BEST VALUE PROCUREMENT FOR HIGHWAY DESIGN-BID-BUILD PROJECTS

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Abstract: Best value procurement is the process in which factors additional to price are considered in the selection of a contractor. Time, operation and maintenance, technical and managerial merit, and past performance are the other key factors considered along with price in best value projects. Compared to the low-bid procurement, best value procurement offers several advantages, including opportunities to improve project quality, promote innovation, and enhance project performance. Best value procurement, while commonplace in highway design-build (D-B) projects, is limited in use for design-bid-build (D-B-B) projects. This paper explores the procedure and existing practices of D-B-B best value contracts for highway projects. Data was collected from a survey questionnaire, structured interviews, and case studies. The survey questionnaire was nationwide distributed to 52 state Departments of Transportation (DOTs) to identify the practices of using best value procurement in transportation projects. The seven structured interviews and four case studies were conducted in detail to investigate the opportunities and challenges of evaluation criteria, selection methodologies, and evaluation committee structure in D-B-B best value projects. The results indicate that evaluation criteria and selection methods are established on a project-by-project basis. The owner agency should develop selection criteria and establish evaluation committees that are most beneficial to a given project. This paper provides some guidance for state DOTs to use best value procurement for their D-B-B projects.

1 INTRODUCTION

State departments of transportation (DOTs) have historically used a low bid approach to procure construction services. Under the low bid approach, price is a sole competitive factor. Non-price factors such as qualifications, experience, technical approaches, and innovative solutions are not considered. Typically, DOT awards the contract based on the lowest responsive bid. The best-performing contractors who will deliver high quality projects are less likely to be awarded the contracts in low bid contracting (Elyamany and Abdelrahman 2010). Researchers have identified several benefits of using low bid procurement including potential for monetary savings (Palaneeswaran et al. 2003), easy and simple implementation, reduced protests and disputes (Gransberg and Senadheera 1999), a long-standing legal precedence, and enhanced competition (Scott et al. 2006). While the low bid approach offers several advantages and is inherently transparent, it does not always offer the best performance during and after
construction. To improve project quality and performance, a number of DOTs are increasingly using best value procurement to deliver their transportation projects.

A review of literature indicated that a number of studies have investigated best value procurement for highway projects. However, most of them have focused on highway design-build (D-B) projects. Limited studies, if any, have explored the use of best value procurement for traditional design-bid-build (D-B-B) projects. Building upon the relevant literature, the objective of this study is to examine how to employ best value procurement in the D-B-B delivery method for highway projects.

2 BACKGROUND

Best value is defined broadly in the literature. Even in the highway industry, the best value definition may vary by state. This study uses the best value definition based on the National Cooperative Highway Research Program (NCHRP) Report 561 as follows: best-value procurement is “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” (Scott et al. 2006). The report also indicated that best value procurement allows both objective and subjective elements to be considered in the selection process. The objective elements may include contractor experience, timeliness and accuracy of submittals, record of safety, or compliance with material and workmanship requirements. The subjective elements may include effective management, proactive measures to mitigate risk, training programs, customer satisfaction, and client relation.

Best value procurement is one of many procurement options. It is not ideal for every project, but it can provide benefits on appropriate projects. Project goals and project characteristics can determine if the use of best value will be advantageous. Goals that align well with best value procurement include shortening of the project duration, creating opportunities for innovation, and selecting the most qualified team. Appropriate project characteristics include opportunities for innovation, the amount of design required to develop a competitive industry proposal, agency experience with the process, and market capability. For example, researchers show that the best value method more often delivers projects that meet owner expectations (El Wardani et al. 2006). Projects delivered using best value usually stay close to the original budget and schedule (Molenaar and Johnson 2003). Best value procurement is useful on those projects with unique objectives or challenges that may be difficult to meet using traditional low-bid procurement (MnDOT 2013).

State DOTs are increasingly using best value procurement for delivering their transportation projects. The 1996 version of the Federal Acquisitions Regulations (FAR) stated that best-value procurement should be selected when the project needs innovation and new technology or when a specific type of experience is required to obtain the desired outcome (FAR 1996). Considerations for best value procurements can include price, schedule, technical and managerial merit, financial health and past performance (Scott et al. 2006). Because the system provides a balance between price and qualitative considerations, it can optimize the benefits of fixed-price sealed bidding and sole source selection. The inclusion of key factors in evaluation criteria that match the specific needs of a particular project can raise the likelihood of meeting project performance goals (Abdelrahman et al. 2008). In fact, public clients use best value procurement when they aim to achieve the maximum outcome for their projects as opposed to the lowest price (Zhang 2006).

As mentioned above, although various studies have focused on the use of best value procurement on D-B highway projects, a little research explores how best value procurement can be used for highway D-B-B projects. This paper attempts to fill this knowledge gap by conducting four case studies with state DOTs.
that have experience using best value procurement on their D-B-B projects. The following sections present briefly how these four case studies were selected.

3 RESEARCH METHODOLOGY

The research methods employed in this study include three main steps: (1) a national survey, (2) structured interviews, and (3) case studies. The objective of step 1 is to preliminarily determine and identify the current state of practice on using best value with D-B-B projects. Based on the results of Step 1, the authors conducted interviews with seven state DOTs who have the most experience with best value procurement. Finally, step 3 involved conducting four in depth case studies to explore how best value procurement can be applied to these four D-B-B projects.

3.1 Survey

Because of the lack of information about the best value D-B-B contracts, the authors developed a Nationwide survey to preliminary collect data. The survey consisted of 18 questions related to the topic such as: project delivery methods using the best value, experience of the agency, evaluation criteria, selection methods, evaluation committee, debriefing, legal, and protest information. The survey was sent to all 50 DOTs across the United States including the District of Columbia, and Puerto Rico. After two follow-up requests, the authors received responses from 46 state DOTs. It is noted that the survey questionnaire asked the participants to describe not only their state of practice related to the best value D-B-B approach, but their perception regarding the use of best value procurement for D-B projects. The survey results indicated that 19 state DOTs are using or considering the use of best value procurement in their D-B-B projects. Based on these responses, the authors searched for relevant information on these state’s D-B-B best value projects in their websites. Much information from state DOT websites could not be found about the use of best value procurement with design bid build apart from the agencies like New York, Michigan, Minnesota, and Oregon.

3.2 Interviews

The responses from the survey were analyzed to determine which state DOTs have the most experience on best value projects. As a result, seven state DOTs were selected for interviews to further investigate the use of best value procurement with the D-B-B delivery method. The interview questions were divided into four sections, including 1) proposal evaluation criteria, 2) selection methodologies, 3) evaluation committee, and 4) debriefing procedures. The authors invited the DOT officials to participate in an interview by phone and email. The interview questions were sent in advance to the officials who had agreed to provide information on their best value projects. After the interviews, the author sent a request for potential case studies on best value D-B-B projects. In addition, the interviewees were requested to provide the documents most relevant to their best value procedures.

3.3 Case studies

Due to the lack of data collected in the survey, and interviews about the use of best value procurement on design bid build delivery method, the case study is a main research tool for this study. In this step, the authors analyzed documents collected from the survey and potential case studies provided by state DOTs in the interview process. As a result, four case studies were selected to conduct a detailed analysis. These four case studies were selected because of the completeness of the documented best value process. In each case study, the authors followed a rigorous case study protocol that included the following four primary criteria: (1) evaluation criteria; (2) selection methodology; (3) evaluation committee; and (4) debriefings. The following sections present the results of these four case projects.
## RESULTS AND ANALYSIS

Table 1 summarizes the key findings from evaluation criteria, best value award algorithm, and evaluation committee of the four case projects.

<table>
<thead>
<tr>
<th>No</th>
<th>State DOT</th>
<th>Project Name</th>
<th>Evaluation Criteria</th>
<th>Best value Algorithm</th>
<th>Evaluation Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Michigan DOT</td>
<td>M-39 Southfield Freeway, Michigan</td>
<td>1. Air Quality (40 points)&lt;br&gt;2. Noise restriction (40 points)&lt;br&gt;3. Managing utilities to homes (40 points)&lt;br&gt;4. Construction traffic and mobility (40 points)&lt;br&gt;5. Avoiding damage to adjacent property from vibration (40 points)&lt;br&gt;6. Local Contractor and Workforce Participation Concerns (150 points)&lt;br&gt;7. Safety and Mobility (100 points)&lt;br&gt;8. Schedule concerns (50 points)</td>
<td>Contract awarded to proposer with lowest composite score.</td>
<td>Detroit Transportation service center (TSC) Manager&lt;br&gt;TSC development manager&lt;br&gt;TSC delivery engineer&lt;br&gt;Metro region Engineer&lt;br&gt;Metro region planning specialist&lt;br&gt;Director of MDOT office of small business development&lt;br&gt;Contract services division administrator</td>
</tr>
<tr>
<td>2</td>
<td>New York DOT</td>
<td>Patroon Island Rehabilitation Project, New York</td>
<td>1. Responsiveness to RFQ&lt;br&gt;2. Legal&lt;br&gt;3. Financial&lt;br&gt;4. Experience&lt;br&gt;5. Past Performance</td>
<td>Project is awarded to lowest cost responsible bid</td>
<td>A technical selection committee comprised of officials from NYSDOT.</td>
</tr>
<tr>
<td>3</td>
<td>Oregon DOT</td>
<td>Dennis L. Edwards Tunnel, Washington County</td>
<td>1. Construction and general tunnel experience (40 points)&lt;br&gt;2. Specific tunnel experience (24 points)&lt;br&gt;3. Traffic control and safety plan (16 points)</td>
<td>Price: 50% Technical qualifications: 40% Technical Approach: 10% Proposal with highest score is awarded the project</td>
<td>Experts from ODOT bridge engineering section, region 1 technical center, project Manager, and representative from FHWA</td>
</tr>
<tr>
<td>4</td>
<td>Oregon DOT</td>
<td>I-84: Sandy River Jordan Road, Bundle 210 project, Multnomah County</td>
<td>1. Qualifications and Experience (18 points)&lt;br&gt;2. Project Understanding and approach (21 points)&lt;br&gt;3. Key personnel (21 points)&lt;br&gt;4. In water work approach (16 points)&lt;br&gt;5. Steel Box girder approach (8 points)&lt;br&gt;6. Diversity (16 points)</td>
<td>Price: 70% Technical and qualification factor: 30% Proposal with highest score is awarded the project</td>
<td>Individuals from ODOT, non-scoring members from outside ODOT</td>
</tr>
</tbody>
</table>
One can observe from Table 1 that the price component is an important factor in selecting the contractor for the D-B-B best value projects. For example, in the case study with NYDOT, it was observed that the contractor was selected based on the lowest responsible bid. The case studies with Oregon DOT revealed that the price factor accounted for 50% and 70% associated with Dennis Edwards Tunnel and I-84 Sandy River Jordan Road projects, respectively. However, the technical factors considered in the evaluation process were varied depending on the project type and characteristics. For example, Oregon DOT asked the proposers about their specific tunnel experience with regards to the Dennis L. Edwards tunnel project. Michigan DOT specified a list of detailed technical criteria such as air quality, noise restriction, safety and mobility on their M-39 Southfield project. New York DOT used standard evaluation criteria that are similar to D-B best value projects on their best value D-B-B Patroon Island Rehabilitation Project. These evaluation criteria include responsiveness to request for qualifications (RFQ), legal, financial requirements, experience, and past performance. The following sections discuss each case study in detail.

4.1 Michigan DOT case study: M-39 South Field Freeway Project

M-39 Southfield freeway project involved the reconstruction of roadway from McNichols to M-10, roadway rehabilitation of 28 bridges, freeway lighting and signing, sanitary sewer and screen wall replacement. Michigan DOT (MDOT) does not have a standard procedure for their best value projects. The selection process and evaluation criteria were determined depending on the type and location of the project. The eight evaluation criteria for this project include: 1) air quality, 2) noise restriction, 3) managing utilities to homes, 4) construction traffic, 5) avoiding damage to adjacent property due to vibration, 6) local contractor and workforce participation concerns, 7) safety and mobility, and 8) schedule concern. The maximum point available for each factor is shown in Table 1. The maximum points available for the technical proposal are 500. The composite score of the proposals is calculated by dividing the bid price of the proposal by technical score. The proposal with the lowest composite score was awarded the contract.

The technical evaluation committee was comprised of the Detroit transportation service center (TSC) manager, development manager, delivery engineer, region engineer, region planning specialist, and director of MDOT office of small business development. The committee started with a baseline score and added points for innovative ideas. The final technical score of the proposals was the consensus rating of all the committee members. Price proposals were opened by the committee after evaluating the technical proposals. Finally, the project manager conducted debriefings to unsuccessful proposers after their request. Detailed comments about the strengths and weakness of the proposals were discussed in that meeting.

4.2 New York DOT case study: Patroon Island Rehabilitation Project

The Patroon Island bridge project involved the construction of ramps connecting the I-90 interchange with I-787, repairing the bridge decks and bearings, and painting the bridges. The project manager worked with the chief engineer to determine the evaluation criteria for the project. The evaluation factors for this project are responsiveness to RFQ, legal and financial information, experience, and past performance of the proposers. These evaluation criteria for D-B-B projects are similar to that of D-B projects. The proposals were evaluated against these factors by the evaluation committee on the pass or fail basis. After evaluating technical criteria, the evaluation committee evaluated the cost proposals. The proposer with the lowest cost bid was awarded the contract.

The evaluation committee, which included officials from the New York DOT, was responsible for the evaluation of the proposals and the selection of the best value contractor. The evaluation committee was prevented from seeing the cost proposals to avoid any potential bias during the evaluation process. The
agency conducted debriefing to the unsuccessful proposers. A debriefing was conducted by a procurement official who is familiar with the selection and contract award process. Strengths and weaknesses of their proposals were explained to the proposers.

4.3 Oregon DOT case studies

Oregon DOT has employed best value procurement for several D-B-B projects. To identify the differences of using the best value approach with different type of projects, the authors conducted two case studies in Oregon DOT.

4.3.1 Dennis L. Edwards Tunnel Project

This project involved removing and replacing the existing lining, improving the wall drainage, and improving the lighting system of the tunnel along with the installation of a bike warning system. Oregon DOT (ODOT) used price plus technical qualifications plus technical approach best value process to select the contractor. The price factor accounted for 50% of the weight in evaluation process while the technical qualification and approach accounted for 40% and 10%, respectively.

The three evaluation criteria for this project included (1) construction and general tunnel experience, (2) specific tunnel experience, and (3) traffic control and safety plan. The evaluation committee was comprised of two technical experts (one from ODOT bridge engineering section and the other from regional technical center), the project manager, a representative from the Federal Highway Administration (FHWA), and the engineering consultants who acted as facilitators and observers during evaluation process. The proposals were evaluated and scored separately by the members and the average of all the scores was the final technical score of the proposers. The project was awarded to the proposer whose combined score is the highest among all the proposers.

4.3.2 I-84 Sandy River – Jordan Road, Bundle 210 project

This project was a typical highway project that involved replacing and repairing the bridge. Different from the Dennis L. Edwards Tunnel project mentioned above, the price factor accounted for 70% of the weight in the selection process and the technical qualifications and approach factors accounted for 30%. The main reason for this is that this project was a typical highway project while the tunnel project was more complex. As a result, the technical factors of the tunnel project accounted for more weight in the evaluation process. In the tunnel project, the agency used a specific tunnel experience factor to select the proposer who have more experience and offers the best value for the particular type of work involved. On the other hand, for the I-84 Sandy River project, which is a typical highway project, the agency preferred setting more weight on the price factor for their D-B-B projects. In addition, the evaluation committee of this project was simpler than that of the tunnel project. Technical experts, a member from FHWA, and a consultant were not required for this project. Only officials from ODOT and a non-scoring member from outside ODOT were included in the evaluation committee.

5 DISCUSSIONS

The case studies presented above illustrate the use of best value procurement in D-B-B projects. It is observed that Michigan and Oregon DOTs develop the evaluation criteria depending on the nature of the project. New York DOT has employed a similar best value D-B project procedure for their best value D-B-B projects. In general, price accounts for the greatest weight in the best value evaluation process for D-B-B projects. Specifically, New York awards the project to the lowest bidder from the list of prequalified bidders while Michigan and Oregon assign more weight to the price while calculating the best value
scores. Michigan selects the best value contract based on the least composite score, which is calculated by dividing the price over the technical score. Oregon selects the best value contractor for their D-B-B projects based on the highest score that is combined between price and technical factors. Recently, Minnesota DOT has published a manual for the best value procurement on D-B-B projects. This manual introduces a streamlined approach to best value procurement that can be applied to a variety of projects. The approach, which is intended for projects that requires advance design, suggests that the agency should develop pass-fail criteria to reflect the benefits of the project and select the low bid from the proposals meeting the criteria (MnDOT 2013).

Based on the four case studies, one can observe that the evaluation committees are often comprised of officials from state DOTs. In some cases officials from outside the agency (i.e., consultants, a representative from FHWA, or a non-scoring member) may also be included in the evaluation committee. Typically, after awarding the best value contract, state DOTs conduct debriefing sessions for the unsuccessful proposers. In these meetings, a member in the evaluation committee often explains the strengths and weaknesses of their proposals.

6 CONCLUSIONS

Transportation agencies are increasingly using best value selection procedures to deliver transportation projects. While low bid procurement processes are simple and transparent, they do not allow agencies to evaluate additional factors that may add value to the agencies and stakeholders. Best value procurement is often used for D-B highway projects. This paper shows that best value approach can be applied to the traditional D-B-B projects. The case studies presented in this paper explained about the methods adopted by the state highway agencies the selection process of a best value contractor. The findings from this paper suggest that the use of best value for D-B-B projects in several state DOTs brings significant benefits to their agencies. Non-complex projects, in particular, have the potential for using streamlined best value processes. The evaluation criteria and award algorithms need not be as complex as those found on large D-B projects. In addition, the owner agency should develop the evaluation criteria and establish the selection committee based on a project-by-project basis.

Although the findings from this paper encourage the use of effective best value procurement on D-B-B delivery, the paper has several limitations. First, due to the lack of best value D-B-B project data, it is challenging to compare the project performance between best value and low bid procurement on D-B-B projects. Second, the sample size for this research is small. This study has not focused on some important factors like industry outreach, stipends, and training to evaluation committee which plays an important role in the selection of the best value contractor. A more substantial study with consideration of other factors and a large sample size should be performed to identify the best practices of using best value procurement on D-B-B delivery method. In addition, future research could determine how to streamline best value procurement, allocate the risks equitably for the agency and contractors, and quantify the project performance between D-B-B low bid and best value projects.

References

