Alternative Project Delivery, Procurement, and Contracting Methods for Highways

EDITED BY
Keith R. Molenaar, Ph.D.
Gerald Yakowenko, P.E.

ASCE

ALTERNATIVE PROJECT DELIVERY, PROCUREMENT, AND CONTRACTING METHODS FOR HIGHWAYS

SPONSORED BY
The Construction Institute (CI)
of the American Society of Civil Engineers

Construction Research Council

EDITED BY
Keith R. Molenaar, Ph.D.
Gerald Yakowenko, P.E.

Published by the American Society of Civil Engineers

Library of Congress Cataloging-in-Publication Data

Alternative project delivery, procurement, and contracting methods for highways / sponsored by the Construction Institute (CI) of the American Society of Civil Engineers [and] Construction Research Council ; edited by Keith R. Molenaar, Gerald Yakowenko.
p. cm.
Includes bibliographic references and index.
ISBN-13: 978-0-7844-0886-5
ISBN-10: 0-7844-0886-6
1. Road construction contracts--United States. I. Molenaar, Keith R. (Keith Robert) II. Yakowenko, Gerald. III. Construction Institute. IV. Construction Research Council (Washington, D.C.)

TE195.A4355 2007
388.1'1--dc22 2006039310

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4400

www.pubs.asce.org

ISBN 13: 978-0-7844-0886-5
ISBN 10: 0-7844-0886-6
Manufactured in the United States of America.

Acknowledgments

The Construction Research Council (CRC) of the American Society of Engineer's (ASCE) Construction Institute (CI) has developed this special publication to provide a comprehensive and objective presentation of the use of alternative delivery, procurement, and contracting methods in the United States highway system. The CI was founded on the hypothesis that a need for cross cutting networking and technical exchange exists given the fragmented nature of the construction industry. The CI was established to provide a collaborative forum for every participant in the construction process and is organized into seven Directorates - Construction, Education and Research, Engineering, Equipment, Materials, Owners, and Services - providing an immediate focus area for every interest within the industry. The CRC is one of four committees under the Education and Research Directorate. The purpose of the CRC is to advance engineering knowledge and practice related to construction through stimulating and guiding research and assisting the financing thereof; to interpret and promote the utilization of the findings of research for the construction industry; and to identify future needs in the construction field and publicize them to stimulate appropriate research. The CRC has a membership of more than 100 of the premier construction engineering and management researchers and educators from around the world.

The CRC is endeavoring to develop special publications on various topics, project delivery included, for the benefit of ASCE membership and the construction industry that has so generously supported academic research and educational efforts. The CRC hopes that this effort will assist in advancing collaboration and research on project delivery methods. It is anticipated that the experiences, successes, and questions raised by the contributors to this publication will foster additional experimentation, research, and dialogue among all segments of the highway design and construction industry.

Early in this process of developing this publication, it was decided that this publication would contain rigorously peer-reviewed chapters. More than 15 CRC members were involved in the review process on a purely volunteer basis. The editors would like to sincerely thank all of the reviewers for their efforts and diligence in reviewing the papers in this publication. The editors would also like to thank the CI for their support in the production and dissemination of this publication. Without the CI and its membership, this work would not have been possible.

Introduction

The United States (US) highway system is the largest and most efficient network in the world. It was primarily built through a traditional design-bid-build delivery approach in which unit price construction contracts are awarded to the lowest bidder. The traditional approach was created to provide a transparent system of checks and balances between quality and cost. Federal and state highway agencies have the responsibility to design and deliver facilities that are safe and durable. Low bid procurement fosters an environment of fair and open competition that has allowed generations of workers to enter the market of public construction. Unit price contracts provide an equitable allocation of risks for quantities and price.

While the traditional project delivery approach has served the US public well, it has also received criticisms stemming from long delivery times, excessive cost growth and litigious relationships. Continuing to face increasing demands of the traveling public with declining staffs, federal, state and local agencies are employing alternative project delivery, procurement and contracting methods to improve the efficiency and effectiveness of public sector project delivery. In response to dissatisfaction by some stakeholders regarding cost, schedule, and quality performance, the Transportation Research Board (TRB) established a Task Force on Innovative Contracting Practices (A2T51) in 1987. This task force was created for the purpose of identifying promising innovative contracting practices for further evaluation. In December 1991, TRB published the final recommendations of Task Force A2T51 in a benchmark document entitled *Transportation Research Circular Number 386: Innovative Contracting Practices*. In 1990, the Federal Highway Administration (FHWA) implemented Special Experimental Projects 14 (SEP 14) to provide a means for evaluating some of the task force's more project-specific recommendations. While SEP 14 is still in use today to monitor innovative contracting methods, many innovative methods, such as time plus cost (A+B) bidding, lane rental, and warranties, have become mainstream and do not require SEP 14 approval on projects with federal aid in financing.

This publication provides a comprehensive and objective presentation of the use of alternative delivery, procurement and contracting methods in the US highway system. The following is a summary of articles included in this publication.

Project Delivery Approaches

"Key Implementation Issues and Lessons Learned with Design-Build Projects": The design-build project delivery method is a relatively new project delivery method for the highway industry. The successful implementation of this approach will ultimately depend upon the implementation of lessons learned by the State Departments of Transportation (DOTs). Gibson, O'Connor, Migliaccio, and Walewski evaluate the

implementation of recommendations in the planning and procurement phases of the Texas DOT's $1.3 billion SH 130 design-build project. In order to gain the full benefits of design-build, the authors believe that Texas DOT and other contracting agencies need to understand, assess and allocate risks in a fair and cost effective manner. While the SH 130 is larger than most State DOT contracts, the lessons learned on SH 130 will serve as a benchmark for TxDOT and other State DOT interested in taking full advantage of this new project delivery method.

"Development of Performance Warranties for Performance-Based Road Maintenance Contracts": Another project delivery method that is seldom used in the US but has the potential for wider acceptance by the highway industry is the use of performance-based maintenance contracting. Ozbek and de la Garza explore the issues associated with the use of warranties in such contracts. The authors discuss the potential benefits and rationale for the use of warranties on performance-based maintenance contracts. The study includes a warranty clause template for the consideration of agencies interested in this approach.

"Miami Intermodal Center – Introducing "CM-At-Risk" to Transportation Construction": The "Construction Manager at Risk" project delivery method is an approach that is familiar to many in the vertical building construction industry; however, its use in the highway industry has been limited to a few non-traditional projects. Minchin, Thakkar, and Ellis discuss the potential benefits and issues associated with the use of CM-at-Risk for the first major transportation project in the US – the $1.35 billion Miami Intermodal Center – a large parking garage / car rental facility at Miami International Airport. The authors compare and contrast CM-at-Risk with other project delivery methods. They cite the following potential advantages in using CM-at-Risk: greater owner control of the design process than found in design-build, the ability to select a contractor with specialized expertise, cost control with a guaranteed maximum price, more effective use of constructability and value engineering expertise in the design phase of the project and more flexibility to deal with unforeseen changes in design. The authors noted, however, that the late acquisition of the construction manager seemed to cause issues and problems for one phase of the contract.

Procurement Methods

"Implementing Best-Value Procurement in Highway Construction Projects": Another alternate procurement method being evaluated by the State DOTs is best-value. This process provides for the use of both price and non-price based factors in the selection of the successful contractor. Gransberg, Molenaar, Scott and Smith analyze the procurement documents of over 50 best-value projects and present the results in a manner that will be helpful to State DOTs in developing procurement and contracting strategies to ensure quality and enhanced performance. The best-value selection plans are categorized into best-value parameters, evaluation criteria, scoring systems and award algorithms. The results of the project literature search, the case studies and a

survey of contracting agencies indicate that there is a growing interest in the selection of a contractor with a proven record of success for special projects rather than relying on the traditional procurement system that is focused solely on the lowest initial price.

"Preference for A+B Contracting Technique Among State Departments of Transportation": One of the more commonly used alternate procurement methods by the State DOTs is the use of cost-plus-time bidding, or A+B bidding. Its recent popularity is based on the premise that is allows the owner to provide contractual incentives for early completion for projects that are subject to high road user costs. Strong, Raadt and Tometich performed a national survey of State DOT Construction Engineers and concluded that A+B bidding was one of the most effective contracting methods for each of the nine project types considered in the study. While the study confirmed the belief that A+B bidding shortens the project delivery time, it is important to note that the authors did not find evidence that A+B bidding increases internal administrative costs.

"Guidelines for Quality-Based Contractor Qualification": As State DOTs begin to consider options to the low-bid system of procurement, there has been increased interest in evaluating systems that incorporate quality factors in the qualification process. Minchin and Smith describe various quality-based performance measurement systems and provide a revised framework for the traditional contracting system used by State DOTs. The successful implementation of a quality-based qualification system would provide contracting industry with another incentive to integrate quality considerations in all phases of the construction operation so that they can remain competitive in an already competitive market.

Contracting Methods

"Guidelines for Warranty Contracting for Highway Construction": This paper received the best paper award for 2002 from the ASCE Journal of Management in Engineering and is being reprinted in this publication due to its significant impact on the industry. As the State DOT's financial and personnel resources continue to shrink in comparison with overall program needs, some owners have expressed increased interest in the use of warranties. Several State DOTs have evaluated pavement warranties and believe that this contracting technique will help them reduce administrative costs, reallocate performance risk, promote contractor innovation, increase the quality of the constructed product and ultimately reduce life cycle costs. Thompson, Anderson, Russell, and Hanna discuss guidelines for implementing warranty provisions for users that have little experience in this area. While the guidelines are intended for agencies that are considering the merits of a warranty program, they will also be helpful to contracting agencies with established warranty programs. The authors examine case study data from Wisconsin DOT's five-year asphalt pavement warranty program. This data shows a significant improvement in the quality of construction when comparing ride and distress values for warranted and non-warranted pavement sections.

"Incentive / Disincentive Contracting Practices for Transportation Projects": State DOTs have found contractual incentives / disincentives (I/D) provisions to be very effective in achieving higher quality and early completion. In particular, the use of I/D provisions and the cost-plus-time bidding technique have generally resulted in great success in reducing the construction time to deliver a critical phase or phases of a project. Sillars and Leray review and consolidate many sources of information regarding I/D provisions for early completion. The authors provide an overview of concepts associated with the successful use of I/D provisions and a discussion of the implementation process that should be used. This process includes the identification of project goals, the selection of potential candidate projects, incentive types, risk management, preparation of specifications, contract administration and an evaluation of the process. The paper includes a model specification for the use of cost-plus-time bidding with and I/D provision.

This page intentionally left blank

Contents