X	X	
Quality				
Quality Management: Q.0	X	X	X	
Design Alternates				
Design with Proposed Alternate: D.0		X	X	
Technical Proposal Responsiveness: D.1	X			
Environmental Considerations: D.2		X	X	
Rating System				
	Satisficing	Adjectival or Modified Satisficing	Direct Point Scoring	

One-Step Best-Value Procurement



Two-Step Best-Value Procurement

- Step 1
  - Evaluation of performance/qualification parameter
  - Similar to current administrative prequalification processes but more detailed
- Step 2
  - Evaluation of alternates, quality, cost, and schedule
  - Same process as One-Step Best-Value

Best-Value Project Screening & Selection

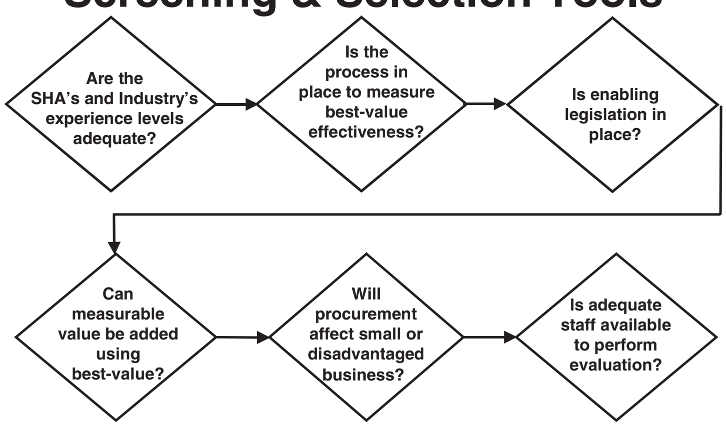
- *Select projects with characteristics that provide significant benefit from using an alternative form of procurement.*
- *Once identified, develop the evaluation plan to confirm that the benefits are real, the negative impacts are minimal, and the risks are manageable.*

Best-Value Project Screening & Selection

Tied to SHA Project Goals & Evaluation Criteria

- Project Characteristics
  - Complexity
  - Specialized expertise needed
  - Opportunities for innovation
- Cost savings
- Quality enhancements
- Time savings
- Procurement Risk

Best-Value Project Screening & Selection Tools



Implementation

- Examples of Selection Process
- Strategies to Implement Best-Value Procurement

Example 1 Meets Technical Criteria - Low Bid

Any selection process where the eventual award will be determined by the lowest priced, fully qualified and/or responsive bidder.

Algorithm: **If $T > T_{min}$, Award to P_{min}**

If $T < T_{min}$, Non- Responsive

T = Technical Score
P = Project Price

Meets Technical Criteria–Low Bid Example

Offeror	Technical Score (60 maximum) (40 minimum)	Price Proposal
1	51	$1,400,000
2	53	$1,200,000
3	**44**	**$1,100,000**
4	39	NR

Example 2 Value Unit Price (Weighted Criteria)

The technical proposal and price proposal are evaluated individually. A weight is assigned to price and each of the technical evaluation factors, and the sum of these values becomes the total score.

Algorithm: $TS = W_1S_1 + W_2S_2 + \ldots + W_iS_i + W_{(i+1)}PS$

Award TS $_{max}$TS = Total Score

W_i = Weight of Factor $_I$

S_i = Score of Factor $_I$

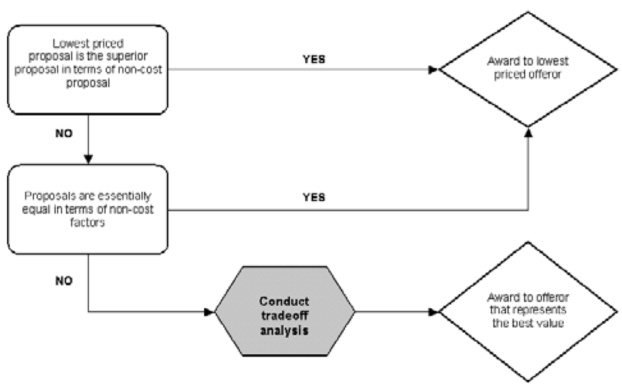
PS = Price Score

Weighted Criteria Example

Offeror	Technical Score (60 maximum)	Price Proposal	Price Score (40 maximum)	Total Score (100 maximum)
1	51	$1,200,000	36	87
2	**53**	**$1,250,000**	**35**	**88**
3	44	$1,100,000	38	82
4	39	$1,000,000	40	79

Example 3 Qualitative Cost - Technical Tradeoff

Tradeoff analysis of price and technical or non-cost factors to arrive at best-value decision.



Strategies to Implement

- Legislative Guidelines
- Model Specifications
- Agency Champion
- Industry Collaboration
- Pilot Projects
- Model Legislation
- Guide Spec

Model Legislation

- ABA Model Procurement Code
- FAR Part 15-Contracting By Negotiation
- Flexibility in Procurement Approach
  - Acceptable to project conditions
  - Appropriate weighting of price and technical factors

Model Specifications

AASHTO Format:

- General Information, Definitions, and Terms
- Proposal Requirements and Conditions
- Award and Execution

Abbreviations and acronyms used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation