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16. Abstract

Public agencies across the country are pursuing innovative project delivery methods such as design-build (D-B) and construction manager-at-risk (CM-at-risk) to improve cycle-time performance on projects, and numerous transportation departments are currently using D-B for highway construction. Although the Texas Department of Transportation (TxDOT) and the Texas legislature have shown a particular interest in the D-B project delivery method, it is legally unavailable at present, as are any delivery methods outside of the traditional design-bid-build (DBB) process. This study provides an overview of various project delivery methods and assesses their use and criteria for selection should they be made available to TxDOT. The research includes a review of several contracting approaches because these are currently available for use by TxDOT and have few legal restrictions. Suggested guidance to implement a D-B project delivery method is also addressed and further detailed in the accompanying guidebook, *Project Delivery Methods and Contracting Approaches: Assessment and Design-Build Implementation Guidance*.

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PROJECT DELIVERY METHODS AND CONTRACTING APPROACHES AVAILABLE FOR IMPLEMENTATION BY THE TEXAS DEPARTMENT OF TRANSPORTATION

by

John Walewski
G. Edward Gibson, Jr.
Jason Jasper

Research Report Number 2129-1

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Conducted for the

TEXAS DEPARTMENT OF TRANSPORTATION

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ABSTRACT

Reducing the time from planning to construction of a project can ensure that the benefits of the project are available sooner to the traveling public. Various public agencies are pursuing innovative project delivery methods such as design-build and construction manager-at-risk to improve cycle-time performance on projects, and twenty-four state departments of transportation are currently using the design-build method for highway construction. Although the Texas Department of Transportation and the Texas legislature have shown a particular interest in the design-build project delivery method, currently it is legally unavailable and is one of several delivery methods that could be beneficial. This report provides an overview of the project delivery methods, assesses the benefits of their use and compliance with current laws. This study also provides a brief review of contracting approaches that are available for highway construction. Suggested guidance to implement a design-build project delivery method is provided, as are recommendations to improve the future effectiveness of implementing alternative project delivery methods.

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IMPLEMENTATION RECOMMENDATIONS

Public agencies across the country are pursuing innovative project delivery *methods* such as design-build (D-B) and construction manager-at-risk (CM-at-risk) to improve cycle-time performance on projects, and numerous transportation departments are currently using D-B for highway construction. Although the Texas Department of Transportation (TxDOT) and the Texas legislature have shown a particular interest in the D-B project delivery method, it is legally unavailable at present, as are any delivery methods outside of the traditional design-bid-build (DBB) process. This study provides an overview of various project delivery methods and assesses their use and criteria for selection were they made available to TxDOT. The research includes a review of several contracting *approaches* because these are currently available for use by TxDOT and have few legal restrictions. Suggested guidance to implement a D-B project delivery method is also addressed and further detailed in the accompanying guidebook, *Project Delivery Methods and Contracting Approaches: Assessment and Design-Build Implementation Guidance*.

Recommendations for implementation of the findings of this study are as follows:

1. Although project delivery methods such as D-B and construction manager-at-risk (CM-at-risk) are unavailable under state law, many innovative contracting approaches, such as A+B contracting, lane rental, and incentives/disincentives, are applicable to traditional DBB projects. TxDOT has applied some of these practices on a limited basis, but should implement a much more aggressive and structured program to evaluate their benefits and deployment on projects.
2. TxDOT should expect that alternative project delivery methods such as D-B will become available as early as 2003. Nearly all other public construction agencies in Texas have been authorized to use innovative project delivery methods as have an increasing number of state DOTs. TxDOT should use the next two years to develop a systematic process to evaluate project delivery methods and contracting approaches, as well as training and human resources preparation.
3. We strongly encourage TxDOT to budget the necessary resources to attend seminars, training sessions, national meetings, and conduct site visits to ensure that staff are adequately prepared for using innovative project delivery methods and contracting approaches.

4. TxDOT should provide input to the legislature on the benefits of alternative project delivery methods for highway construction, as well as an assessment of the provisions proposed by Senate Bill 298 during the 2001 legislative session. Specifically, future legislation should permit a full portfolio of delivery methods including D-B, CM-at-risk, and privatization. The provision requiring a $50 million minimum project size for D-B projects has little basis and should be lowered or omitted.

In summary, TxDOT is lagging behind many other states in the implementation of alternative contract delivery methods due to legislative restrictions. However, there are proven contracting approaches that may be applied immediately to TxDOT projects that could significantly enhance their delivery speed and reduce the impact of construction on the traveling public.

CHAPTER 1. INTRODUCTION

1.1 Overview

Highways play an increasing role in the economic development of Texas and benefits can be achieved from techniques that improve the speed and effectiveness of highway-related construction. While other public entities are utilizing alternative project delivery methods and contracting approaches with increasing frequency, current state law limits the Texas Department of Transportation (TxDOT) to the design-bid-build (DBB) project delivery method, and few innovative contracting approaches have been extensively used. In response, TxDOT initiated a research project with the Center for Transportation Research (CTR) at The University of Texas at Austin to investigate the legal, regulatory, and policy implications of innovative project delivery methods because of the proven success by the public building sector in Texas, and other state departments of transportation (DOTs). The objectives of this research investigation were to identify and determine the benefits of innovative project delivery methods and contracting approaches, evaluate and summarize the current legal climate in terms of choosing these strategies, develop draft procedures for implementing the methods that are currently available or under development for use, and prepare project documentation including recommendations and guidelines as needed. This study included the development of the accompanying design-build (D-B) implementation guidebook, *Project Delivery Methods and Contracting Approaches: Assessment and Design-Build Implementation Guidance*.

Alternative project delivery and contracting methods are not intended to replace the standard DBB method that is applicable to most projects. As a result, the goal of this study was to identify the portfolio of project delivery methodologies and contracting approaches that are available, evaluate their strengths and weaknesses, and determine when and where they should be applied. Based on past legislative actions and industry trends, it is in the opinion of the researchers that D-B will eventually become one of the many project delivery methods and contracting approaches for use by TxDOT.[1] Although this research effort highlights the D-B

[1] For this research project and guidebook a project delivery method equates to a procurement approach and defines the relationships, roles and responsibilities of project team members and the sequence of activities required to complete a project. A contracting approach is a specific procedure used under the larger umbrella of a procurement method to provide techniques for bidding, managing, and specifying a project. Further details and examples are discussed in Chapter 2.

project delivery method, it is one of several delivery methods that could benefit TxDOT and the traveling public. To maximize public resources and benefits to its customers, adequate consideration should be given to the portfolio of construction project delivery methods and contracting approaches every time TxDOT undertakes a project.

The succeeding sections of this report address the statement of task in the following manner. The remainder of Chapter 1 focuses on the background issues and rationale behind the switch to alternative project delivery methods and contracting approaches. Chapter 2 provides an overview and description of the different project delivery methods and—to a lesser extent—contracting approaches, their use and application, as well as a process to assess and select among the project delivery options. Chapter 3 is a legal review of the project delivery methods available to TxDOT. Chapter 4 in an overview of the D-B method and the efforts needs to successfully implement this procedure. Chapter 5 summarizes the findings and recommendations of this research project.

1.2 Methodology

The initial task of the research team was to perform an extensive literature review to gain a greater understanding of the current body of knowledge, practice, and research related to highway construction procurement and contracting. The focus of the literature review was academic, legal, and both public and private publications, manuals, etc. related to the state-of – the-art project delivery methods and contracting approaches. Appendix A is the resulting bibliography from the literature review. A total of six industry forums and conferences were attended to investigate and determine the current project delivery methods and contracting approaches of other state DOTs. A detailed review of the legal and regulatory status was performed and summarized to determine which procurement tools are legally available to TxDOT. Based on input from the TxDOT project team and literature review, a structured interview instrument was developed as given in Appendix B. Thirteen structured interviews were conducted with experts from the construction industry, the legal community and academia to include a wide-range of perspectives in order to assess the current status and availability of delivery methods and contracting approaches. Conversations were held with an additional eighteen industry and academic contacts to solicit specific information. Four meetings were held with the TxDOT project team to provide input and guidance to the

research team's work and direction. A listing of seminars, interviews, contacts and meetings are given in Appendix C.

1.3 Background

Increased project delivery flexibility and responsibility is not new to public agencies in Texas with the alternative delivery method made available to public education entities in 1995, 1997 for higher education, and extended in 2001 to cities and counties as well as the General Service Commission (GSC). Procurement options for public agencies in Texas were dramatically changed with the passage of S.B. 1 during the 74th legislative session. School districts were the first public agencies in Texas with the ability to consider factors beyond price—such as schedule, quality, safety, and experience—when making facility procurement decisions. The initial changes to the Education Code were very general and gave little guidance. However, with input from state agency staff, various professional organizations, individual engineers, architects, contractors, attorneys, and consultants, the law was refined as well as expanded (S.B. 583, 75th session; S.B. 669, 76th session) to include higher education. Furthermore, with the passage of S.B. 311 and S.B. 510 in 2001 during the 77th session, state agencies, cities, and counties are authorized to use alternative project delivery methods for buildings and facilities.

Experience and results with the revised procurement laws have been positive. School districts and universities have had greater flexibility in choosing contracting and delivery approaches. For example, the average total project duration on twenty-one D-B projects (eighteen buildings and three utility upgrades) decreased by 33 percent at the University of Texas System (Gallegos 2001). However, because no adequate and systematic method exists to evaluate how project delivery methods and contracting approaches have impacted costs, it is difficult to validate the financial impacts of their use (Molenaar and Gransberg 2001). Nevertheless, the consensus is that better control over schedule, quality, risk, etc., has been received when agencies give consideration to the portfolio of options that are available (Sanvido and Konchar 1998; Federal Highway Administration (FHWA) 1998).

It is reasonable to believe that in response to the success with alternative project delivery methods, the 77th Legislature felt reasonably sure that state agencies under the jurisdiction of the GSC, as well as cities and counties, will be able to achieve the same success. With adequate support and planning it is also reasonable to believe that the same flexibility

could work equally well for highway construction. It is the opinion of the authors that in the movement toward uniform procurement practices for public construction throughout Texas, TxDOT should anticipate and undertake what is necessary to prepare for similar responsibilities granted to its peers.

The Texas Comptroller of Public Accounts e-Texas Commission recommended in December 2000 that TxDOT needs to focus more on quickly delivering projects, and recommended that D-B and A+B bidding should be pursued by TxDOT. The Commission did not call for a wholesale replacement of DBB, but rather the two methodologies should be used where they will provide benefits to the taxpayer, such as increased completion speed on complex highway projects (Texas Comptroller 2000).

The Texas legislature controls the ability of TxDOT to deploy project delivery methods by any other means than the traditional design-bid-build system and has shown interest in accelerating the procurement of projects to minimize costs and the negative impacts to road users and to maximize quality. To date, much of the emphasis on improving project delivery practices for highways has focused on D-B with unsuccessful attempts made in the past two legislative sessions to grant D-B authority to TxDOT.

Nonpassage of D-B authority can be viewed as an *opportunity* for TxDOT to identify the limitations of DBB, analyze other project delivery and contracting approaches, and gain the required knowledge, skills, etc. needed to successfully implement D-B. Shifting away from the existing paradigm is best achieved by an analysis of how other entities have begun to move toward a new model of public infrastructure and highway procurement that supports the use of multiple project delivery methods and contracting approaches (Miller and Ibbs et al. 2000). It is anticipated that at a minimum, D-B authority for TxDOT will be reconsidered at the 2003 legislative session. *TxDOT should use the interim time to prepare and gain the knowledge needed to make the most informed decisions relative to efficient and effective project delivery and contracting approaches.*

1.4 Need for Change

Increasing traffic demands, budget issues, and public frustration contribute to the perception that highway construction in the U.S. is not delivered in a timely manner. To address the needs of the traveling public, numerous states have sought change and innovation in project delivery methods and contracting approaches focusing on quality, time, and other

value adding factors. Furthermore, the relationship among the state DOTs, highway designers, and contractors is changing. Smaller staffs at state agencies have created a situation where work traditionally done as a state function is now contracted out and these staffing issues have come at a time when funding for road construction has nearly doubled. Major issues that are driving innovative project delivery methods and contracting approaches include:

1. End-user and political demands for shorter project durations for highway projects;
2. Increased traffic volume and corresponding workload;
3. Decrease in DOT staff levels;
4. Changing industry practices and acceptance of nontraditional methods in the public sector;
5. Increasing flexibility in selecting the proper delivery method that best meets the situation and maximizes public resources; and
6. Successful use by others.

TxDOT uses a "pay as you go" strategy for funding highway construction and it is estimated that this method finances approximately 30 percent of highway needs in Texas and that present funding levels were found to be 60 percent below the level required just to maintain current conditions (TxDOT 2000). In response, the 77th Legislature has not set aside any new sources of highway funding, but rather allowed for Texans to vote for a constitutional amendment to allow the state to use up to 30 percent of its $600 million federal highway funding to leverage bonds sold by newly created regional transportation authorities with payoff by collecting tolls.

Because the current DBB procurement process is limited in its attempt to meet the current demand, TxDOT should anticipate changes not only to how projects are funded, but also should seek a more comprehensive approach of incorporating project delivery methods and contracting approaches to improve highway acquisition. Miller's (1997) work on "engineering systems integration" calls for a discipline that treats both the choice of project delivery method and the project finance method as variables to be considered by the engineer in the development and comparison of alternatives for the owner.

Acceptance of innovative project delivery methods for highway projects has also gained momentum in the past few years. Twenty-four state DOTs are currently using D-B and forty-two states have approved at least limited use of D-B on public projects (Molenaar 1999;

FHWA 2001a). With passage of the Transportation Equity Act for the 21st Century (TEA-21), D-B is poised to become considerably more commonplace for state DOTs, because TEA-21 Section 1307 (a) allows state DOTs or local transportation agencies to award a D-B contract for a qualified project using any procurement process permitted by applicable state or local law.

Innovative project delivery methods such as D-B and construction management-at-risk (CM-at-risk) can improve cycle-time performance on both public and private projects and for the past 15 years their use has steadily increased. Research completed on *building* projects by the Construction Industry Institute has shown that D-B contracting methods can significantly improve project delivery time and give better cost and quality performance. In an analysis involving 351 U.S. building projects, D-B unit costs were 6 percent less than DBB and construction speed was 12 percent faster (Sanvido 1998).

Exclusive use of the DBB project delivery method has given owners minimal reasons to adopt innovations because of their acceptance and control over the process. Innovation requires all of the parties involved to change roles and share risks and responsibilities. As DOT staffs continue to decrease owing to budget cuts, retirements, and salary inequities, more work will be outsourced. Lack of experience will require further reliance on outside firms to take the lead with certain project phases. Alternative project delivery methods can enhance the application of engineering knowledge into the procurement process, filling the gap left by retirement and workforce shortages. In other words, these methods will allow DOTs to leverage expertise. Although a proliferation of construction project delivery systems and contracting approaches exists, there is considerable confusion on their application and use. The next chapter provides an overview and clarification of the differing innovative project delivery methods and contracting approaches being used on transportation projects.

CHAPTER 2. INNOVATIVE PROJECT DELIVERY AND CONTRACTING METHODS

2.1 Introduction

Noting the difference between delivery methods and contracting approaches is critical as this report's focus is on delivery methods, and specifically on design-build (D-B). Upon making the distinction, the following sections describe the characteristics, benefits, and drawbacks for project delivery methods used for highway projects. Per the statement of task, this section includes a matrix to assist the Texas Department of Transportation (TxDOT) in the selection of project delivery methods — if and when it is given the authority to do so. The chapter concludes with a brief overview of the various contacting approaches being used by transportation departments in conjunction with an alternative delivery method or a supplement to design-bid-build (DBB).

The difference between a procurement approach and a contracting approach is related to scope. A procurement approach is a general scheme for purchasing services. For this research investigation and guidebook, procurement approaches equate to project delivery systems or methods. A project delivery method is the process by which the components of design and construction—including the roles and responsibilities, sequence of activities, cost, materials, labor, etc.—are combined to complete a project (NCHRP 1999; Loulakis and Huffman 2000). A contracting approach is a specific technique used under the larger umbrella of a procurement approach to provide techniques for bidding, managing, and specifying a project.

There are several approaches to project delivery procurement that are currently used in the highway industry. In the U.S., the major project delivery methods are DBB, D-B, construction management-at-risk (CM-at-risk), and privatization. Privatization can be broken down into wholly private ventures and those that are a partnership between public and private entities.

In addition to the these alternative project delivery methods, many types of contracting innovations have occurred in the construction industry over the past two decades and in recent years the highway sector has begun to adopt many of these techniques. After decades of using

strictly traditional methods, innovative delivery methods and contracting approaches are being implemented in several states, while many others are under review for possible implementation. A survey was conducted in 1999 by researchers at the University of Kentucky of all fifty state departments of transportation (DOTs) and four Canadian DOTs to determine their experience with ten selected innovative contracting practices (Hancher 1999). The survey asked each agency to identify innovative practices that have been tried and to rate the benefit of using each innovation and the difficulty of its implementation. Twenty-four DOTs responded and the results (Table 2.1) show that many of the respondents had experimented with the different methods; nearly all believed the new methods were beneficial—although implementation would be difficult. In this survey, D-B was included as a contracting practice and had been used by less than 50 percent of the respondents.

Table 2.1 – Contracting Practices Used by Transportation Departments

Contract Innovation	Percentage of Respondents Use	Benefit Received	Difficulty of Implementing
Quality Control by Contractor	93.1	3.9	3.4
Partnering	89.7	3.9	2.7
A + B (Cost + Time)	69.0	3.5	2.4
Constructability Review	65.5	3.9	2.9
Lane Rental	52.0	3.1	2.8
Performance Specifications	52.0	3.3	3.0
Design-Build	48.3	3.0	3.3
Warranties	20.7	3.2	3.0
A + B + C (Cost + Time + Quality)	3.4	4.0	4.0

The benefit perceived from each innovation was rated by the respondents from 1.0 (low) to 5.0 (high). The difficulty of implementing the innovation was rated from 1.0 (easy) to 5.0 (very difficult). Source: Hancher and Ross, TR News, Number 205, Nov-Dec 1999, p. 14.

Although TxDOT is limited to the DBB project delivery method, various contracting approaches and strategies such as constructability reviews, incentives/disincentives, and warranties are available, and TxDOT has already used DBB in combination with various

contracting approaches. For example, the Texas Comptroller reported that TxDOT has used on a limited basis A + B contracting in conjunction with the DBB project delivery method (Texas Comptroller 2000). Lane rental is another contracting approach that TxDOT has begun to use as a way to encourage better lane closure management. The Construction Division of TxDOT has developed a guide—found in Appendix D—to the contracting strategies used and the contract provisions from the 1993 TxDOT Specifications Book. With the advent of several alternative project delivery methods as well as innovative contracting approaches, a host of possibilities exist to provide the best value to the state considering time, cost, and quality. Given the range of possible selections, uncertainty exists on which combination of delivery method and contracting approaches is the best fit for a specific project. It should be noted that selection of project delivery systems (if available) and contracting approaches used should be a project-specific decision *process* and is very dependent on the type of project, risk profile, human resources available, and overall objectives of the project.

2.2 Evolving Practices

Various contracting approaches and project delivery methods are used in the highway industry. The American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Construction, along with the Federal Highway Administration (FHWA), have developed a catalogue of project delivery methods and contracting approaches. The FHWA has served as a resource in coordinating, research, training, educational efforts, and other program issues related to project delivery and contracting. Initiatives undertaken by the FHWA in the mid-1980s allowed state DOTs to pilot-test innovative contracting approaches on federally funded projects and this paved the way for significant changes in highway contracting. As a result, state DOTs are now much more likely to adopt project delivery methods and contracting approaches that have been successfully used by others. In 1987 the Transportation Research Board (TRB), with FHWA cooperation, formed a task force to identify promising innovative contracting practices. The final report of the task force (TRB 1991) was followed by FHWA approval of Special Experimental Project (SEP) No. 14, a process of evaluating innovative project delivery and contracting proposals suggested by the task force or by state DOTs. TxDOT is already using some contracting innovations like incentive and disincentive clauses and factoring in construction time as part of the bidding procedures.

Initiation of SEP 14 in 1990 by the FHWA was a major step to evaluate project delivery and contracting practices considered to be innovative to highway construction in the United States. From the beginning, the objectives of SEP 14 were to identify, evaluate, and document the methods and approaches that brought life-cycle value and quality that were compatible with the open competitive bid process. Furthermore, FHWA has been consistent in incorporating the use of project delivery and contracting practices within the structure of awarding contracts to the lowest responsive and responsible bidder.

2.3 Project Delivery Methods

Construction delivery systems provide the necessary frameworks for the planning, design, construction and even the operation/maintenance of capital projects. These methods include design-bid-build, design-build, construction management (agency and at-risk), multi-prime contracting, design-build-operate-maintain and fast-track construction (Phillips, et al. 1997). The following sections briefly define and describe these processes with special consideration given to the advantages and disadvantages of design-bid-build and design-build.

2.3.1 *Design-Bid-Build*

The traditional project delivery method for highway construction projects in the United States has been DBB. This method separates design and construction by both sequence and contract. Using this method, state DOTs normally contract with design and engineering firms and once the designs and specifications are completed, the project is ready for bid solicitation. Because the steps are followed sequentially, firm costs can usually be established on the design, thus simplifying contractor selection for the owner because price is the major criterion used. DBB provides minimal interaction between the designer and constructor, generally omits reviews for constructability cost savings, and often creates an adversarial relationship between the parties.

DBB is the standard procurement methodology used by TxDOT for highway construction. DBB contracting practices in Texas are structured to ensure fairness and manage risk. As part of the lowest responsive bidder procedures, design, technical specifications, and management practices focus on minimizing risk for TxDOT. Under this traditional approach, design documents for a project are first completed and construction is awarded to the qualified

bidder with the lowest price. TxDOT utilizes the services of either in-house staff or engineering consulting firms to design projects. Although the construction contract must be awarded to the responsive and responsible bidder with the lowest submitted bid, federal aid regulations and the Texas Transportation Code require that engineering and design services contracts be awarded on the basis of qualifications that can then be followed by competitive negotiations. Pay items for construction are generally established on a unit price basis, the specifications are method based, and the role of TxDOT (or its agent) is mostly administration and inspection.

In structuring a competitively bid, fixed-price procedure to award highway construction projects, there is clear separation between the design and construction project phases. Every state in the U.S. regulates and restricts the practice of professional engineers and architects. In Texas, professional engineers are charged by state law with protecting the public's interest first before giving consideration to profit, and only licensed engineers are allowed to perform professional engineering services. The conflict between qualification-based selection procedures for engineers and the sealed-bid selection for constructors is a major factor in influencing why procurement methods other than the traditional DBB are illegal under some state procurement and licensing statutes.

In general, the traditional benefits associated with DBB include:

- Larger pool of potential bidders and subsequent competition
- Simple process
- Risk and rewards are easy to understand
- Approach is generally considered to be fair
- No requirements for justifying use of this technique
- Reduces potential for graft and corruption
- Well known and accepted by transportation agencies, designers, and contractors throughout the country

Drawbacks associated with DBB include:

- Process does not value speed of project delivery, i.e., it is a sequential procedure rather than concurrent
- Innovation is often stifled and often difficult to implement
- Disputes arise often over authority, responsibility, and quality

- Limited ability to preclude poor or dishonest contractors from bidding
- Sometimes difficult to get construction knowledge applied into the design process

2.3.2 Design-Build

The D-B concept allows the contractor maximum flexibility for innovation in the selection of design, materials, and construction methods. With D-B procurement, the contracting agency identifies the end result project parameters and establishes the design criteria. The prospective bidders then develop design proposals that optimize their construction abilities. The submitted proposals are rated by the contracting agency based on factors such as design quality, timeliness, management capability, cost; and these factors may be used to adjust the bids for the purpose of awarding the contract.

Federal statutes require that construction contracts be awarded to the lowest responsive, responsible bidder, while engineering service contracts are awarded according to qualifications-based selection procedures. Because the D-B concept combines these two types of services into one contract, the FHWA considers D-B contracts experimental. FHWA's SEP-14 concept approval is necessary for all federally funded D-B projects. Appendix E lists the project approved under SEP-14 as of April 2001.

D-B has been increasingly used by state DOTs despite its experimental status and opposition from some members of the highway construction industry. A persistent belief is that smaller firms would be economically disadvantaged when attempting to compete with larger firms on D-B contracts (ARBTA 2001; AGC 2001; ASHTO, 1998). It has also been suggested that bidders would incur significant expenses preparing proposals and it would be difficult for smaller firms to stay competitive (FHWA 1998). The principles of D-B present an apparent conflict with the federal Brooks Act that requires qualifications-based selection procedures for engineering and architectural service contracts and the design professional's loyalty to the public owner (Schenck 2000). Professional engineering associations have also expressed concerns with D-B regarding professional design liability issues (ACEC 2000).

TEA-21 provides a modification of Title 23, United States Code, that will eventually allow states to use D-B contracting on a limited basis. FHWA was required to develop D-B regulations by June 9, 2001, but as of that date was still involved with the rule making. After the final rules are developed, states will be able to utilize the D-B technique for projects over

$50 million and ITS projects over $5 million without FHWA headquarters' approval. Other D-B projects may be approved under FHWA's SEP-14 program. FHWA is scheduled to submit a report to Congress on the cost-effectiveness of D-B by June 9, 2003.

2.3.3 Design-Build-Warrant

Some agencies have combined the conditions of a warranty clause with a D-B contract. This technique may be more appropriate for projects that incorporate technological features where the contracting agency would benefit from a limited warranty for workmanship, materials, and functionality such as intelligent transportation systems.

A limited number of states, including Alaska, Michigan, and Utah, have used design-build-warrant projects under SEP-14 (FHWA 2000).

2.3.4 Design-Build-Maintain (Operate)

The design-build-maintain (operate) approach to project delivery involves the investment of private capital to finance, design, construct, operate, and maintain a road or highway project for public use for a specific term. During this term, the investment consortium is able to collect revenue from facility users to repay the debt, operate and maintain the roadway, and incur a profit. At the conclusion of the term of ownership, the roadway is transferred to the government at no cost. While no federal-aid projects have utilized the design-build-maintain concept, several states have initiated toll road projects under this contracting method.

California used this concept on several toll road projects in the state. These toll roads include the San Joaquin Hills Corridor, Eastern Transportation Corridors, and Foothill Transportation Corridors. These three corridors will provide more than 96 km (60 mi) of new freeways at a cost of approximately $2.5 billion. Contracts have been awarded, and design and construction work is underway. Similarly, California Assembly Bill 680 provides the legal authority and financing for several toll roads that use the plan, design, finance, construct, and lease-back method of procurement and ownership. Virginia and Colorado have also used a similar concept known as design-build-maintain on nonfederal-aid toll road projects. Canada's Northumberland Strait Crossing project is a design-build-maintain project that provides for the financing, design, construction, and operation of a 12.9 km bridge for 35 years following

construction. Similarly, the construction of the Toronto Toll Highway 407 project is being delivered under the design-build-operate concept (AASHTO 1998).

2.3.5 Construction Management

Construction management is a broad term covering a variety of project delivery methods in which a construction manager (CM) is part of the project team to provide oversight with cost, schedule, and project management activities. CMs serve in varying capacities and authority depending on the project and the management structure desired Generally, the CM acts as a go-between to the owner and contractor/designer. CM fees are relative to the service performed, which range from advising during a particular phase of a project to acting as the owner's agent in all matters. In general, CMs are used on projects that are relatively complex where budgets or schedule must be closely monitored and those requiring extensive coordination of consultants or subcontractors.

In Texas, the 74th Legislature through Senate Bill No. 1 and the 75th Legislature through Senate Bill 583 authorized school districts and institutions of higher learning to use, among other methods, construction management to construct, rehabilitate, alter, or repair facilities (AGC-Texas 1998). Under the provision of the Education Code, school districts procure construction management—either agency or risk—under the request for proposal provisions. While some districts engage the services of project managers, program managers, or a CM-advisor to assist or augment staff, these *service* roles are recognized as delivery methods. Although construction management is not a licensed activity in Texas, most CMs are trained, and at times, licensed as an engineer or architect. Often, the term CM is used generically to describe a situation where the owner hires a consultant to act as his advisor or agent on a project. Little evidence was found in the literature on the use of CM methods for highway projects. The differences among the three types of construction management arrangements are discussed in the next sections.

2.3.6 Construction Manager-at-Risk (CM-at-risk)

In CM-at-risk, the CM is hired prior to the completion of design to act as project coordinator and general contractor. Selection is based on criteria that combine qualifications, experience, and possibly fee and general conditions. Compared to other options, this method is contractually similar to DBB because the owner contracts separately with a designer and a

contractor. CM-at-risk has the advisory benefits of CM-advisor, and involves the early cost commitment characteristics of D-B. The CM-at-risk provides a guaranteed maximum price (GMP) to fix the cost and competitively bids or receives proposals from the trades and subcontractors. The CM-at-risk contractor typically assumes all the liability and responsibility of a general contractor.

Using CM-at-risk, the owner contracts with the designer just before or at the same time as the CM-at-risk. The CM-at-risk subsequently provides assistance in evaluating costs, scheduling, and constructability. When construction documents are complete, the CM-at-risk contractor generally will rebid some or all of the construction to other contractors in order to improve profitability.

CM-at-risk is commonly used when contract cost, schedule, or construction are expected to be difficult to manage or when a project is fast tracked. The principal advantages are the initial focus on design issues, construction advice during the design process, careful oversight of costs and schedule, early cost commitments, and opportunities to shorten the overall project schedule (Sanvido 1998; AGC-Texas 1998). This method has been used extensively on educational facilities in Texas since 1997. Disadvantages include the potential for adversarial relationships, change orders and delay claims from low-bidding prime contractors, difficulty in evaluating the validity of GMP, and the reduced ability of the owner to control construction quality (AGC-Texas 1998).

2.3.7 Construction Manager as Agent (CM-agent)

This project delivery method is characterized by the addition of a CM with agency power of the owner. This allows the owner to step back from a project. Like CMs who are advisory, those acting as the owner's agent are hired for their expertise in cost control, schedule management, design management, and construction management. Because CM-agents assume financial authority for a project, they also must have experience in managing the fiscal aspects of a project.

When using a CM-agent the owner typically hires the CM-agent to oversee the entire project from design through the construction process. The principal advantage to the method lies in giving the owner, as well as others working on the project, a single point of responsibility, which can shorten the project's schedule. Because the CM-agent typically uses a

traditional DBB sequence, it is also easy for the owner to track progress and assign responsibilities. It also allows the owner to augment staff shortages.

2.3.8 Construction Manager as Advisor (CM-advisor)

This is a project delivery method where a CM consultant is brought in who acts as an advisor to the owner. The authority given to CM-advisor varies, but generally the designer and contractor maintain their conventional roles. The CM-advisor is hired by the owner either at the onset of the project or once the design is complete. When hired at the beginning of a project, the CM-advisor generally oversees planning and design regarding their implications on cost, schedule, and constructability. The CM-advisor also may advise regarding the documents developed for construction bidding. During contractor selection, the CM-advisor often serves in an advisory capacity and in most cases stays on until the completion of the project.

Because the project adds a consultant with an associated fee, a CM-advisor is more appropriate for large, complex projects, rather than those that are relatively small and routine. A CM-advisor is also appropriate for owners who want to hire a designer and contractor but do not have the ability, resources, or expertise to oversee planning, design, and construction. The principal advantage of a CM-advisor is to ease oversight responsibilities for the owner in tracking costs and schedule. Disadvantages include the added consultant cost and the confusion of traditional project roles by increasing relationship complexity.

2.3.9 Multi-Prime and Fast-Track Contracting

Multiple prime contracting is a variation on other delivery systems where the owner or agent contracts with a number of trade contractors instead of one general, prime contractor. The supposed advantage of multi-prime contracting lies in the reduction of the layers of overhead and profit on the project. On conventional construction projects, the prime contractor marks up the price of the work performed by its trade subcontractors to reflect the prime contractor's administrative and overhead cost. By using multi-prime contracting, the owner seeks to avoid this mark up. While the owner may save money by avoiding paying an additional layer of overhead and profit, he or she accepts responsibility for the administration and coordination of the trade contractors. Often, owners are ill-equipped to coordinate and administer a multi-prime project, and thus ultimately lose money through project cost overruns and/or litigation (Bramble and West 1999).

Fast-track (or phased) construction overlaps portions of the construction and design phases so that certain elements of the construction work can start early. While fast-track construction is normally associated with D-B projects, it can also be applied to other delivery methods. The fundamental advantage of fast-track construction is time savings. However, fast-tract construction can lead to pitfalls, such as rework because of the contractor getting ahead of the ultimate design (Bramble and West 1999).

2.4. Summary of Methods Available to TxDOT

Under current state law, TxDOT is limited to traditional DBB contract delivery system, as summarized in Table 2.2. The Texas Transportation Code requires competitive bidding for highway improvement contracts,[1] an approach originally intended to protect public funds from graft and favoritism. Furthermore, design service contracts in Texas must be let on a qualifications basis.[1] This approach intends to address public safety issues, and protect the quality of these critically important services, as well as the independence of the designers. Because D-B contracting requires a joint effort between construction and design services, it is impossible to procure this work under current Texas law without violating one of the aforementioned statutes. For example, if work is let based on a competitive bid standard, the design professional's qualification standard would be violated. Similarly, if the work is let on a qualification standard, the contractor's competitive bid standard would be violated. A more detailed treatment of legal implications is given in Chapter 3.

Table 2.2 Summary of Project Delivery Methods Currently Available to TxDOT

	DBB	CM-at-risk	CM-agency	D-B
Available for use by TxDOT	**Yes**	**No**	**No**	**No**
Legal Restraints	**None**	**Yes**	**Yes**	**Yes**

By its very nature, a design-builder may breach the aforementioned statutes owing to his or her overlapping roles as both designer and constructor. Because the selection of a design-builder combines two procurement functions, both the price and qualification

[1] *See* Vernon's Texas Code Annotated §223.001. Contract Requiring Competitive Bids

[1] *See* Vernon's Texas Code Annotated §2254.003. Selection of Provider; Fees

standards must be viewed together. In order to make D-B contracting viable under Texas law, a new procurement standard must satisfy both competing public interests: quality and price. Many public agencies avoid this dilemma by employing a two-step approach to procurement. Most two-step approaches narrow a prospective field of bidders by a minimum qualification standard, then make a final decision based on price. For example, The University of Texas System employs a two-step selection procedure, which separates a preliminary qualification-based selection from a final price-based selection (Liao 2000). Most state DOTs using D-B contracting have transitioned from a sealed bid, fixed-price method to a similar two-step best value method (Molenaar 2000).

To a lesser extent, another area of Texas law could provide an obstacle for TxDOT adopting D-B contracting as a regular means of highway procurement. Texas Civil Statute, Article 3271(a), "Texas Engineering Practice Act," limits the practice of engineering to persons registered under the same, stating: "The privilege of practicing engineering [is] entrusted only to those persons duly licensed and practicing under the provisions of this Act."[2] Because this act limits design services to duly licensed persons, a D-B firm or joint venture, which blurs the lines between construction and engineering, could run the risk of violating this statute. For example, the design-builder's nonengineering staff, which participates in value-engineering or constructability issues of the design, could be involved with the unauthorized practice of engineering.

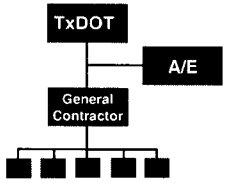
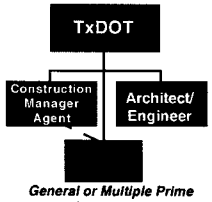
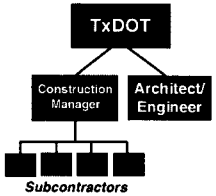
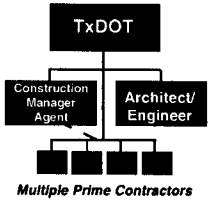
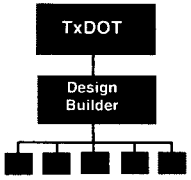
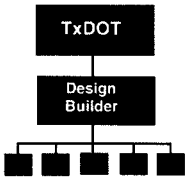
2.5 Matrix of Project Delivery Methods

Both TxDOT and the Texas legislature have shown an interest in pursuing alternative project delivery methods in lieu of the current restrictions. If granted the authority to use the methods described above, TxDOT will need to compare the various alternatives to each other as well as to DBB and evaluate the delivery methods. Table 2.3 is a matrix of the most relevant project delivery methods for highway projects and their various attributes. The matrix allows for a cross comparison of the pros and cons of each method, responsibilities of the parties involved, general assumptions concerning which projects each method is best and least suited for, and generalizations on how each method impacts quality, schedule, cost control, and legal

[2] Vernon's Texas Code Annotated § 2254.004. Contract for Professional Services of Architect, Engineer, or Surveyor

liability. The matrix is intended to provide TxDOT with a simple overview analysis of which delivery method is applicable for a specific project.

Table 2.3 Matrix of Project Delivery Methods

*MATRIX OF PROJECT DELIVERY METHODS**						
Delivery Method	**Traditional Process, Design-Bid-Build**	**Construction Manager-Agent**	**Construction Manager-at-Risk**	**Multi-Prime**	**Design-Build**	**Design/Build/Operate**
Definition	A delivery method where TxDOT selects an architect/engineer based on qualifications to design and develop construction documents from which TxDOT solicits lump sum bids. Selection of the contractor is based on the lowest responsible bid and the contractor serves as a single point of responsibility for construction.	A method where the construction manager serves as an agent for the owner providing pre-construction and construction services in lieu of a general contractor. The construction manager-agent provides design phase assistance but holds no subcontracts nor provides project bonding for the construction. A GC or multiple trade contracts are held by the owner. Selection is based on the proposal offering the best value to the owner.	A method where the construction manager serves as the general contractor providing pre-construction and construction services. The construction manager-at-risk provides design phase consultation in evaluating costs, schedule,and implications of alternative designs. A guaranteed maximum price (GMP) may be issued and the CM-at-risk serves as the responsible party contracting directly with subcontractors during construction.	A method where the owner, or sometimes an agent, oversees multiple contractors as opposed to a general contractor conducting total oversight. The owner or agent assumes greater control over the project but also assumes significantly more risk. The multiple trade contracts are usually held by the owner. Selection is based on the proposal offering the best value to the owner.	A method where a single entity is contracted to provide both design and construction. The design-build team consists of contractor and architect/engineer who contract directly with the subcontractors and is responsible for delivery of the project. Selection of the design-build contractor is based on the proposal offering the best value.	A form of design/build where the investment of private capital is used to finance, design, construct, operate, and maintain a road or highway project for public use for a specific term. During the term the investor are paid-back with toll revenue and after an agreed upon time the project reverts to the public owner.
Pros	• Familiar delivery method • Defined project scope • Single point of responsibility for construction • Open, aggressive bidding • Limits graft and corruption	• Design phase assistance • Selection flexibility • Faster schedule delivery • Change flexability • Non-adversarial relationship	• Selection flexibility • Design phase assistance • Single point of responsibility for construction • Team concept • Faster schedule delivery • Change flexibility	• Selection flexibility • Cost savings possible • Faster schedule delivery • Change flexibility • Greater control over project	• Selection flexibility • Single point of responsibility for design and construction • Faster schedule delivery • Team concept	• Single point of responsibility for all project components • No up-front public cost • Risk carried by investors • Faster schedule delivery • Life-cycle design
Cons	• No design phase assistance • Longer schedule duration • Price not established untill bids • Adversarial relationship • Lack of flexibility for change	• No single point of responsibility • No garanteed price • Owner must manage many contracts	• Adversarial relationship reduced • Difficult for owner to evaluate GMP	• No single point of responsibility • No guaranteed price • Owner must manage many contracts	• Loss of check and balance • Different management techniques required • Potential adversarial relationship between owner and Design/ Builder	• Loss of check and balance • Investment decisions rule • Difficult process to manage • Limited to toll roads
Best Suited	New projects that are not schedule sensitive or subject to potential change.	Large new or renovation projects that are schedule sensitive, difficult to define, or subject to change.	Larger new or renovation projects that are schedule sensitive, difficult to define, or subject to change.	Larger new or renovation projects that are schedule sensitive, difficult to define, or subject to change.	New or renovation projects that are schedule sensitive.	Larger new projects that lack adequate public funding.
Least Suited	Complex projects that are sequence or schedule sensitive. Projects subject to potential change.	Smaller projects	Smaller projects	Smaller projects	Projects that are difficult to define, and are less schedule sensitive.	Smaller projects and those that are not investment grade.

* Adopted from the matrix found in: *Project Delivery for Texas Public Schools* developed by the Texas Building Branch, AGC, Texas Society of Architects, and Consulting Engineers Council of Texas, 1997.

2.6 Contracting Approaches

Highway construction contracting practices in the U.S. have remained relatively stagnant compared to the advances in construction technologies, methods, and materials. With the exclusive use of DBB, transportation agencies have not ventured much further than contracting approaches that dictate exact methods and prescriptive specifications on how the work is to be done. However, in recent years, state highway departments have increasingly used contracting approaches to supplement procurement methods for added short- and long-term benefits. Generally these alternative approaches tend to involve a reallocation of the risks whereas the traditional government contracts tend to be risk adverse. As a result, a significant barrier to the use of alternative contracting approaches is a resistance to change.

The Transportation Research Board (TRB), FHWA, and AASHTO have all begun to explore the benefits of innovative contracting practices as ways to optimize and improve project quality and effectiveness. For example, the National Cooperative Highway Research Program (NCHRP) of TRB has an ongoing project (10-49) to develop comprehensive guidelines for implementing selected nontraditional contracting methods for highway construction projects. The guidelines for nontraditional contracting methods, prepared as part of the project's final report, will be published as *NCHRP Report 451*. The following section conveys the contracting approaches the above organizations have highlighted as the most promising innovations being developed and implemented for highway construction. The approaches are listed in descending order to their usage found in Table 2.1 presented earlier and additional methods have been included at the conclusion of this section. Details on each of the methods are listed below, and the results of the NCHRP 10-49 Panel on developing guidelines for the implementation of non-traditional contracting approaches are discussed in section 2.7.

2.6.1 Quality Assurance/Control

As defined by AASHTO, quality assurance (QA) is the planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. QA specifications sometimes combine traditional method specifications with end-result specifications. Many QA specifications are statistically based. They often involve random sampling, testing, and statistical analysis of selected material

properties or workmanship. Frequently, they place requirements on the variability of the process and end product. Desired quality levels are defined and price adjustments for variations in quality are specified.

At least forty-four states in the U.S. and three provinces in Canada use asphaltic concrete QA specifications; about a dozen states use portland cement concrete (PCC) pavement and/or structural QA specifications; and a few states use QA specifications for embankments and aggregate base (AASHTO 1998).

2.6.2 Transfer of Quality Control

For some time, quality control has been a major requirement on highway construction projects and the basis of many problems for highway agencies. With increasing costs and shrinking staff resources, many agencies are addressing this problem by specifying that contractors are responsible for quality control, with the DOT only performing QA tests to ensure that the contractor is fulfilling its quality control responsibilities properly. This approach allows the government agency to reduce its staff, which in turn results in lower operating costs and, therefore, lower overhead costs. The contractor can reduce project costs by having more control over materials and workmanship, but this cost savings is lowered somewhat by the need to hire more people to handle the quality control activities.

Government agencies involved in the construction process still must set the standards each project must satisfy. To ensure that a project meets those standards, government representatives spot-check some parts of the project for QA. The contractor is penalized if the project is not meeting its requirements. Penalties can include being removed from the contract if the project is of very poor quality. Conversely, incentives are given to those contractors achieving significantly better results than required.

2.6.3 Partnering

Partnering is the creation of an owner-contractor relationship that promotes the achievement of mutually beneficial goals. The relationship is based on trust, dedication to common goals, and a mutual understanding of expectations and values. Partnering is expected to improve the relationship between contractor and owner by creating an organizational structure that can identify and resolve construction issues and problems. The primary thrusts behind partnering are quality improvement, effective project control, and improving cost

effectiveness. Partnering can occur among the contracting agency, contractor, and other parties at the project level; among disciplines within the contracting agency; or between the contracting agency and industry organization on a broader scale. It has been widely used on public projects and used successfully in TxDOT (Grajek et al. 2000).

2.6.4 A+B Contracting

A+B contracting (also called cost plus time) is a procedure that incorporates the lowest initial cost, but also factors into the selection process the added cost of time to complete the project. The time cost for bidding is calculated by multiplying the estimated time of the project by a set daily user cost. The bid for award consideration is based on a formula comprising the traditional price bid by the contractor (A) and the amount of time allowed for the project or the amount of time the contractor says it will take (B), and is computed as: award bid = (A) + (B x road-user cost/day) with road-use cost determined by the contracting agency and specified in the bid documents. A+B contracts work best with rehabilitation projects and projects that require quick completion, especially in urban settings.

Road-user costs can be difficult to determine and in practice they vary for different roads (FHWA 1998). Estimates are based on the expected impact of the construction road users during the construction phase. After a five-year evaluation period under SEP-14, A+B bidding was declared operational on May 4, 1995, and is no longer considered to be experimental.

Other elements can be added to the cost plus time contract to form multiparameter contracts, including any that the DOT considers part of the construction process, such as quality, warranties, safety, past performance, lane rental, performance specifications, or any combination of these. Such elements usually do not affect the bid price and evaluation, but do affect the payment the contractor receives through incentives/disincentives. Of all of these elements, quality is most frequently considered for incorporation into A+B contract clauses. By incorporating a quality element into the bid, the contractor is promising to perform at a set level or to receive a disincentive for failing to do so.

A+B contracting was first used by TxDOT in 1997 (Texas Comptroller 2000). According to a 1998 TxDOT report, the advantages of A+B bidding include:

- consideration of the time component of a construction contract;

- favorable treatment of contractors with the most available resources to complete the project;
- incentives for contractors to compress the construction schedule; and
- greater potential for early project completion.

In its use of A+B bidding, TxDOT has recognized the method is not applicable to all projects and that there must be a balance between the benefits of early completion and any increased cost of construction. TxDOT also felt that all right-of-way must first be acquired and utilities adjusted or relocated before the project is bid to take advantage of the faster contract completion (TxDOT 1998). TxDOT guidelines state that road-user cost may be considered for the following types of projects:

- projects that add capacity (may include grade separations);
- projects where construction activities are expected to have an economic impact on local communities and businesses; and
- rehabilitation projects in very high traffic volume areas (TxDOT 2000).

In addition to the criteria listed above, TxDOT guidelines state that a secondary evaluation can be made considering issues relating to utility relocations and right-of-way clearing and the availability of inspection forces. TxDOT can also require that the estimated daily road-user cost be greater than the contract administrative liquidated damages.

2.6.5 Constructability Reviews

Constructability reviews involve a formal process of allowing contractors to provide input on the design of a project prior to bidding. The contractor reviews the design to determine the level of difficulty of construction and to suggest design revisions that could enhance the construction process, while resulting in possible cost and time savings and fewer disputes. Such reviews result in greater potential for a better-quality final product. Constructability review is most effective when contractor input is sought during the preliminary design phase, not a point just prior to when the bidding begins. It is much easier to implement changes in philosophy early in the design process instead of waiting until the design effort is nearly complete.

Constructability input can be provided by a single contractor or several contractors serving as consultants to the project. One of the major issues is whether the contractor(s) providing the input will later be allowed to bid on the project. NCHRP Project 10-42, *Constructability Review Process for Transportation Facility*, was recently completed by the Texas Transportation Institute to develop a methodology for a constructability review process for application by transportation agencies. The research identified concepts, evaluated the application of existing analytical tools, and provided implementation procedures for tailoring this methodology to individual transportation agencies (NCHRP 1996).

2.6.6 Value Engineering

Value engineering is an organized effort directed by persons trained in techniques to analyze functions of systems, equipment, and services to determine the essential functions at the lowest life-cycle cost consistent with performance, reliability, availability, quality, and safety requirements. Value engineering can be considered a constructability method, whereas any savings that result from designer or contractor input become a shared savings with the owner. Value engineering provides an incentive to all parties to identify areas of savings, although the contracting agency must clearly define what is considered value engineering and what will be considered as normal steps involved in the design process (NCHRP 1999).

2.6.7 Lane Rental

Under the lane rental concept, the contractor is assessed a daily or hourly rental fee for portions of the roadway that are out of service during the project. The goal of the lane rental concept is to encourage contractors to minimize road-user impacts during construction. The lane rental fee is based on the estimated cost of delay or inconvenience to the road user during the rental period. Lane rental fee rates are often included in the bidding proposal in dollars per lane per time period (which could be measured as daily, hourly, or fractions of an hour).

For many early lane rental projects, neither the contractor nor the contracting agency gave an indication as to the anticipated amount of time for which the assessment will apply and the low bid was determined solely on the lowest amount bid for the contract items. (NCHRP 1999). Similar to cost-plus-time bidding, this technique is the subject of a current FHWA study to determine the best practices review being conducted by Utah State University

and is intended to produce a state-of-the-art summary for this technique and a list of recommended practices. Lane rental was declared operational on May 4, 1995, and is no longer considered experimental by FHWA. TxDOT has recently applied the lane rental concept to the contract for the interchange at U.S. 75 and Interstate 635, dubbed the Dallas High Five project.

2.6.8 Performance-Related Specifications

Performance-related specifications (PRS) are QA specifications that describe the desired levels of key materials and construction quality characteristics that have been found to correlate with fundamental engineering properties that predict performance. These quality characteristics (for example, air voids in asphaltic pavements and strength of concrete cores) are amenable to acceptance testing at the time of construction. True performance-related specifications not only describe the desired levels of these quality characteristics, but also employ the quantified relationships containing the characteristics to predict subsequent pavement performance. PRS provides the basis for rational acceptance and/or price adjustment decisions. Their major distinguishing feature is the use of improved acceptance plans with rationally derived performance-related price adjustments. As in conventional QA specifications, desired product quality rather than the desired product performance is specified.

FHWA is currently sponsoring research into the development of PRS for both hot-mix asphalt and PCC pavement construction. A prototype PRS has been developed for use in jointed-plain concrete pavement construction. The prototype is based on models that predict when and to what extent the constructed pavement will exhibit distresses; it also relies on maintenance and rehabilitation cost models. The two types of models enable predictions of a pavement's life-cycle costs (LCC). Price adjustments, either positive or negative, are based on the difference between the as-designed pavement LCC and the as-constructed pavement LCC (FHWA 1998).

2.6.9 Construction Warranties

A warranty is an assurance that a product will serve its useful life and that if it does not, the provider will replace the product or pay to return it to its proper condition. Most construction warranties differ from a normal manufacturer's warranty because they typically apply for five years and include workmanship as well as material. There are many advantages

and benefits to requiring warranties on highway construction, including motivating the contractor to provide a higher quality product, encouraging innovation by the contractor, and reducing the need for agency resources, including inspection and maintenance (AASHTO 1998). The risks associated with warranties can be significantly reduced by selecting warranty items and projects with predictable inputs and known parameters, and using well-defined procedures for warranty evaluation.

2.6.10 Indefinite Quantity/Indefinite Delivery

Indefinite quantity/indefinite delivery is also known as job order, task order, and open-ended contracting. Under this method, contractors bid on unit work items with the location to be determined under future work orders. An estimate of the total work over the life of the contract is provided in each contract. Municipalities utilize this contracting method on a citywide or area wide basis to provide greater flexibility in the construction program. Selection of the contractor is based on a combination of experience, qualifications, past performance, technical ability, financial stability, reputation and price, and which provides the best value (FHWA 1998). The maximum allowable size of the task orders dictate what type of work may be performed under this method and this makes it well suited for smaller projects. Contractor selection may be adapted to fit either competitive bidding or on a best value basis.

2.6.11 Incentive/Disincentive Provisions for Early Contract Completion

Incentive/disincentive (I/D) provisions for early completion are intended to motivate the contractor to complete the work on or ahead of schedule. It allows a contracting agency to compensate a contractor a certain amount of money for each day identified that critical work is completed ahead of schedule and assess a deduction for each day the contractor overruns the I/D time. The contracting agency specifies the time required for critical work and uses this provision for those critical projects where traffic inconvenience and delays are to be held to a minimum. The I/D amounts are based upon estimates of such items as traffic safety, traffic maintenance and road-user delay costs. I/D provisions encourage innovation to improve quality, time, and safety by the use of financial enticements (FHWA 1998).

2.6.12 Quality-based Contractor Prequalification

Prequalification of contractors has been used for years by most DOTs to screen out firms that represent a risk of not adhering to state highway project specifications. Although many prequalification compliance standards could be set for interested contractors, essentially all that is required is the ability to secure a bid or performance bond for a project. One of the major qualification criteria is the quality of prior work performed, but this criterion has generally been discussed and not enforced. The emphasis on quality performance, however, is now becoming a major factor in the evaluation of contractors.

The Ontario Ministry of Transportation has begun using a highly innovative approach to contractor prequalification to improve the quality of performance and reduce infractions. This approach involves evaluating the contractor in four areas: quality, safety, timeliness, and contract execution. Each area is given a different weight in the determination of a contractor's performance index: quality counts for 60 percent of the contractor's rating, safety and timeliness each account for 15 percent, and contract execution for the remaining 10 percent. The performance index covers the past 3 years and is weighted to give the most recent projects more influence. Contractors are allowed to appeal and attempt to improve their rating. The performance index is used to either increase or decrease the amount of work a contractor can be given on the basis of the prequalification limit (AASHTO 1998).

2.6.13 No Excuse Incentives

The Florida DOT has used No Excuse Incentive contracts to give the contractor an incentive to complete the contract work on time. TxDOT will use a No Excuse Incentive contract clause on a major highway renovation project that is beginning in Dallas. The contractor is given a "drop-dead date" for completion of a phase of work or the entire project. If the work is completed in advance of this date, the contractor will receive a bonus. There are no excuses, such as weather delays, for not making the completion date. On the other hand, there are no disincentives (other than normal liquidated damages) for not meeting the completion date. The incentive amount should be based on some public savings for opening the project early, such as road-user costs (FHWA 1998).

2.6.14 Lump Sum/Guaranteed Maximum Price (GMP)/Cost Reimbursable

Lump sum, guaranteed maximum price (GMP), and cost reimbursable contracting are all common ways for owners to sign contracts for payment with contractors or CMs in nonhighway construction industries. In lump sum contracting, the contractor bids a single fixed price for the construction of a project. Plans and specifications are most often complete. In cost reimbursable contracting, the owner pays the contractor for the actual cost of performing the work. The contractor's payment request must detail every expenditure both in terms of staff, materials, equipment, etc. In GMP contracting, a contractor typically begins work on a cost reimbursable basis and at a certain point in the project, usually when the design is fully developed, the contractor and the owner negotiate a target not to exceed price (NCHRP 1999).

2.7 Assessment and Selection of Contracting Approaches

Each of the above contracting practices have been applied to projects in North America with varying frequency, and each is usable regardless of the project delivery method. Research conducted by the NCHRP 10-49 Panel evaluated 22 different versions or combinations of contracting approaches and assessed the advantages and disadvantages of the techniques including legal comments such as barriers to implementation, development of contract language, and case law. The Panel also evaluated a few of the approaches for refinement and selection-guideline development because they met the criteria of minimizing DOT resources, shifted risk to the contractor, and maintained product quality. The detailed results of these evaluations are to become available in the upcoming NCHRP Report 451, and TxDOT should use this resource to assist with improving its knowledge, use, and selection of contracting approaches.

2.8 Summary

At an increasing rate, state highway agencies are using alternative project delivery methods and innovative contract approaches to improve quality, save costs, and reduce time and risk. Selecting the appropriate methods and approaches requires an adequate understanding of each delivery method and contracting approach, and the ability to distinguish their differences. By providing a method of comparing the pros and cons of the different project delivery methods, and descriptions of the various contracting approaches and source

document, the potential for good management decisions on their use can be enhanced. The next chapter is a legal review of the project delivery methods available to TxDOT.

CHAPTER 3. LEGAL REVIEW OF PROJECT DELIVERY METHODS

3.1 Introduction

As a matter of law, the Texas legislature controls the ability of the Texas Department of Transportation (TxDOT), and other state agencies, to employ innovative procurement alternatives. Under existing laws, TxDOT cannot accomplish highway construction work by any other means than the traditional design-bid-build system. Recently, however, TxDOT and the Texas legislature have shown interest in more speedy, cost effective and quality conscious alternatives to the traditional approach, and a particular interest in design-build contracting. As a result, this legal synopsis will focus primarily on design-build construction and was a stated deliverable for Project 0-2129.

3.2 Texas Law Regarding Alternative Delivery Methods

Under current Texas law, design-bid-build is the standard contracting methodology for TxDOT highway construction. The Texas Transportation Code requires "competitive bids each contract for: (1) the improvement of a highway that is part of the state highway system; or (2) materials to be used in the construction or maintenance of that highway."[1] On the other hand, Texas statutes require design work to be procured on a qualification basis.[2] The conflicting principles in these statutes lend themselves to the design-bid-build approach.

Nonetheless, alternative contracting delivery methods are specifically authorized for some types of public construction. For example, the education system can employ design-build and construction management arrangements. The Texas Turnpike Authority also can use innovative procurement systems. Other public agencies, such as TxDOT, have no authorized alternatives to the traditional design-bid-build method.

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[1] *See* Vernon's Texas Code Annotated § 223.001. Contract Requiring Competitive Bids.

[2] Vernon's Texas Code Annotated § 2254.003. Selection of Provider; Fees, § 2254.004. Contract for Professional Services of Architect, Engineer, or Surveyor.

3.2.1 Available Means/Methods for all Texas Public Agencies

Under Texas' current law, there are three types of public construction where state agencies can employ non-traditional contracting methods: (a) educational facilities, (b) agencies under the direction of the General Services Commission, cities, and counties, and (c) Texas Turnpike Authority road projects.

a. Educational Facilities

In 1997, the Texas legislature approved various alternative delivery methods for the construction of educational facilities,[3] and Senate Bill No. 510 of 2001 further defined those parameters.[4] Section 44.036 of the Texas Education Code Annotated authorizes design-build construction.[5] The code defines design-build as "a single

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[3] SUBCHAPTER B. PURCHASES; CONTRACTS
Vernon's Texas Code Annotated § 44.031. Purchasing Contracts

(a) Except as provided by this subchapter, all school district contracts, except contracts for the purchase of produce or vehicle fuel, valued at $25,000 or more in the aggregate for each 12-month period shall be made by the method, of the following methods, that provides the best value for the district: (1) competitive bidding; (2) competitive sealed proposals; (3) a request for proposals, for services other than construction services; (4) a catalogue purchase as provided by Subchapter B, Chapter 2157, Government Code; (5) an interlocal contract; *(6) a design/build contract;(7) a contract to construct, rehabilitate, alter, or repair facilities that involves using a construction manager;* or (8) a job order contract for the minor construction, repair, rehabilitation, or alteration of a facility. . . (Emphasis added).

[4] SECTION 9. Subsection (b), Section 44.031, Education Code, is amended to read as follows: (b) Except as provided by this subchapter, in determining to whom to award a contract, the district may consider: (1) the purchase price; (2) the reputation of the vendor and of the vendor's goods or services; (3) the quality of the vendor's goods or services; (4) the extent to which the goods or services meet the district's needs; (5) the vendor's past relationship with the district; (6) the impact on the ability of the district to comply with laws and rules relating to historically underutilized businesses; (7) the total long-term cost to the district to acquire the vendor's goods or services; and (8) any other relevant factor<<+specifically listed in the request for bids or proposals+>><<- that a private business entity would consider in selecting a vendor->>.

[5] Vernon's Texas Code Annotated § 44.036. Design-Build Contracts for Facilities
(a) In this section: (1) "*Design-build contract*" means a single contract with a design-build firm for the design and construction of a facility. (2) "*Design-build firm*" means a partnership, corporation, or other legal entity or team that includes an engineer or architect and builder qualified to engage in building construction in Texas. (3) "*Design criteria package*" means a set of documents that provides sufficient information to permit a design-build firm to prepare a response to a school district's request for qualifications and any additional information requested, including criteria for selection. . . .
(b) *A school district may use the design-build method for the construction, rehabilitation, alteration, or repair of a facility.* (Emphasis added); *see also* Vernon's Texas Code Annotated §§ 51.780.

Senate Bill No. 510 adds: SECTION 12. Subsections (c) and (e), Section 44.036, Education Code, are amended to read as follows: (c) the district<<+shall+>><<-may->>designate an engineer or architect<<+independent of the design-build firm+>>to act as its representative<<+for the duration of the

contract with a design-build firm for the design and construction of a facility."[6] Sections 44.037-.038 allow for agency and at-risk construction management contracts, respectively.[7] Finally, Sections 4.039-.041 address competitive bidding and competitive proposals, and job order contracts.[8]

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work on the facility+>>. If the district's engineer or architect is not a full-time employee of the district, any engineer or architect designated shall be selected on the basis of demonstrated competence and qualifications in accordance with<<+Section 2254.004+>><<-Subchapter A, Chapter 2254->>, Government Code. (e) The district shall evaluate statements of qualifications and select a design-build firm in two phases: (1) In phase one, the district shall prepare a request for qualifications and evaluate each offeror's experience, technical competence, and capability to perform, the past performance of the offeror's team and members of the team, and other appropriate factors submitted by the team or firm in response to the request for qualifications, except that cost-related or price-related evaluation factors are not permitted. Each offeror must certify to the district that each engineer or architect that is a member of its team was selected based on demonstrated competence and qualifications<<+, in the manner provided by Section 2254.004, Government Code+>>. The district shall qualify a maximum of five offerors to submit additional information and, if the district chooses, to interview for final selection. (2) In phase two, the district shall evaluate the information submitted by the offerors on the basis of the selection criteria stated in the request for qualifications and the results of any interview. The district may request additional information regarding demonstrated competence and qualifications, considerations of the safety and long-term durability of the project, the feasibility of implementing the project as proposed, the ability of the offeror to meet schedules, costing methodology, or other factors as appropriate. The district may not require offerors to submit detailed engineering or architectural designs as part of the proposal. The district shall rank each proposal submitted on the basis of the criteria set forth in the request for qualifications. The district shall select the design-build firm that submits the proposal offering the best value for the district on the basis of the published selection criteria and on its ranking evaluations. The district shall first attempt to negotiate with the selected offeror a contract. If the district is unable to negotiate a satisfactory contract with the selected offeror, the district shall, formally and in writing, end negotiations with that offeror and proceed to negotiate with the next offeror in the order of the selection ranking until a contract is reached or negotiations with all ranked offerors end.

[6] *See* Vernon's Texas Code Annotated § 44.031. Purchasing Contracts.

[7] *See* Vernon's Texas Code Annotated § 44.037. Contracts for Facilities: Construction Manager-Agent
(a) *A school district may use the construction manager-agent method for the construction, rehabilitation, alteration, or repair of a facility. . . .*
(Emphasis added).

Vernon's Texas Code Annotated § 44.038. Contracts for Facilities: Construction Manager-At-Risk

(a) *A school district may use the construction manager-at-risk method for the construction, rehabilitation, alteration, or repair of a facility. . . .*

(Emphasis added); *see also* Vernon's Texas Code Annotated §§ 51.781-.782.

[8] *See* Vernon's Texas Code Annotated § 44.039. Selecting Contractor for Construction Services Through Competitive Sealed Proposals, § 44.040. Selecting Contractor for Construction Services Through Competitive Bidding, and § 44.041. Job Order Contracts for Facilities Construction or Repair.

b. Other State Entities

With the passage of Texas Senate Bills 311 and 510 in 2001, the Texas legislature approved the use of alternative delivery methods for the construction of buildings and facilities by the General Services Commission as well as cities and counties.

c. TTA Projects

The Texas Turnpike Authority ("TTA") also has a broader range of contract procurement delivery methods than the traditional design-bid-build system. The Texas Transportation Code Annotated Chapter 361, Subchapter I authorizes TTA to enter development agreements.[9] The broad terms of §§ 361.301-302 seem to allow almost any type of delivery method, including design-build, DBOM and turn-key construction. This authority would be extended to any successor agency resulting from the November 2001

See also Vernon's Texas Code Annotated §§ 51.783-.784.

[9] SUBCHAPTER I. PARTICIPATION IN TURNPIKE PROJECTS

Vernon's Texas Code Annotated § 361.301. Agreements With Public or Private Entities to Construct, Maintain, Repair, and Operate Turnpike Projects

(a) *The authority may enter into an agreement with a public or private entity, including a toll road corporation, to permit the entity, independently or jointly with the authority, to construct, maintain, repair, and operate turnpike projects. . . .*

(Emphasis added).

Vernon's Texas Code Annotated § 361.302. Exclusive Development Agreements With Public or Private Entities

The authority may use an exclusive development agreement with a private entity to construct, maintain, repair, operate, extend, or expand a turnpike project by invested private funding or by public and private funding. *The authority: . . .*

> *(2) may negotiate provisions relating to professional and consulting services with regard to the turnpike project and to the construction, maintenance, and operation of the project, including provisions for combining those services. . . .*

(Emphasis added).

referendum to create the Texas Mobility Fund and provide a mechanism for toll road construction and operations.

3.2.2 Means/Methods Available to TxDOT for Highway Construction

Texas state law currently limits TxDOT to the traditional design-bid-build contract delivery system. As previously mentioned, the Texas Transportation Code requires competitive bidding for highway improvement contracts.[10] This procurement approach intends to protect the public's treasury. On the other hand, design service contracts must be let on a qualification basis.[11] This approach intends to protect the quality of these critically important services and the independence of the designers. Since design-build contracting requires a joint effort between construction and design services, it would be impossible to procure this work under Texas' current law system without violating one of the aforementioned laws. For example, if the work was let on a competitive bid standard, the design professional's qualification standard would be violated. Similarly, if the work was let on a qualification standard, the contractor's competitive bid standard would be violated.

By its very nature, a design-builder breaches the aforementioned statutes due to its overlapping roles as both designer and constructor. Since the selection of a design-builder combines two procurement functions, both the price and qualification standards must be viewed together. In order to make design-build contracting viable under Texas law, the new procurement standard must satisfy both competing public interests: quality and price. Many jurisdictions and administrations get around this dilemma by employing a two-step approach to procurement. Most two-step approaches narrow a prospective field of bidders by a

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[10] *See* Vernon's Texas Code Annotated § 223.001. Contract Requiring Competitive Bids.

[11] *See* Vernon's Texas Code Annotated § 2254.003. Selection of Provider; Fees

(a) A governmental entity may not select a provider of professional services or a group or association of providers or award a contract for the services on the basis of competitive bids submitted for the contract or for the services, but shall make the selection and award:

(i) on the basis of *demonstrated competence and qualifications to perform the services*; and

(ii) for a fair and reasonable price.

(Emphasis added).

Vernon's Texas Code Annotated § 2254.004. Contract for Professional Services of Architect, Engineer, or Surveyor

(a) In procuring architectural, engineering, or land surveying services, a governmental entity shall:

(i) *first select the most highly qualified provider of those services on the basis of demonstrated competence and qualifications; and*

(ii) *then attempt to negotiate with that provider a contract at a fair and reasonable price.*

(Emphasis added).

minimum qualification standard, then make a final decision on price. For example, the University of Texas System employs a two-step selection procedure, which separates a preliminary qualification-based selection from a final price-based selection.[12] Furthermore, most state DOTs using design-build contracting have transitioned from a sealed bid, fixed-price method to a similar two-step best value method.[13]

To a lesser extent, another area of Texas law could provide an obstacle to TxDOT adopting design-build contracting as a regular means of highway procurement. Texas Civil Statute, Article 3271(a) "Texas Engineering Practice Act," limits the practice of engineering to persons registered under the same, stating: "The privilege of practicing engineering [is] entrusted only to those persons duly licensed and practicing under the provisions of this Act." Since this act limits design services to duly licensed persons, a design-build firm or joint venture, which blurs the lines between construction and engineering, would run the risk of the violating this statute. For example, the design-builder's non-engineering staff, that participates in value-engineering or constructability issues of the design, could be found guilty of the unauthorized practice of engineering. This law, as well as all other related laws, should be adjusted so that an uniform legislative front is presented.

3.3 Other States' Progressive Laws Regarding Alternative Delivery Methods

Like Texas, many states authorize alternative contracting methods for certain state construction projects (Other states have no specific legislation regarding alternative delivery methods.). Since TxDOT and the Texas State Legislature have shown a particular interest in design-build contracting, this section will focus on states using this alternative method of contracting.

3.3.1 Fifty State Design-Build Survey

Attached as Appendix F, is a 50-state survey public agency design-build authority, prepared by Nancy C. Smith and Brian G. Papernik of Nossaman, Guthner, Knox & Elliot, LLP, Los Angeles, CA. This comprehensive survey briefly describes innovative approaches to public design-build contracting and constitutes an effective tool for referencing individual

[12] Interview with Schiller Liao (December 2000).

[13] Interview with Keith Molenaar (October 2000).

states' design-build codes. Due to recent changes in design-build laws, however, this survey should be verified as accurate before relying upon it.[14]

3.3.2 Individual States' Approaches to Design-Build Contracting

As per a recent Design-Build Institute of America survey, the majority of states authorize design-build contracting to various extents.[15] In particular, two of these states' departments of transportation, South Carolina and Utah, have extensively employed design-build contracting to some degree of success. Consequently, the legal framework of these two states' highway procurement systems, will be addressed in greater detail, as models for possible Texas legislation.

a. South Carolina

The South Carolina legislature authorizes design-build construction, as well as any other appropriate contracting method deemed necessary. The authorizing statute, South Carolina Code Annotated § 57-3-200, states:

> **SECTION 57-3-200. Department of Transportation authorized to enter into agreements to finance construction and maintenance of highways, roads, streets, and bridges.**
>
> From the funds appropriated to the Department of Transportation and from any other sources which may be available to the Department, *the Department of Transportation may expend such funds as it deems necessary to enter into partnership agreements* with political subdivisions including authorized transportation authorities, and private entities *to finance,* by tolls and other financing methods, *the cost of acquiring, constructing, equipping, maintaining and operating highways, roads, streets and bridges in this State.* The provisions of this Section must not be construed to confer upon the Department of Transportation or political subdivisions any power to finance by tolls or other means the acquisition, construction, equipping, maintenance or operation which the Department of Transportation or political subdivisions does not possess under other provisions of this Code.

This statute represents a generic authorization to the Department of Transportation to expend funds for highway construction "as it deems necessary." Since the statute does not reference any particular form of contracting, it could be interpreted as a broad authorization to

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[14] *See* "Growing Number of State DOTs Consider Design-Build Legislation," Engineering News-Record 17-18 (March 19, 2001).

[15] *See id.*

any and all innovative types of project delivery systems, including design-build contracting, that are "deemed necessary."

b. Utah

Utah's legislature specifically authorizes design-build contracting. Utah Code Annotated §§ 63-56-5 (1) and (9) defines design-build as:

> the procurement of architect-engineer services and construction by the use of a single contract with the design-build provider. . . . This method of design and construction can include the design-build provider supplying the site as part of the contract. . . . "Architect-engineer services" are those professional services within the scope of the practice of architecture as defined in Section 58-3a-102, or professional engineering as defined in Section 58-22-102 . . .

Utah's statute-specific terms provides contrast against South Carolina's general authorization.

Moreover, Section 63.56-36.1 specifically allows the Utah Department of Transportation to select design-build as an alternative to design-bid-build "for any transportation project that has an estimated cost of at least $50,000,000. . ." In part, Section 53.56-36.1 states:

> *The Department of Transportation may:*
> *(a) award a design-build transportation project contract for any transportation project by following the requirements of this section*; (Emphasis added). and
> (b) make rules, by following the procedures and requirements of Title 63, Chapter 46a, Utah Administrative Rulemaking Act, establishing requirements for the procurement of its design-build transportation project contracts in addition to those required by this section.[16]

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[16] Utah Code Annotated § 63-56-36.1. Procurement of design-build transportation project contracts.

(1) As used in this section:

(a) *"Design-build transportation project contract" means the procurement of both the design and construction of a transportation project in a single contract with a company or combination of companies capable of providing the necessary engineering services and construction.*

(b) "Transportation agency" means:

(i) the Department of Transportation; . . .

(2) *Except as provided in Subsection (3), a transportation agency may award a design-build transportation project contract for any transportation project that has an estimated cost of at least $50,000,000 by following the requirements of this section.*

(3) *The Department of Transportation may:*

(a) award a design-build transportation project contract for any transportation project by following the requirements of this section; and

This statute represents a non-generic authorization to the Department of Transportation to contract for highway construction by design-build means. The statute does not give broad authorization to any and all innovative types of project delivery, as the South Carolina's generic authorization seems to do. However, a related statute, Utah Code Annotated § 63-56-21, seems to offer a broader scope of contracting possibilities through its more generic language.[17] Section 63-56-21 authorizes contracting through competitive sealed proposals when the use of competitive sealed bidding is neither practicable or advantageous to the state.

These statutes provide a contrast to South Carolina's legislation. Both states' legislation have been interpreted to allow design-build construction, but the Utah statute specifically references and defines "design-build." The Texas legislature must determine how broad of an authorization it is comfortable with giving, and phrase its legislation accordingly. The above referenced statutes provide good illustrations of how the Texas Legislature may proceed.

3.4 Federal Highway Administration's Approach to Design-Build Contracting

The Federal Government has allowed design-build construction under an interpretation of statutes 23 U.S.C.A. 112(b)(1) and 23 U.S.C.A. 112(b)(2). Section 1 requires competitively-bid construction contracts, "unless the State transportation department demonstrates . . . that some other method is more cost effective or that an emergency exists." Section 2 allows for qualification-based selection of design services. Read together, design-build contracting has been authorized by the FHWA, but only in cases where the state statutes allow for it.

Under the Transportation Equity Act for the 21st Century ("TEA-21"),[18] § 1307 "Design-Build Contracting," the FHWA must develop design-build regulations by June 9,

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(b) make rules, by following the procedures and requirements of Title 63, Chapter 46a, Utah Administrative Rulemaking Act, establishing requirements for the procurement of its design-build transportation project contracts in addition to those required by this section. . . .(Emphasis added).

[17] Utah Code Annotated § 63-56-21. Use of competitive sealed proposals in lieu of bids -- Procedure.
(1)(a) When, according to rules established by the Procurement Policy Board, the chief procurement officer, the head of a purchasing agency, or a designee of either officer above the level of procurement officer determines in writing that *the use of competitive sealed bidding is either not practicable or not advantageous to the state, a contract may be entered into by competitive sealed proposals.*
(Emphasis added).

[18] Pub. L. No. 105-178 (1998) (TEA-21 amends 23 U.S.C.A. 112).

2001. Moreover, TEA-21 grants specific authority for design-build contracting. Section 1307 (a)(3)(A) provides: "A State transportation department or local transportation agency may award design-build contract for a qualified project . . . using any procurement process permitted by applicable State and local law." As a consequence of this proposed legislation, design-build contracting should become more popular amongst the states' departments of transportation. Accordingly, TxDOT's planned pilot program should pose no problems to future federal funding by the FHWA. By TEA-21 definition, a qualified project is one exceeding $5 million in estimated cost for intelligent transportation systems or $50 million estimated cost for other highway projects (FHWA 1998). Provisions of Section 1307 of TEA-21 have motivated some states to move forward with D-B projects and push for authorizing legislation.

Although federal regulations for D-B highway construction are expected, FHWA has provided notice that it will continue to review and authorize appropriate D-B projects valued at less than $50 million. Furthermore, in comments provided to FHWA during rulemaking for D-B, the American Consulting Engineers Council recommended that FHWA develop guidance documents and procedures to assist owner-agencies in selecting the most appropriate project delivery method for a specific project and owners should adopt the delivery method that offers the best value given the unique opportunities, constraints, risks, and demands of the particular project (FHWA 2000).

3.5 Legal Solutions for TxDOT and Conclusions

Simply put, the Texas Legislature must change the existing laws in order for TxDOT to deviate from DBB contracting. As previously mentioned, other sates have authorized D-B and other forms of contracting in the arena of highway construction. These states' statutes, and the resulting affects of the statutes, provide a valuable vantage point if Texas so decides to modify its existing laws.

The Texas Legislature should determine what alternative types of procurement it deems valuable. The Legislature then should modify Texas law around those considerations. It is the author's opinion that more specific statutes, addressing the exact extensions and modifications of the existing law, provide for the most efficient and effective changes of policy. These statutes should allow for the effective and efficient use of resources by both the contractor and TxDOT. Moreover, the definite terms of the statutes allow the legislature to

control the procurement process, as opposed to the courts. A court's misinterpretation of a vague statute could totally defeat its intended purposes.

If Texas modifies existing laws to allow for innovative contracting delivery methods, it is critical that the legislature also alters the design professional licensing requirements so the licensing laws stay in step with the contracting authority. Again, the Legislature should use clear and unambiguous language in the modified licensing laws to specifically address D-B contracting issues. It is worth mentioning, however, that D-B in other state agencies has proceeded smoothly to date without this change.

Chapter 4. DESIGN-BUILD IMPLEMENTATION FOR HIGHWAY CONSTRUCTION IN TEXAS

4.1 Introduction

As part of the research investigation the authors were asked to specifically investigate and develop recommendations for implementation of Design-Build (D-B) in the Texas Department of Transportation (TxDOT). This chapter provides an overview of D-B and outlines the steps needed to implement the delivery method in the future. Detailed guidance to implement a D-B project delivery method is addressed further in the accompanying guidebook, *Project Delivery Methods and Contracting Approaches: Assessment and Design-Build Implementation Guidance*.

D-B has the potential to benefit TxDOT as an alternative form of delivering highway construction projects and is expected to supplement the traditional design-bid-build (DBB) delivery method at some point in the future. For the benefits to be realized, a balance must be reached in the distribution of project tasks, allowing enough freedom for the design-builder to be innovative, yet keeping enough TxDOT control to ensure that the project is being designed and constructed to achieve the desired product. D-B allows for the shifting of certain tasks and responsibilities normally performed by TxDOT to the design-builder. For TxDOT to adequately adapt D-B, it needs to understand, assess, and allocate the associated risks as well as determine a process to implement the methodology. The portfolio of risks associated with highway construction must be identified by TxDOT, and assignment must be done according to who is best capable to handle them.

The 2001 session of the Texas legislature gave consideration to, but did not pass, Senate Bill 298 that would have allowed TxDOT and the Texas Turnpike Authority (TTA) to use the D-B delivery method on a pilot program basis limited to no more than a total of twenty-four projects in 8 years. If S.B. 298 had passed, TxDOT and TTA would have been allowed to test the use of D-B and required to submit a report to the legislature as part of the sunset review of TxDOT. SB 298 would have authorized D-B on transportation projects with estimated costs of more than $50 million. The language of the bill required TxDOT and TTA

to prepare a request for qualifications (RFQ) of certain information to assist D-B firms in submitting qualifications for projects including:

> EVALUATION AND SELECTION OF DESIGN-BUILD FIRM.
> (a) Requires the department or the authority to evaluate and select a design-build firm in two phases.
>
> (b) Requires the department or authority, in phase one, to prepare a request for qualifications and evaluate each responding design-build firm according to certain appropriate (excepting cost-related or price-related) factors submitted by that firm.
>
> (c) Requires each design-build firm that responds to the request for qualifications to certify to the department or authority that each engineer or architect who is a member of the firm was selected on the basis of demonstrated competence and qualifications in the manner required by Section 2254.004 (Contract for Professional Services of Architect, Engineer, or Surveyor), Government Code.
>
> (d) Authorizes the department or authority to interview the design-build firms that respond to the request for qualifications and requires the department or authority, if interviewing, to qualify at least two, but not more than four, firms for phase two of the evaluation and selection process.
>
> (e) Requires the department or authority, in phase two, to prepare and provide to qualified firms a design criteria package and a request for proposals seeking additional information regarding certain specific factors and any other factor the department or authority considers relevant or necessary.
>
> (f) Authorizes the department or the authority to interview one or more of the design-build firms responding to the request for proposals.
>
> (g) Requires the department or authority to rank each responding design-build firm on the basis of the criteria in the request for proposals and select the design-build firm submitting the proposal that offers the best value considering price, time for project completion, technical evaluation factors, and any other factor described in the request for proposals.

In addition, Section. 223.173 of the proposed bill:

> (a) Provides that the use of design-build contracts by the department and the authority under this subchapter is a pilot program.
>
> (b) Prohibits (before December 31, 2009) the department and the authority from using design-build contracts under this subchapter for more than 24 transportation projects.
>
> (c) Provides that money spent by the department or the authority for a project under the pilot program is not included in computing the amount required to be spent for engineering and design contracts under Section 223.041 in any fiscal year.
>
> (d) Requires the department and the authority, not later than February 1 of each odd numbered year, to each submit a report to the legislature relating to the use of design-build contracts under this subchapter during the preceding two years.

> (e) Requires the state auditor, the department, and the authority to each submit, not later than December 1, 2008, a final report to the legislature relating to the use of design-build contracts under this subchapter as part of the review of the department in 2009 by the Sunset Advisory Commission under Chapter 325, Government Code (Texas Sunset Act) (S.B. 298, 2001)

Although S.B. 298 was not enacted into law, TxDOT should anticipate that similar legislation will come up for consideration during the 2003 session. Passage of legislation resembling its current form would require TxDOT to develop a D-B process for implementation as a pilot program. An expected outcome of a D-B pilot program would be the identification of changes necessary to permit efficient use of D-B contracting on future projects—assuming the method provides adequate benefits for TxDOT and the public. It is anticipated that TxDOT would have to change and modify current practices to accommodate the D-B method and these changes are discussed later in this chapter as part of an evaluation of transition measures to implement D-B. At a minimum, TxDOT will need to address long-range planning, budgeting, and training decisions, as well as agency culture, to accommodate D-B.

4.2 Transportation Design-Build

Utah's reconstruction of I-15, the turnpikes undertaken by the Transportation Corridor Agencies in California, the E-470 project in Colorado, and numerous other D-B megaprojects have recently captured the attention of the transportation community (Postma et. el. 1999; Zapalac 1999; Norton 2000). However, the size of state projects for D-B varies considerably, from bridge projects costing a few million dollars, to the aforementioned $1.4 billion reconstruction of I-15 in Utah. D-B has gained acceptance from various transportation authorities, and has been used on projects such as automated traffic management systems and reconstruction of decaying roads. Although smaller D-B projects have not gained the notoriety of megaprojects, the Federal Highway Administration (FHWA) has approved D-B on over 100 smaller projects since 1988 under Special Experimental Project (SEP) No. 14 (FHWA 2001a) as given in Appendix E. While state highway departments are becoming more receptive to D-B contracting, FHWA still considers the approach experimental and an overall assessment of the broad benefits, costs, and applicability of D-B remains limited by the relatively small number of completed projects. To date, only limited data exist that detail the

success of D-B on transportation projects and the majority of success stories consist of anecdotal information.

4.3 Advantages and Disadvantages of Design-Build

D-B has been used successfully for many years on building construction projects and increasingly has been tested and adapted by various state DOTs as a viable alternative to the traditional project delivery method of DBB. Literature promoting D-B discusses the promise of innovation stemming from the designer/builder collaboration and the primary reason D-B contracting is selected by public and private owners is to shorten the duration on specific projects by melding the design and construction processes (Songer 1996; Molenaar 1999; Broaddus 2001). Quality, cost-effectiveness, and a single point of responsibility are also cited as reasons to pursue D-B (Sanvido 1998; Tenah 2000). Furthermore, D-B can allow owners to better establish costs and schedules, promote innovation, and reduce claims.

In their research paper, *Comparison of U.S. Project Delivery Systems*, sponsored by the Construction Industry Institute, Konchar and Sanvido (1998) used data from 351 *building* projects with the findings that D-B was superior to traditional design-bid-build because:

- Unit costs were at least 6.1 percent less.
- Construction speed was at least 12 percent faster.
- Overall project delivery speed was at least 33.5 percent faster.
- Cost growth was at least 5.2 percent less.
- Schedule growth was at least 11.4 percent less.
- Quality was equal or better.

D-B allows architects and engineers to enhance their design by using the knowledge and experience of their construction partner. This upfront feedback can provide for an improved final project because it allows construction to proceed before final design and construction documents are created. D-B can foster a team approach that encourages communication to assist with the delivery of a successful project. Early collaboration on projects between designers and contractors usually enhances their relationship, and often results in avoiding change orders because the process encourages the contractor to point out

problems in the design or constructability issues early in the bidding process. The owner's dilemma of determining whether the contractor or the designer is at fault for changes is reduced when a single source of responsibility exists. Conversely, with DBB, improvements during construction are often difficult and can become costly and time consuming because change orders or new specifications are necessary. The structure of DBB also may contribute to claims and disputes because it allows the parties to blame each other for delays and scope-of-work issues regardless of origin.

The advantages of D-B include:

- Project costs are known early in the project and the decision to proceed with a project can be made before significant design costs are incurred.
- Projects can be delivered faster because of the overlap of design and construction, as well as the elimination of the procurement phase between design and construction.
- Quality improvements can be made because of greater builder participation during the design phase.
- The owner has a single source responsibility and can focus on project scope rather than coordination and disputes between designer and contractor.
- Change orders are reduced with the single source responsibility.

However, D-B can limit competition during the bidding process. With D-B**,** an owner puts the project out to bid and design-builders may be reluctant to develop proposals without the benefit of complete plans. Comparison of project proposals can be difficult because each of the proposers is responding to limited guidance and final solutions can vary widely. Problems can also arise when an owner has an ill-prepared project and equally ill-defined D-B selection criteria.

Some of the major disadvantages identified with D-B contracting include:

- Institutional obstacles that limit or prohibit its use.
- Lack of experience with the process and corresponding increase of risk.
- Loss of owner control. Because the designer is now on the contractor's team, the owner may have limited access to information that it would have using DBB.

- Elimination of the designer-owner partnership where the designer provides a construction oversight function for the owner.
- Selection methods may only address contractors' performance without considering other factors such as poor design, poor administration, and improper testing.
- Risk-shifting may occur to those with little or no experience.

The Associated General Contractors (AGC) and other industry associations have expressed concern over the use of D-B. The AGC raised numerous concerns over the public's use of the D-B method in an 1997 *AGC White Paper on the Use of Alternative Contract Award Methods in Highway Construction* including:

- D-B restricts competition by eliminating small- and medium-sized contractors because they cannot afford the level of additional risk associated with D-B. Emerging contractors would be virtually eliminated from entry into D-B competitions.
- Preparation of a D-B proposal requires a substantial initial investment that may not be fully covered by the stipends paid to unsuccessful proposers.
- The D-B process of short-listing restricts competition and can result in increased costs.
- Subjectivity is introduced into the bid process that can politicize source selection and may also increase the potential for litigation at that stage of the process.
- Design competition based solely on price is in direct conflict with the goal of designing the highest quality into projects.
- Unforeseen conditions at the site that are normally the owner's risk under the differing site conditions clause might be shifted to the contractor with D-B.

The disadvantages and concerns raised over the use of D-B for highway construction have resulted in a lack of uniform support for adoption and utilization. Currently, no special emphasis for using D-B exists at the federal level beyond the SEP-14 initiative. Most state DOTs do not consider D-B contracting unless they have the statutory authority within their

state to do so. In fact, Section 1307 of the TEA-21 says that a state DOT or local public agency may award a contract using any procurement method permitted by applicable state and local law. FHWA encourages state DOTs to first have the necessary state authority. Then, when the state DOT determines the method it will use to procure and award such contracts, they request SEP-14 approval from FHWA.

The FHWA requires all owners to request D-B concept approval under SEP-14 through the submittal of a work plan. The length of the work plan and reporting requirements are proportional to the magnitude and complexity of the project. The time it takes to receive SEP-14 approval is not an issue because the approval process can be relatively short. The SEP-14 work plan can be submitted electronically through FHWA division offices and approval memos are also done by e-mail. When there are no significant legal issues, approval can be swift.

Under SEP-14, twenty-four states, and several local transportation agencies have design-build projects approved or underway. The State DOTs include: Alabama, Alaska, Arizona, California, Colorado, Delaware, Florida, Georgia, Hawaii, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Utah, and Washington (FHWA 2001a).

4.4 Design-Build Project Selection

Delivering a project using D-B contracting eliminates very few steps when compared to the standard DBB process. The same work tasks and products are required whether they are done by the owner or the contractor. Differences will occur in the timing, order, and who performs which task because the D-B method shifts some tasks and responsibilities from the owner to the contractor. Determining when it is appropriate to use D-B and on what type of projects, are critical steps in gaining the advantages the process can provide. For TxDOT to do this, an objective method of assessing the factors to be considered in the decision should be undertaken in order to encourage competition while at the same time seeking the best value.

The Federal Acquisition Reform Act of 1996 (FARA) provided federal agencies the opportunities to seek out more efficient contracting mechanisms. Section 253m of FARA is used by civilian agencies to determine the selection process that must be used and the procedures that must be followed when determining if D-B is appropriate (Tarullo et al. 2000).

Section 253m(b) of the act outlines various factors that need to be considered when making this determination and include:

- The extent to which the project requirements have been defined.
- The time constraints for delivery of the project.
- The capability and experience of potential contractors.
- The suitability of the project for use of the two-phase selection procedures.
- The capability of the agency to manage the two-phase selection process; and
- Other criteria established by the agency.

Selecting D-B contracting as the delivery method for a specific highway project requires an assessment of potential benefits and known risks associated with the project. Various state DOTs with the authority to undertake D-B have begun to develop criteria and methods to assess the application of selecting candidate projects for D-B. The Washington State Department of Transportation (WSDOT), for example, has identified a programmatic and an in-process approach for selecting candidate projects for D-B. The programmatic process focuses on selecting a candidate project from an initial screening from their Transportation Improvement Program. Using this method, project managers play a critical role in identifying projects as well as developing and evaluating the project scope to confirm that the benefits are real and risks are manageable. The WSDOT in-process approach selects projects already under development in the conventional DBB method that exhibit attributes that make converting to D-B attractive. The selection criteria used to screen potential D-B projects for WSDOT are similar to those outlined above that must be followed when federal agencies determine if D-B is an appropriate project delivery method (WSDOT 1999).

In creating a D-B pilot program, the South Dakota Department of Transportation (SDDOT) developed—as part of a guidance manual—assessment criteria for consideration of candidate projects for D-B. The selection criteria provided a filter for screening projects to identify candidate D-B projects. SDDOT developed a questionnaire based on possible risks, potential benefits, and project attributes typically associated with successful D-B projects. Table 4.1 is a modification of the SDDOT questionnaire incorporating the above factors as well as the perceived needs of TxDOT. If the answer to the majority of the remaining questions is "yes," then it is a good candidate for D-B. The project selection criteria were developed by SDDOT to initiate its D-B pilot program.

A possible first screen is project cost because the language of S.B. 298 allows D-B consideration for projects that have an expected cost of $50 million or above. According to the Texas Comptroller e-Texas Report, only five projects were let in excess of $50 million between 1995-98 and nine such large projects were undertaken in 1999 (Texas Comptroller 2000). It should be noted that according to a presentation made by the FHWA at a D-B industry conference in April 2001, little merit exists for setting D-B requirements to projects at $50 million or greater (FHWA 2001b). Speculation on setting such a high-dollar figure is that it was done to limit D-B to larger projects where the chances are greater that the entities involved would be experienced with nontraditional project delivery methods.

Table 4.1 – D-B Project Screening Criteria for TxDOT

Design-Build Project Selection Questionnaire If the answer to question #1 is "no," the project is not a candidate for design-build under criteria similar to S.B. 298 from the 77th Legislative Session. If the answer to question #1 is "yes," and "yes" is the response to the majority of these questions, then the project is a good candidate for D-B.	**Yes**	**No**
1. Does the project budget exceed $50 million (or some other budget value)?		
2. Does the project have schedule constraints?		
3. Has a similar project been completed by TxDOT using non D-B methods so that benchmark data is available?		
4. Can a TxDOT project team be assembled to respond to the delivery schedule?		
5. Is the project funded for design?		
6. Is the project funded for right-of-way?		
7. Is the project funded for construction?		
8. Is the geotechnical fieldwork complete?		
9. Is the NEPA process complete?		
10. Are permits acquired or predictable?		
11. Is right-of-way acquired or predictable?		
12. Have all inter/intra-governmental agreements been obtained?		
13. Are utility agreements in place or predictable?		
14. Will the public endorse the project?		
15. Are design exceptions obtained or predictable?		
16. Does the project offer unique or unusual features?		
17. Does the project include multiple design features (road, bridge, etc.)?		
18. Does the project include opportunities for innovative construction staging?		
19. Does the site present unique or unusual conditions?		
20. Are specialty skills needed for design or construction?		
21. Is the project timing critical (work windows, seasons, short time)?		

Source: Adapted from SDDOT Design-Build Process for Highway Projects, Appendix A. July 1999 Working Draft

Forcing the wrong project into a D-B contract may diminish or eliminate any potential benefits. The overriding consideration when assessing a project is whether risks can be controlled while obtaining reasonable benefits when the project is delivered using a D-B process. If so, the potential benefits need to be recognized and measured, especially for the pilot projects. The most commonly recognized benefits assembled from similar programs include:

- Project time savings (accelerating program schedule and construction duration);
- Higher quality products;
- Innovative concepts;
- Staff resource savings and workload leveling; and
- Less disruption to the public.

4.5 Contractor Solicitation and Selection

The goal of the owner in the selection process should be to enter into a contract that provides the greatest value. D-B provides public agencies an opportunity for selecting the design-builder based solely on qualifications, price, or a combination of both. Each of the methods has been used successfully and no single process is appropriate for every situation. A 1999 study by Molenaar, Songer, and Barash analyzed the evolution and performance of public sector D-B and found that two-thirds of the current public-sector selection of design-builders is accomplished through a combination of price and qualifications by the use of a weighted scoring system. When using weighted criteria, requirements are set for a qualitative proposal (e.g., experience, design solution, management plan) and for price, and the owner establishes a point rating for the two factors. Agencies often use prequalification as a way to increase their chances for project success and to narrow the pool of bidders.

Recent research by Molenaar and Gransberg (2001) summarized six case study comparisons of state DOT D-B processes. The projects were classified as smaller-sized D-B projects (between $2 and $30 million with a mean average size of $10.2 million) and compared design-builder solicitation and selection. The analyzed DOTs were Arizona, Colorado, Indiana, New Jersey, South Carolina, and Washington. The design-builder selection methods for the states reviewed were characterized either as fixed-price, one-step, or two-step procedures. The researchers found that states developed procedures based on state procurement statutes, level of design at the request for proposal (RFP) stage, project complexity, familiarity with the D-B process, and agency culture. The six case studies have shown a pattern that parallels design-builder selection in the public building sector; i.e., states are transitioning from fixed-price and one-step low bid methods to two-step best value procedures (Molenaar and Gransberg 2001).

The following section provides an overview of the one- and-two-step D-B selection processes from the case studies for insight as to how agencies are approaching D-B solicitation

and selection for highway projects. It should be noted that, as proposed, SB 298 required a two-step process.

4.5.1 One-Step Process

A typical one-step D-B selection process is when the competing D-B firms submit a technical proposal and cost proposal, each under separate sealed covers is provided. A good example of this technique has been practiced by the South Carolina Department of Transportation, and Molenaar and Gransberg graphically depicted the process similar to what is shown in Figure 4.1. Technical proposals in South Carolina are reviewed by a selection committee made up of five voting members and a group of nonvoting members with expertise in contract management, engineering, finance, and construction. Technical proposals are scored on innovation of design/constructability, future maintenance, management criteria (such as quality control and management approach), and project schedule. The cost proposals are opened only if the technical proposal score is above the preset value. The proposal is deemed nonresponsive and the price proposal rejected if the technical score is below the preset minimum value. The South Carolina Department of Transportation reserves the right to adjust the proposals based on any contingencies or qualifications deemed necessary (South Carolina 2000).

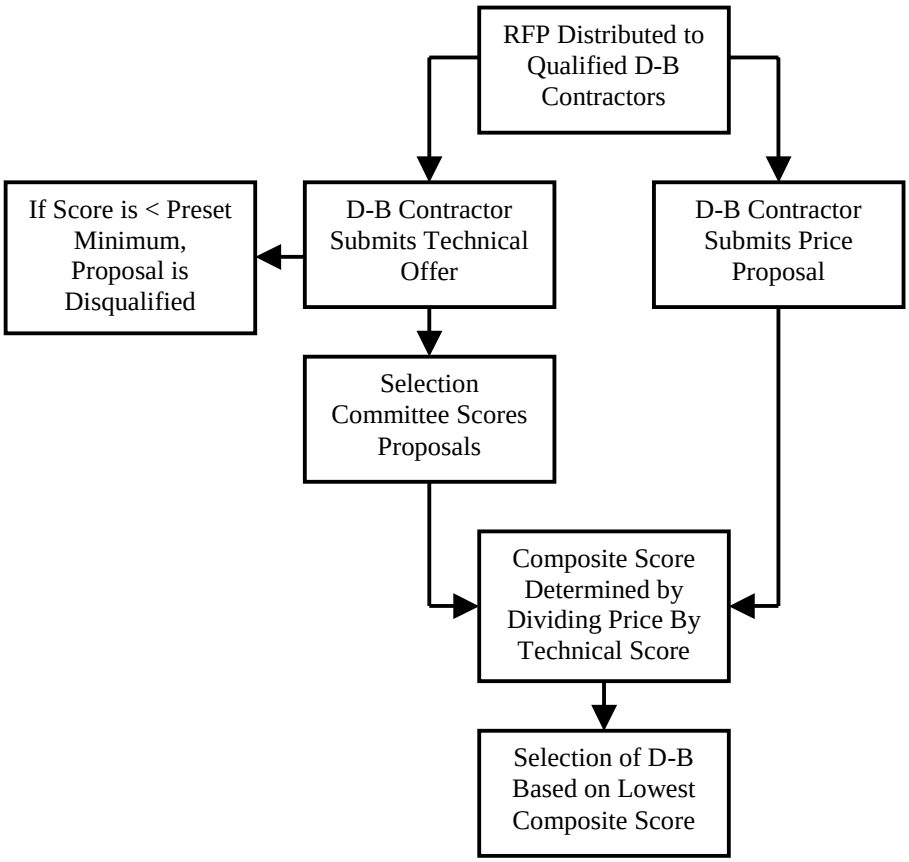

Figure 4.1 South Carolina DOT One-Step Best Value Selection (Adapted from Molenaar and Gransberg 2001)

4.5.2 Two-Step Process

A typical two-step selection procedure involves the prequalification of firms through a Request for Qualifications (RFQ) followed by an evaluation of price and/or technical proposals. When the two-step process is used, proposals usually contain elements of design (technical proposal) and a second element of price (price proposal). The method determining how the price and technical evaluations are combined constitutes the best value assessment by the agency. State DOTs have used numerous methods to determine the best value, and the two-step method deployed by WSDOT is outlined in figure 4.2 for illustration.

WSDOT begins its two-step selection process by advertising the RFQ, along with a draft RFP that details criteria for prequalifying. Figure 4.2 graphically depicts Washington's

selection process. Interested design-builders prepare a Proposal of Qualifications (POQ) that specifies how to meet the criteria listed in the WSDOT issued RFQ. WSDOT compares the POQs to the selection criteria and creates a short-list of three to five design-builders most qualified to proceed to the second step. A final RFP is sent to the short-listed design-builders and they are given a fixed period of time to complete a Best and Final Proposal (BAFP). For WSDOT, the BAFP includes two separate submittals, a technical proposal and qualifications describing the design solution and a price proposal representing the total cost. The committee assembled to make the selection consists of an evaluation process manager, a selection official, a proposal evaluation board, and technical evaluation team and technical evaluation advisors. The committee's selection criteria usually consists of, an understanding of the project, composition of the project team, key personnel and processes, proposer's past performance, and the quality control and safety programs. Once the technical scores are assigned, the price component of the proposal is opened and the best value proposal is determined using a standardized equation. The proposal with the highest best value score is considered the winning bid and the competing firms are awarded a predetermined stipend for their effort (WSDOT 1999).

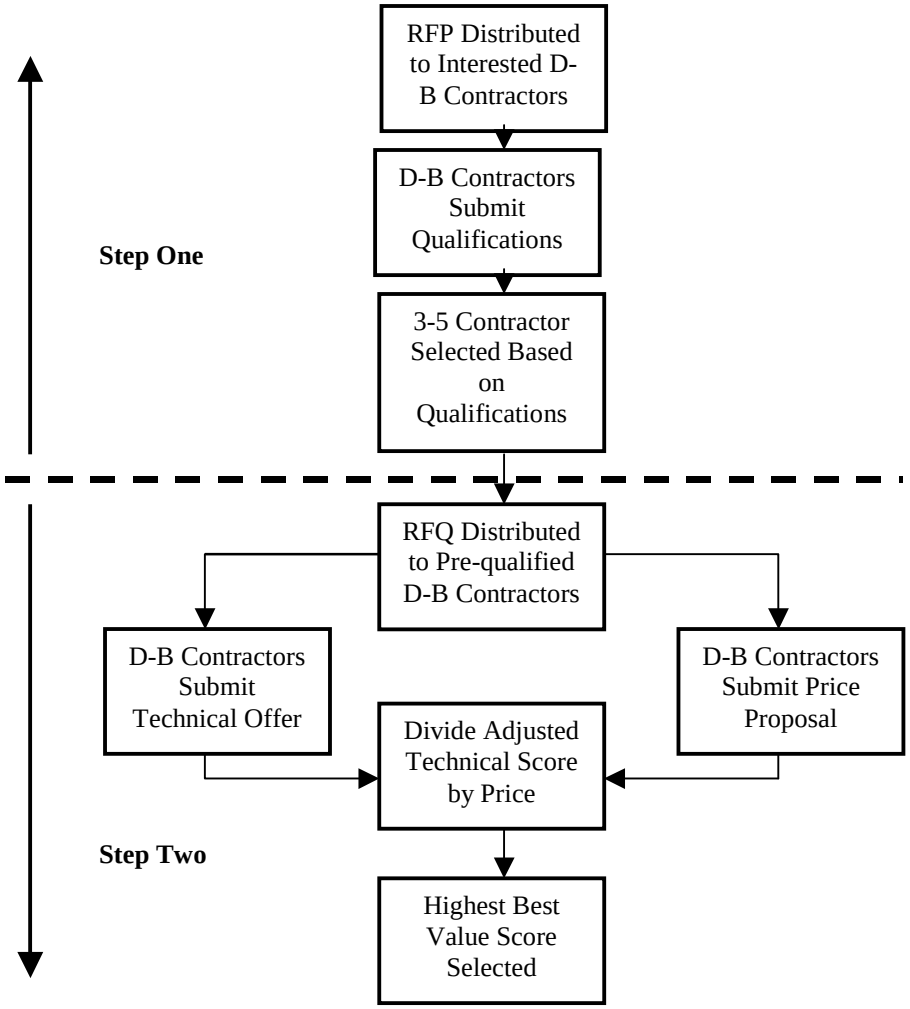

Figure 4.2 Washington DOT Two-Step, Best Value Selection (Adapted from Molenaar and Gransberg 2001)

4.6 Typical Steps in the Design-Build Project Delivery Process

The D-B project delivery process consists of the fundamental steps required to deliver a project from the time developmental work begins to final acceptance of the constructed project. As defined by the Design Build Institute of America, the steps associated with a typical D-B project are outlined below. Appendix G gives a graphical depiction of the D-B process and is based on similar diagrams developed by WSDOT, SDDOT, and information gleaned

from interviews and the literature review during the development of a D-B process for highway projects. The steps are:

1. **Strategic Planning**—The owner analyzes current and future requirements to determine the required project development plan.
2. **Program Definition**—The owner establishes the project needs based on performance needs, codes and standards, right-of-way, etc., and begins developing the specifications and contract requirements.
3. **RFQ**—Requirements for proposers are defined and articulated in a RFQ either by in-house staff or a consultant. The requirements are established to ensure that the proposers are qualified in terms of experience and financial capabilities.
4. **Qualification Statements**—The owner sends the RFQs to interested proposers, receives and evaluates responses, and establishes a shortlist of at least three, and no more than five, of the firms receiving the highest evaluation scores.
5. **RFP**—The owner issues a RFP to the shortlisted firms. Among the items found in a typical RFP are the expanded project definitions and design criteria, geotechnical data, contract requirements, selection procedures, and proposal requirements. The owner also establishes a framework for evaluating and awarding the contract, setting up the evaluation team, and determining the weights of different evaluation criteria.
6. **Proposal Submission and Evaluation**—Once received, proposals are evaluated on the basis of quality of design, price, and other factors.
7. **Contract Award**—The selected proposer enters into a contract with the owner and is issued notice to proceed with design work with the proper administrative submittals.
8. **Commencement of Construction**—Upon completion of an appropriate level of design, the design-builder will begin construction. Certain contracts require construction to proceed after logical phases of the design have completed and approved.
9. **Completion**—Upon completion of the construction phase, the facility is turned over to the owner.

The procedural steps and the process map provide a draft baseline and will need modification when a D-B project delivery process is developed specifically for TxDOT.

4.7 Design-Build Project Phases and Risk

The major tasks associated with a given project will be required regardless of the contracting method used. The order of major tasks and the assignment of responsibility to perform these functions vary depending on the contracting method used. When considering D-B contracting, each major task must be evaluated to ensure an appropriate allocation of risk and maximum realization of benefits. The draft D-B Process Map shown in Appendix D is simplified below in Figure 4.3. Each of the phases and the associated tasks are discussed in full detail in the associated report *Project Delivery Methods and Contracting Approaches: Assessment and Design-Build Implementation Guidance*.

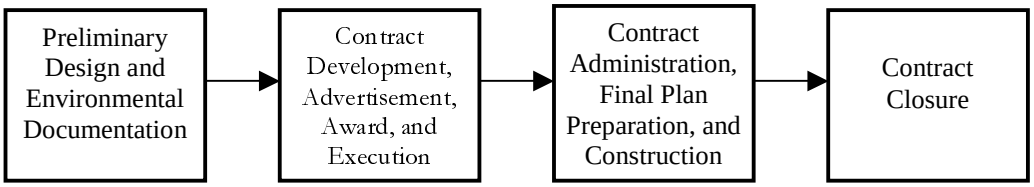

Figure 4.3 Major Phases of the Design-Build Process

The number of tasks associated with project development and construction is not significantly reduced using the D-B method. The same basic project functions that exist on a DBB project must be accomplished. However, the order and scope of some tasks may be different and the effort and time to implement tasks may be reduced for some items while increased for others. The project "clock" can speed up significantly and participants on the TxDOT side will be asked to make decisions and perform work in a more expedient manner.

The preference of most DOTs is to keep the risk unless through a project-specific risk analysis a significant value can be gained through allocation to the design-builder. On typical DBB projects, state DOTs own most project risks. In allocating risk for individual tasks associated with a D-B project, a determination needs to be made on how much to pay a design-builder to assume risks that are typically assumed by the owner.

A baseline should be defined using information from other state DOTs, existing practices, and external stakeholders to establish a risk assessment approach for D-B contracting. The baseline will indicate if the high-risk areas such as environmental studies, permit acquisition, public involvement, right-of-way acquisition, and utility relocation

agreements should be retained by TxDOT. It is critical that TxDOT performs an analysis of D-B projects to determine if project risks are manageable and to what extent they should be allocated to the design-builder.

4.8 TxDOT Transition to Design-Build

The transition to achieve proficiency with the D-B project delivery system requires TxDOT as an owner-organization to:

1. Develop D-B process guidelines and a delivery process (planning, scope, RFP, selection, management, etc.). D-B is a unique, distinct project delivery method so the associated guidance documents should be developed specifically for this procurement method.
2. Assess the availability of the skills required for the use of D-B in the organization. Experience with D-B contracting enhances the chances for success and limits the risk to the parties involved. If TxDOT lacks the necessary skills and experience to undertake D-B, consideration should be given to obtaining professional services from an experienced firm to assist with preparing the necessary documents and performing the required tasks.
3. Train selected members of the organization in the use of the D-B project delivery system. D-B contracting requires a different skill set than administrating traditional DBB contracts for highway construction. To perform these tasks adequately, TxDOT staff involved with D-B project delivery should receive adequate training to gain the required knowledge needed.
4. Optimize communication among the parties involved within TxDOT. D-B projects require more project coordination at the onset of the project planning phase and will require the design and construction divisions of TxDOT to integrate and coordinate on a much grander scale than currently exists.
5. Optimize the pre-project planning process. TxDOT must develop the skills to create a detailed scope package for D-B and develop reasonable submission requirements. Overly detailed RFP proposals may reflect a lack of understanding of the project scope and can be financially burdensome for the bidders as well as TxDOT. Proposals should be limited to the information necessary to adequately make judgment based on the merits of the proposals.

6. Select pilot D-B projects that have a relatively certain scope and contain well-known processes and technologies. Although D-B can been used on all types of highway-related construction, TxDOT should select projects with which it has adequate experience for the initial phase of the pilot program.
7. Ensure selection of qualified D-B contractors. Prequalification of contractors should limit the final competitors to those with adequate experience and financial resources. A balanced evaluation process should be administered by individuals who understand the design and construction constraints specific to the project.
8. Develop succinct criteria specifications. The project requirements listed in the RFP should be designed in performance terms rather than the more limiting prescriptive manner that may limit creative solutions.
9. Develop a systematic way to evaluate project results to determine if existing D-B procedures and approval processes are adequate, and respond to legislative requirements.

The steps needed to transition to D-B are outlined in more detail in the D-B guidebook.

The development and implementation of a process to deliver TxDOT projects through D-B contracting requires the direction and support from senior TxDOT management. Adjustments in policies and procedures that govern the day-to-day operation of the TxDOT will also be necessary for D-B contracting to be successful. Changes in administrative, managerial, and operational areas may be required to ensure that the D-B method will work efficiently within the existing project delivery structure. Pursuing new methods of contract delivery such as D-B will also require new management skills and traits, as well as new work processes. A recent study conducted by the Center for Construction Industry Studies (CCIS) has investigated the changing patterns of outsourcing of traditional owner capital facility functions such as pre-project planning, detailed design, and procurement. The study has shown that new skills are needed to manage these new relationships and that most organizations that have been studied have done little to prepare themselves for their new roles. Indeed, the institutional knowledge of many of these organizations has been severely strained and they are facing serious problems in the near future (CCIS 1998; CCIS 1999; CCIS 2000). Any new contract delivery approach, followed with a new division of work, must therefore be accompanied by a corresponding review and inventory of skills to handle proposed changes.

Traditionally, project needs are addressed through a design process that depends on a general knowledge of construction methods and practices. Builders use the plans and construct accordingly. Design improvements identified during construction, though desirable, can become costly and time consuming, because changes require value engineering (VE) studies, change orders, new specifications, and schedule adjustments. With the ideal D-B project, the design process takes place in a collaborative effort between the designer and builder. The design is tailored to the specific capabilities and resources of the team. Innovation, time savings, and sometimes lower costs can result from effectively blending the talents of the designer with the capabilities of the builder. By applying D-B to the right project, it is possible that the public will get a quality product in a shorter time, and in some cases at a lower price.

D-B contracting is intended to be only one of several project delivery methods and contracting approaches in TxDOT's toolbox and is not intended to replace the standard DBB method used on most projects. For projects where completion time is important, and when other factors are present, D-B may be a viable alternative. Although S.B. 298 were not become law, the objectives of the 77th Legislature with S.B. 298 was to investigate the strengths and weaknesses of D-B for highway construction by allowing for pilot projects. In developing a valid test, TxDOT should look carefully at existing conditions and aggressively pursue a method that fits within the organization but is not constrained by the system in place for typical DBB project delivery.

CHAPTER 5. CONCLUSIONS

Although currently disallowed by law, TxDOT and the Texas legislature have shown an interest in the design-build (D-B) project delivery method. This research report has been developed to provide an overview of the project delivery methods and contract approaches that are available to TxDOT, assess the legality of their use and criteria for selection, and provide guidance for implementing a D-B project delivery process. Legislation recently under consideration would have required TxDOT to develop a D-B process for implementing a pilot program. Although S.B. 298 was not enacted into law by the 77th Legislature, TxDOT should anticipate that the bill will come up for consideration during the next legislative session. The review and assessment of other state DOTs in implementing similar processes shows that success has been achieved by the organizations that have been proactive in their approach to managing change. To accommodate and effectively undertake innovative procurement and contracting practices TxDOT will have to modify current practices. The following conclusions are to assist TxDOT in identifying the factors that can inhibit efforts to improve project quality, cost, and schedule.

- D-B contracting requires different skills than administrating traditional DBB contracts for highway construction. Learning new methods and procedures requires proper training. TxDOT employees involved with innovative project delivery methods and contracting approaches need adequate training to understand and perform these duties.
- Implementing innovative project delivery methods and contracting approaches are process changes that require a commitment from staff and senior management to accept the challenge and provide adequate leadership.
- When the D-B project delivery method is used, overall project delivery time can be reduced. However, overall staff time commitments typically remain nearly the same as those for traditional projects (with the exception of detailed design commitment), and D-B requires more coordination and staff resources at the onset of a project. As a result, the design and construction divisions of TxDOT will have to integrate and coordinate on a larger scale than currently exists.

- The sharing of risk is a critical element when selecting project delivery methods. TxDOT should undertake a risk assessment appropriate to a project's size and complexity, and risks should be assigned to those best suited to undertake them.
- Caution and care should be taken in selecting the projects for the initial phase of the D-B pilot program. Although D-B can be used on all types of highway-related construction, TxDOT should select projects that it has considerable experience and knowledge of for the initial phase of the pilot program.
- TxDOT should develop a systematic method for capturing project performance data that can be used to monitor the impacts on implemented changes and respond to legislative reporting requirements.

Recommendations:

- Although new project delivery methods such as D-B and construction manager-at-risk are not currently available under state law, many innovative contracting approaches, such as A+B contracting, lane rental, and incentives/disincentives are applicable to traditional design bid build projects. TxDOT has applied some of these concepts on a limited basis, but should take a much more aggressive tact.
- TxDOT should expect that new project delivery methods such as D-B will become available in the future. Nearly all other public construction agencies in Texas have been authorized to use innovative project delivery methods as have an increasing number of state DOTs. TxDOT should use the next two years to develop the process outlined in this manual, and in training and human resources preparation. The appendices in this report provide draft documents that can be adapted by TxDOT as part of this action.
- TxDOT should provide input to the legislature on the benefits of alternative project delivery methods for highway construction, as well as an assessment of the provisions in S.B 298. Specifically, a full portfolio of delivery methods including D-B should be permissible and the provision requiring a $50 million minimum project size has little basis and should be omitted.

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DBIA's Design-Build Manual of Practice

DBIA's Design-Build Contract Forms:

- Standard Form of Preliminary Agreement Between Owner and Design-Builder (#520C)
- Standard Form of Agreement Between Owner and Design-Builder -- Lump Sum (#525C)
- Standard Form of Agreement Between Owner and Design-Builder -- Cost Plus Fee with an Option for a Guaranteed Maximum Price (#530C)
- Standard Form of General Conditions of Contract Between Owner and Design-Builder (#535C)
- Standard Form Of Agreement Between Design-Builder and Designer (#540C)
- Standard Form Of Agreement Between Design-Builder and General Contractor -- Cost Plus Fee with an Option for a Guaranteed Maximum Price (#550C
- Standard Form Of Agreement Between Design-Builder and General Contractor -- Lump Sum (#555C)
- Standard Form Of Agreement Between Design-Builder and Design-Build Subcontractor -- Guaranteed Maximum Price (#560C)
- Standard Form Of Agreement Between Design-Builder and Design-Build Subcontractor -- Lump Sum (#565C)

DBIA's Design-Build Contracting Guide (#2215)

DBIA's Design-Build RFQ/RFP Guide - For Major Public Sector Projects (#2210)

DBIA's Design-Build RFQ/RFP Guide - For Small-to-Medium Projects (#2211)

DBIA's Design-Build Process Documents (#2220)

The Design-Build Process for the Civil Infrastructure Project (#2240)

Guide to the Federal Design-Build Marketplace (#5115)

Survey of State Engineering and Architecture (Licensing) Boards on Design-Build (#2230)

Survey of State Procurement Laws Affecting Design-Build (#2225)

Design-Build Delivers Design Excellence (#2245)

Alternative Clauses to Standard Construction Contracts (#3010)

Cost Effective Design-Build Construction (#3060)

Design-Build Contracting Claims (#3064)

Design-Build Contracting Formbook (#3065)

Design-Build Contracting Handbook (#3070)

The Design-Build Process: A Guide to Licensing and Procurement Requirements in the 50 States and Canada (#3075)

Report on Design-Build as an Alternative Construction Delivery Method for Public Owners (#5125)

Selecting Project Delivery Systems (#3200)

The Selection Process for Capital Projects (#3201)

State-By-State Guide to Architect, Engineer, and Contractor Licensing (#3062)

A State-by-State Guide to Construction and Design-Law (#3069)

Appendix B
Structured Interview Questionnaire

Center for Transportation Research – University of Texas at Austin
Research Project 0-2129, Innovative Project Delivery Methods Available for Immediate Implementation in the Texas Department of Transportation

1. **Personal Background Information**
    a. Contact Information:
        i. Full Name:
        _____
        _____
        ii. Address:
        _____
        _____
        iii. Phone Number:
        _____
        _____
        iv. Fax Number:
        _____
        _____
        v. Email Address:
        _____
        _____
    b. <u>Education:</u>
        i. College(s) Attended and Degree(s) Obtained:
        _____
        _____
        ii. Relevant Seminars/Workshops/Continuing Education Programs:
        _____
        _____
    c. Work Experience:
        i. Positions Held:
        _____
        _____

2. **Experience with Alternative/Innovative Delivery Methods** (i.e., approaches other than the traditional design-bid-build)
    a. What types of approaches (Design-Build Contracting (where design-build contracting is defined as one entity processing sole responsibility for the design and construction of the project; design-builder can be a single corporation, a joint-venture, etc.), Construction Management (CM)-At-Risk, Cost Plus Time Bidding, Cost Plus Time Plus Quality Bidding)?
    _____
    _____
    _____
    b. Do you have experience with any other alternative delivery methods?
    _____
    _____
    c. Were any of the aforementioned processes applied to Highway Construction?
    _____
    _____

3. **Specific Experience with the Above-Mentioned Approaches?**

a. Introduction:
   i. When were you first introduced to any of these methods?
   _____
   _____
   ii. What method was employed?
   _____
   _____
   iii. What was the type of project?
   _____
   _____
   iv. What was the size of project?
   _____
   _____

b. Since your first experience, what frequency or number of these types of projects have you completed?
_____
_____

c. What has been your overall experience with alternative delivery methods?
_____
_____
   i. What positive experiences have you had?
   _____
   _____
      1. For these positive experiences, what type of delivery method was employed?
      _____
      _____
      2. What was the cause of these positive experiences (size, management, etc.)?
      _____
      _____
      3. What were the specific benefits (cost, time, quality, etc.)?
      _____
      _____
   ii. What negative experiences have you had?
   _____
   _____
      1. For these negative experiences, what type of delivery method was employed?
      _____
      _____
      2. What was the cause of these negative experiences (size, management, etc.)?
      _____
      _____
      3. What were the specific benefits (cost, time, quality, etc.)?
      _____
      _____
   iii. For these experiences, what was your perspective (personal (or company/agency) perspective)?
   _____
   _____

4. Alternative Delivery Methods vs. Traditional Design-Bid-Build Contracting

a. What types of projects are best/worst suited for alternative delivery methods?

_____
_____

i. What effect does size ($) have?
_____

ii. What effect does time sensitivity have?
_____

iii. What effect does local support have (ex: no complete plans in design-build contracting in early phases)?
_____

iv. What effect does environmental concerns have?
_____

v. Does it matter if the project is urban or rural?
_____

vi. Does it matter if the project is new construction or rehabilitation?
_____

vii. Are there any other factors?
_____

5. **Legal Requirements for Public Alternative Delivery Methods**
   a. Public contracting carries different rules and regulations than private contracting.
      i. The standard public contracting requirements are as follows:
         1. Competitive bidding (theoretically employed to protect public funds).
            a. Do you believe this practice is theoretically sound?
            _____
            _____
            b. Do you believe this practice is practically sound?
            _____
            _____
         2. Subcontractor listing (theoretically employed as anti-"bid shopping" and DBE enforcement measures).
            a. Do you believe this practice is theoretically sound?
            _____
            _____
            b. Do you believe this practice is practically sound?
            _____
            _____
   b. In 1997, the Texas legislature passed legislation allowing DB contracting in the construction of public schools and the UT System.
            a. Have you any experience with this legislation or contracting under it?
            _____
            _____
               i. Was it positive or negative, and how so?
               _____
               _____
            b. What differences or problems do you see with implementing similar legislation for TxDOT Highway Construction?
            _____
            _____
         2. The Texas legislature has also allowed Turnpike Authorities to use DB contracting?
            a. Have you any experience with this legislation or contracting under it?
            _____
            _____

i. Was it positive or negative, and how so?

_____

_____

b. What differences or problems do you see with implementing similar legislation for TxDOT Highway Construction?

_____

_____

3. Are you aware of the proposed Texas legislation (SB 298) for a pilot DB program at TxDOT?

_____

_____

a. If so, did you have any involvement?

_____

_____

b. Have you reviewed the proposed legislation?

_____

_____

i. Do you have any suggestions?

_____

_____

ii. Some other states allow alternative delivery methods on public works.

1. With what states do you have any of this type of experience?

_____

_____

2. Has your experience been positive or negative?

_____

_____

a. What differences or potential differences did the other states programs have with the proposed TxDOT Highway Construction DB Program?

_____

_____

c. Do you foresee problems with Texas design professional licensing laws?

_____

_____

i. Where would the problems occur?

_____

_____

ii. What has your experience been in other states regarding this licensing issue?

_____

_____

d. Do you foresee problems with the legislation's interface with FHWA?

_____

_____

i. Where would the problems occur?

_____

_____

ii. What has your experience been in other states regarding this licensing issue?

_____

_____

e. Do you foresee problems with the legislation's interface with DBE legislation?

_____

_____

i. Where would the problems occur?

_____

_____

1. When should DBEs be disclosed?

_____

_____

ii. What has your experience been in other states regarding this DBE issue?

_____

_____

f. Do you foresee problems with the legislation's interface with National Environmental Policy Act (NEPA)?

_____

_____

g. Where would the problems occur?

_____

_____

i. Are there special considerations for permitting?

_____

_____

1. Generic Permits:

_____

_____

2. Design Orientated Permits:

_____

_____

ii. What has your experience been in other states regarding this EPA issue?

_____

_____

6. **Practical Guide to Alternative Delivery Methods**

a. Is a special owner management infrastructure required?

_____

_____

i. Under the concept of a smart buyer, the owner must be qualified to manage the contract.

1. Does TxDOT fit into the "smart buyer" criteria?

_____

_____

b. Are you familiar with owner's outsourcing contract administration for these types of delivery methods?

i. Would you recommend outsourcing?

_____

_____

1. If so, what type of administration (Construction Manager, Design-Build Consultant)?

_____

_____

a. Are there any other types?

_____

_____

7. **Procurement Process for Alternative Delivery Methods**

a. How far should the design or scope of work be developed before the procurement process begins?

_____

_____

b. What procurement method would you recommend?

_____

_____

i. Are you familiar with the Two-Step Method for DB contracting (short list top three teams then select most qualified and cost competitive team)?

_____
_____

1. Would you recommend this method?

_____
_____

2. If not, what method would you recommend?

_____
_____

ii. Are familiar with the use of stipends for all short listed design-builders?

_____
_____

1. Would you recommend the use of stipends for the unselected teams?

_____
_____

c. On what basis, should the contract be awarded?

i. Low Bid:

1. What are the advantages/disadvantages?

_____
_____

ii. Adjusted Bid:

1. What are the advantages/disadvantages?

_____
_____

iii. Best Value:

1. What are the advantages/disadvantages?

_____
_____

iv. Competitive Negotiation:

1. What are advantages/disadvantages?

_____
_____

v. Any other method?

1. What are advantages/disadvantages?

_____
_____

d. In what areas do you see a conflict of interest problem?

i. Preliminary Design:

1. Should the owner's consultant be restricted?

_____
_____

2. Should the owner's consultant's sub-consultants be restricted?

_____
_____

e. How should the owner deal with right of way procurement?

i. Who should be responsible for the procurement (owner or design-builder)?

_____
_____

1. What are the advantages/disadvantages?

_____
_____

8. **Design-Build Contract Provisions** (special considerations)

a. Changes Clauses:

i. How should minor changes be dealt with?

_____
_____

1. Whose approval is necessary? (For example, in a design bid build (DBB) situation, normally the architect can approve without the owner's consent. What about a design build (DB) situation?)

   _____
   _____

ii. Value Engineering (VE):

1. What role, if any does VE play?

   _____
   _____

b. Differing Site Conditions Clause:

i. Type I (materially different than indicated in the contract documents):

1. Who is responsible?

   _____
   _____

ii. Type II (unusual nature):

1. Who is responsible?

   _____
   _____

c. Risk Shifting Clauses:

i. Bonding:

1. Should design work (full contract price) be bonded?

   _____
   _____

   a. If so, why?

      _____
      _____

   b. If so, how will design professional obtain bonding?

      _____
      _____

ii. Indemnification Clauses:

1. Should the contract include a general (negligence) indemnity clause for the design-builder?

   _____
   _____

2. Should the contract include a general (negligence) indemnity clause for the owner?

   _____
   _____

iii. Insurance:

1. What type of insurance should the design-builder be required to obtain?

   _____
   _____

2. What type of insurance should the owner be required to obtain?

   _____
   _____

iv. Warranties:

1. Are there special considerations for the design-builder warranties?

   _____
   _____

d. Incentive/Disincentive Clauses:

i. Are incentive/disincentive clauses appropriate?

_____
_____

e. How should commissioning/turnover be handled in the contract?

_____

_____

f. Dispute Resolution:

i. Who will act as the project arbiter? (For example in a DBB situation, the project architect acts as arbiter between owner and contractor. What about a DB situation?)

_____

_____

ii. Litigation:

1. Do you see the design-builder as sole source of responsibility/contact as a large advantage to this type of contracting?

_____

_____

2. Are there other special considerations for DB or any other alternative delivery method?

_____

_____

iii. ADR:

1. Are there other special considerations for DB or any other alternative delivery method?

_____

_____

g. Do you have any other special contract concerns?

_____

_____

9. **Other Sources of Information**

a. Is there any specific DBIA information that you see as beneficial to this research topic?

_____

_____

b. Is there any specific information from any other industry society or association that you see as beneficial to this research topic?

_____

_____

c. Is there any specific project/company/agency documentation that you see as beneficial to this research topic?

_____

_____

i. Are you familiar with any design-build manuals or handbooks?

_____

_____

ii. Are you familiar with any design-build contracts?

_____

_____

d. Is there any TxDOT personnel who you believe would be helpful to this research?

_____

_____

e. Is there any Texas contractors, architects, engineers, lawyers, government officials who you believe would be helpful to this research?

_____

_____

f. Is there any out-of-state contractors, architects, engineers, lawyers, government officials who you believe would be helpful to this research?

_____

THANK YOU! We will send you the final report upon its completion.

Appendix C
Conferences and Meetings Attended, and Interviews and Conversations Conducted

1. **Conferences**
   - October 4-7, 2000, San Diego, California, Design Build Institute of America (DBIA) 2000 Annual Conference
   - October 30, 2000, Austin, Texas, Association of Professional Engineers briefing session on design-build issues in the upcoming legislative session.
   - January 7-11, 2001, Washington, D.C., Transportation Research Board National Conference
   - January 31, 2001, Austin, Texas, Forum on Construction Project Delivery for Texas Public Agencies
   - April 18-20, 2001, Denver, Colorado, DBIA/FHWA Design-Build for Transportation Conference
   - October 25, 2001, Boston, Massachusetts, DBIA 2001 Annual Conference, presentation of the research project results

2. **Meetings**
   - August 31, 2000, Austin, project kick-off meeting
   - January 5, 2001, Austin, progress report meeting I with TxDOT project manager
   - January 21, 2001, Austin, progress report meeting II with TxDOT project team
   - May 8, 2001, Austin, progress report meeting III with TxDOT project team

3. **Interviews**
   - Stewart Anderson, Associate Professor, Department of Civil Engineering, Texas A&M University
   - James Broaddus, Consultant and former President, Design Build Institute of America
   - Lisa B. Choplin, Assistant Division Chief, Highway Design Division, Maryland State Highway Administration
   - Mike Clark, Project Manager, Washington State Department of Transportation
   - Steve Clay, Senior Vice President for Major Projects, TDIndustries
   - Joe Henner, Partner, Kilpatrick Stockton LLP
   - Paul R. Huston, Design-Build Engineer, Office of Construction and Contract Administration, Minnesota Department of Transportation
   - Schiller Liao, Project Manager, Office of Facilities Planning and Construction, The University of Texas System
   - Helen McBrady, Business Manager, Trauner Consulting Services
   - Steve Nelson, C.E.O., Faulkner Construction Company
   - Phillip Russell, Director, Texas Turnpike Authority
   - Nancy Smith, Partner, Nossaman, Guthner, Knox & Elliot, LLP
   - Neal Sweeney, Partner, Kilpatrick Stockton LLP

4. **Conversations**
   - Brian Bellfi, Transportation Project Manager, CH2MHILL
   - Gerald Benson, Vice President, Black & Veatch
   - David Brattan, Transportation Project Manager, KPMG
   - William Burnett, Director of Project Development, J.D. Abrams, Inc.
   - Robert G. Burns, Engineer, Oregon Department of Transportation
   - John Cable, Director, Project Management Program, University of Maryland
   - Don Freeman, State Highway Engineer, South Carolina Department of Transportation
   - Darrell Gianonetti, Construction Engineer, Utah Department of Transportation
   - Doug Gransberg, Associate Professor, University of Oklahoma
   - Crawford Jencks, Research Manager, National Cooperative Highway Research Program, Transportation Research Board, National Research Council
   - Doug Johnson, Project Manager, CH2MHILL
   - Douglas Kaiser, Vice President, EXXCEL Contract Management
   - Keith Molenaar, Assistant Professor, Construction Engineering & Management Program, University of Colorado
   - Steve Stagner, Executive Director, Consulting Engineers Council of Texas
   - Larry Weiss, State Highway Engineer, South Dakota Department of Transportation
   - Gregory Xanders, State Construction Engineer, Florida Department of Transportation
   - Gerald Yakowenko, Contract Administration Engineer, Federal Highway Administration
   - David Zachry, Head of Civil Group, H.B. Zachry Company

Summary

Type	Number Attended/Completed
Conference Presentations attended	6 27
Meetings with TxDOT	4
Interviews	13
Conversations	18

APPENDIX D – TXDOT GUIDE TO CONTRACTING STRATEGIES & CONTRACT PROVISIONS

The Construction Division of TxDOT has developed the following matrix to identify the contract provisions from the 1993 Specifications Book and the General Notes required for each of the listed contracting strategies. Source: TxDOT Construction Division, May 2001.

	CONTRACT PROVISIONS										
CONTRACTING STRATEGY	**1a, b, or c**	**2**	**3**	**8a**	**8b**	**8c**	**8d**	**8e**	**8f**	**9**	**General Notes**
Std Low Bid w/ Bar Chart.						●					
Std Low Bid w/ Basic CPM.						●					A
Std Low Bid w/ Advanced CPM.							●				
Std Low Bid w/ Road User Cost Damage only.	●			●			●				B, C
Std Low Bid w/ Road User Cost Damage & Incentive.	●			●	●		●				B, C, D
A+B Bid w/ Road User Cost Damage only.	●	●	●	●			●			●	B, C, D, F
A+B Bid w/ Road User Cost Damage & Incentive.	●	●	●	●	●		●			●	B, C, D, E, F
No Excuse Bonus								●			B, C, D
Lane Rental									●		

KEY TO GENERAL NOTES

A. General note requiring basic CPM.
B. General note required for specifying project specific daily road user cost value(s).
C. General note for establishing the beginning and ending of phases.
D. General note required for specifying project specific maximum number of days for incentive(s).
E. General note required for specifying project specific maximum number of days that can be bid.
F. General note required for establishing time between substantial completion and project acceptance (used when time not established by TxDOT).

CONTRACT PROVISIONS (1993 Specifications Book)

1a. SP 001-108: Definition of Terms - daily road user cost and 5 days/week calendar day definitions.
1b. SP 001-109: Definition of Terms - daily road user cost and 6 days/week calendar day definitions.
1c. SP 001-110: Definition of Terms - daily road user cost and 7 days/week calendar day definitions.
2. SP 002-085: Instruction to Bidders - to submit working days.
3. SP 003-041: Award and Execution of Contract - consideration of bids being A+B.
8a. SP 008-151: Prosecution and Progress - Road User and Contract Administration Cost Liquidated Damages.
8b. SP 008-152: Prosecution and Progress - Incentive provision.
8c. SP 008-117: Prosecution and Progress - bar chart or basic CPM schedules required to be submitted by contractor.
8d. SP 008-118: Prosecution and Progress - Advanced CPM.
8e. SP 008-xxx: Prosecution and Progress - No excuse bonus incentive provision.
8f. SP 008-xxx: Prosecution and Progress – General lane rental provision. Addendum to special provision required with lane rental schedule.
9. SP 009-054: Measurement and Payment - Explains that the days bid are for comparison purposes only and not a pay item.

APPENDIX E - Design Build Projects Approved Under SEP-14 as of January 10, 2001

Source: FHWA SEP-Program, April 2001

	STATE	BRIEF DESCRIPTION /LOCATION	FHWA CONCEPT APPROVAL	CONTRACT AMOUNT (millions)	AWARD METHOD
1	AL	Ferry Boat	16-Apr-97	$0.695	Low Bid
2	AL	Resurface , Replace Bridge	16-Apr-97		
3	AK	Ocean Class Ferry Boat	07-Dec-92	$80.400	Adjusted Bid
4	AK	Whittier Tunnel	01-Nov-96	$57.000	Adjusted Bid
5	AK	Very Fast Vehilce Ferry (option to buy up to 5 ferries)	24-Jan-00		Best Value
6	AZ	Emergency Relief Bridge Replacement		$3.500	Low bid
7	AZ	I-10/Cortaro Rd Interchange	11-Feb-97	$2.760	Adjusted Bid
8	AZ	I-17 Thomas Road to Dunlap Avenue, Phoeniz	06-May-98		Adjusted Bid
9	AZ	AZ State Route 68 near Kingman AZ, 13.5 miles reconstruction	27-May-99		
10	AZ	US Route 60	04-Apr-00		Adjusted bid
11	CA	Emergency Relief - LaCienega / Venice Undercrossing	16-Jun-94	$3.856	Low Bid
12	CA	SR-125	05-Mar-97		
13	CA	TCA Foothills South -	19-Mar-99		
14	CA	TCA - Glenwood-Pacific Park Drive	22-May-00		low bid
15	CO	Woodland Park urban street		$0.670	Low Bid
16	CO	I-70 Reconstruction, MP 336.8 to 11.4	14-Mar-97	$20.664	Low bid
17	CO	I-70 reconstruction	06-Jan-98		
18	CO	Colorado Transportation Management System - System Integrator	26-May-98		
19	CO	I-25 near Wellington, CO, 27 km roadway reconstruction	24-Oct-97		Low Bid
20	DC	Enhanced I&M station (auto emission monitoring)	21-Aug-97		Adjusted Bid
21	DE	Choptank Road over Back Creek	27-Mar-00		Adjusted bid
	FL	Florida Design-build program approval *	12-Sep-96		Adjusted Bid
22	FL	I-10 Santa Rosa count FL Major Structure over BlackwaterRiver	13-Oct-95	$28.300	
23	FL	#240957 - SR 483, Daytona Beach, Clyde Morris Pedestrian Overpass	*	$1.125	
24	FL	#239472 - SR-15/SR 600, Orlando FL Pedestrian Overpass (minor)	*	$2.162	
25	FL	#218772 - Replace Bryant Patton Bridge (major)	*		
26	FL	#219371 - SR 75 (US 231) Welcome Station (minor)	*		
27	FL	#219049 - SR 22 Resurfacing Guld Co. (minor)	*		
28	FL	#228843 - SR 76 Misc construction (minor)	*	$2.180	
29	FL	#231531 - I-75 Alley Interchange (minor)	*	$2.047	
30	FL	#232858 - Parking Lot Emergency Command Center	*	$1.350	
31	FL	#238407 - SR 50 Resurfacing (minor)	*	$0.636	
32	FL	#242301 - I-95 Pedestrian Overpaass (minor)	*	$0.972	
33	FL	#251624 - CCTV Cameras (minor)	*		
34	FL	#256408 - SR 700 (US98) Resurface (minor)	*		
35	GA	I-95 Bryan County, N/O Jerico River to S/O US 17	03-Dec-98	$19.687	Low Bid
	GA	Programmatic approval for modified design-build program	22-Dec-00		Low bid

APPENDIX E - Design Build Projects Approved Under SEP-14 as of January 10, 2001

Source: FHWA SEP-Program, April 2001

	STATE	BRIEF DESCRIPTION /LOCATION	FHWA CONCEPT APPROVAL	CONTRACT AMOUNT (millions)	AWARD METHOD
36	HI	Kuihelani Highway on Maui	12-Sep-97		Low Bid
	IN	Indiana Design-Build Program Approval *	21-Jul-97		
37	IN	#1 I-65 , Crawfordsville District	*		Low Bid
38	IN	#2 I-65, Greenfield District , Marion County	*		Low Bid
39	IN	#3 I-65 LaPorte District , Lake County	*		Low Bid
40	IN	#4 I-465 / I-70 interchange, Greenfield District, Marion County	*		Low Bid
41	IN	#5 I-64, Vincennes district, Posey and Vanderburgh Counties	*		
42	IN	#6 'I-465 Greenfield District, Marion County (Des #9706730)	*		
43	IN	#7 I-70 Crawfordsville District, Vigo County; bridge over Wabash River	*		
44	IN	#8 I 69 Ft. Wayne District, Allen County	*		
45	MA	Route 3 North, from Route 128 to the NH border	11/23/99	$385.000	Best Value
46	MD	US-113 from N/O US 50 to S/O MD 589; four-lane highway along new location	22-Oct-98	$10.344	Low Bid
47	MD	MD 32 at Samford Road	15-Feb-00		Low bid
48	ME	Bath-Woolwich Bridge Replacement	09-Oct-96	$46.600	Adjusted bid
49	MI	Detroit Freeway Management System, ATMS / ATIS	03-May-94	$32.800	Adjusted Bid
50	MI	I-94 / Vining Rd Interchange	26-Aug-94	$14.890	Adjusted Bid
51	MI	US 23 pavement rehab project	28-Dec-95	$7.610	Adjusted Bid
	MI	Bridge Replacement Program *	30-Jun-95		Low bid / A+B
52	MI	I-94 Frazho& Martin Bridge Deck Replacement	*	$1.730	Low bid / A+B
53	MI	I-96 Wixom Bridge Deck Replacement	*	$1.052	Low bid / A+B
54	MI	I-75 Gardenia Bridge Superstructure replacement	*	$0.854	Low bid / A+B
55	MI	I-69 Wadham Bridge Superstructure replacement	*	$0.640	Low bid / A+B
56	MI	I-94 Burns Bridge Deck Replacement	*	$1.143	Low bid / A+B
57	MI	US-24 Rouge R. Bridge Deck Replacement	*	$1.730	Low bid / A+B
58	MI	M-10 Lafayette & Us12 Bridge Deck Replacement	*	$3.538	Low bid / A+B
59	MI	M-10- Warren Bridge Deck Replacement	*	$2.042	Low bid / A+B
60	MI	M-10 Greenfield Bridge Deck Replacement	*	$2.060	Low bid / A+B
61	MI	I-75 Second Bridge Deck Replacement	*	$1.461	Low bid / A+B
62	MI	I-96 BL GTW RRBridge Deck Replacement	*	$3.750	Low bid / A+B
63	MI	I-696 M-10 Bridge Superstructure replacement	*	$0.990	Low bid / A+B
64	MI	M-28 Ontonagon River Bridge Deck Replacement	*	$0.729	Low bid / A+B
65	MI	I-94 Rouge River B& GTW RRridge Superstructure replacement	*	$4.900	Low bid / A+B
66	MI	I-94 Harper Bridge Deck Replacement	*	$1.551	Low bid / A+B
67	MI	Beaver Island Ferry Boat	11-Jul-95	$2.400	Low bid
68	MI	I-275 reconstruction, 8.3 km, 5 Mile Road to I-696, Wayne and Oakland Co.	01-Sep-98		Low Bid
69	MI	I-69 and I-75 Weigh Stations	26-May-00		best value
70	MN	I-35 pavement rehabilitation	04-Jun-96	$7.668	Low bid

APPENDIX E - Design Build Projects Approved Under SEP-14 as of January 10, 2001

Source: FHWA SEP-Program, April 2001

	STATE	BRIEF DESCRIPTION /LOCATION	FHWA CONCEPT APPROVAL	CONTRACT AMOUNT (millions)	AWARD METHOD
	NJ	Program approval for modified design-build procurement	28-May-97		
71	NJ	Route I-280 Access Ramps	12-Mar-96	$4.600	Modified D-B
72	NJ	Local Bridge Projects 11th Ave & 14th St	12-Mar-96	$1.827	Modified D-B
73	NJ	Local Bridge Projects Bordentown - Georgetown Rd	12-Mar-96	$1.513	Modified D-B
74	NJ	Local Bridge Projects Oakview Ave, Roosevelt and Westervelt Ave.	12-Mar-96	$2.773	Modified D-B
75	NJ	Route 29 Improvements	12-Mar-96	$70.930	Modified D-B
76	NJ	Routes 50 & 322 Interchange Reconstruction	12-Mar-96	$8.416	Modified D-B
77	NJ	Route 35 Victory Bridge	12-Mar-96	$84.800	Modified D-B
78	NJ	Route 9, 25K	12-Mar-96	$57.944	Modified D-B
79	NJ	Enhanced I&M stations	04-Aug-97	$63.156	Best Value
80	NJ	Emergency Bridge Replacement over Peckman's Brook, Passaic County	19-Oct-99		Modified D-B
81	NJ	Delaware River Tram between Camden NJ and Phildelphia, PA	15-Mar-00		
81	NY	New York City DOT, pedestrian safety project	23-Jun-98		Adjusted Bid
82	NY	New York City DOT, Belt Parkway / Ocean Parkway Bridge	30-Aug-00		Adjusted Bid
83	NY	Port Authority of NY and NJ - Traffic Surveillance on George Washington Bridge	27-May-99	$17.537	
84	NC	CARAT ITS project	13-Oct-95	$13.750	Adjusted Bid
85	NC	Statewide wetland mitigation	16-Nov-98		best value
85	OH	OTT/ERI-2-44.103/0.000 roadway mill and resurface, deck overlays	*	$2.600	Low bid
86	OH	WYA-231-27.868; Bridge replacement	*	$0.500	Low bid
87	OH	Lor-252-8.738; Bridge replacement	*	$2.000	Low bid
88	OH	LAK 2-12.231 Bridge replacement	*	$2.000	Low bid
89	OH	TUS -800-36.967; bridge replacement	*	$0.198	
90	OH	chp / cla-68-0.0024.441 ; 1.2 km of new 4-lane highway 3 structures	07-Aug-96	$13.900	
91	OH	Toledo Lucas County marine passenger terminal	17-Jul-98		Low bid
	OH	Program approval for a modified design-build program **	21-Jul-99		
92	OH	VAN-US127-12.39, replace 3 bridge decks	**	$1.010	Low Bid
93	OH	ALL-IR075-29.548, replace Swaney Rd. bridge deck	**	$0.667	Low Bid
94	OH	LOR-IR090-9.48, 4 lane resurfacing & deck overlays	**		Low Bid
95	OH	MED-IR271-0.00, complete pavement replacement	**	$17.313	Low Bid
96	OH	ATB-SR045-19.92, SR45 over IR90 bridge widening	**	$2.964	Low Bid
97	OH	POR-SR088-1.79, traffic signal & turn lanes	**		Low Bid
98	OH	STA-US062-34.616, replace US62 bridges over IR077	**		Low Bid
99	OH	STA-IR077-11.85, add 3rd lane & replace existing pavement	**	$24.000	Low Bid
100	OH	GUE-SR660-4.98, replace 2 bridges	**	$0.471	Low Bid
101	OH	MIA-IR075-7.948, add 3rd lane & replace existing pavement	**	$45.480	Low Bid
102	OH	PRE-IR070-0.00, pavement rehab & bridge work	**	$20.534	Low Bid
103	OH	GRE-US35J-0.00, pavement planning & overlay	**	$10.498	Low Bid

APPENDIX E - Design Build Projects Approved Under SEP-14 as of January 10, 2001

Source: FHWA SEP-Program, April 2001

	STATE	BRIEF DESCRIPTION /LOCATION	FHWA CONCEPT APPROVAL	CONTRACT AMOUNT (millions)	AWARD METHOD
104	OH	HAM-IR071-11.08, pavement planning & overlay	**		Low Bid
105	OH	HAM-IR275-32.27, pavement rehab & bridge work	**	$29.500	Low Bid
106	OH	HAM-IR471-00.26, pavement rehabilitation	**		Low Bid
107	OH	ROS-SR159-0.00, pavement repair & overlay	**	$2.290	Low Bid
108	OH	NOB-IR077-6.22, joint replacement & concrete overlay	**	$10.650	Low Bid
109	OH	CUY-IR480-19.93, noisewall retrofit panels	**	$2.516	Low Bid
110	OR	I-5 reconstruction; 9.7 km; near Evans Creek, Rock Point	14-Sep-98	$7.774	Adjusted bid
111	PA	Wetland bank on US 220 project	11-Feb-97		Low bid
	PA	PennDOT Programmatic concept approval for modified design-build	08-Oct-97		Modified D-B
112	PA	District 1 Warren Co, Expressway reconstruction	**		Modified D-B
113	PA	District 1 Veango Co., Bethel Sunville Rd., Bridge Replacement	**		Modified D-B
114	PA	District 2-0 Clearfield 53-A04 022C035 Bridge Replacement	**		Modified D-B
115	PA	Distrct 2 Clearfield Bridge Replacement	**		Modified D-B
116	PA	Distict 2 Mifflin County , Bridge over Kishacoquilas Creek	**		Modified D-B
117	PA	District 2 McKeam Bridges over Allegheny River and Railroad	**		Modified D-B
118	PA	District 3-0 Tioga 0015-F13 037C1386 New 2 Lane Bridge on SBL	**		Modified D-B
119	PA	District 3 Tioga Co., New two-lane bridge on SBL	**		Modified D-B
120	PA	District 3 Lycoming Deck Replacment on the Susquehana River Bridge at Muncy	**		Modified D-B
121	PA	District 4-0 Susquehanna 0706-570 045C034 Wyalusing Creek Bridge	**		Modified D-B
122	PA	District 4-0 Susquehanna 0267-572 045C035 Bridge over EB Wyalusing Creek	**		Modified D-B
123	PA	District 4-0 Wyoming 0029-770 047C026 Bowman's Creek Bridge	**		Modified D-B
124	PA	District 4 Susquehanna Wyalusing Creek Bridge	**		Modified D-B
125	PA	District 4 Luzerne, Bridge Replacement Carey Ave	**		Modified D-B
126	PA	District 5-0 Berks 0100-090 Passmore Bridge	**		Modified D-B
127	PA	District 6-0 Chester 0029-50S 062C050 Bridge Replacement	**		Modified D-B
128	PA	District 6-0 Bucks 2006-02S 061C102 Deck Replacement	**		Modified D-B
129	PA	District 9-0 Bedford 30-13B Everett Bypass Bridge Replacement	**		Modified D-B
130	PA	District 9-0 Somerset 56-12B Replacement of 69 foot Pipe Culvert	**		Modified D-B
131	PA	District 10-0 Indiana 0954 104C033 Two Lick Bridge	**		Modified D-B
132	PA	District 11-0 Allegheny 4003-A03 Nelson Run Bridge	**		Modified D-B
133	PA	District 11-0 Lawrence 3009-L04 Hickory Run Bridge	**		Modified D-B
134	SC	Bridge Replacements- Reedy Creek, Enoree River	22-Jan-96	$2.835	High Comp Score
135	SC	Bridge Replacement - Wateree River	07-Aug-96	$7.856	Adjusted bid
136	SC	Bridge Replacement - Stono Creek	11-Feb-97		Modified D-B
	SC	Design-build program approval for adjusted bid, best value, fixed budget/bv	10-Mar-99		
137	SC	Conway Bypass		$386.3M	
138	SC	Carolina Bays Parkway	10-Mar-99	$225.4M	FB / BV

APPENDIX E - Design Build Projects Approved Under SEP-14 as of January 10, 2001

Source: FHWA SEP-Program, April 2001

	STATE	BRIEF DESCRIPTION /LOCATION	FHWA CONCEPT APPROVAL	CONTRACT AMOUNT (millions)	AWARD METHOD
139	SC	SC 170 Widening	10-Mar-99	$65.7M	High Comp Score
140	SC	Cooper River Bridge Repl.	10-Mar-99		Low bid
141	SD	Reconstruction of I-229 from Western Ave. to Benson Rd. in Sioux Falls	02-Sep-99		Adjusted bid
142	TN	MPW Nashville and Davidson County, ITS Parking and Traffic Guidance System	19-May-99		
143	UT	ITS Traffic Operations Center project	31-Jan-97	$4.573	Low-Bid
144	UT	ITS Interim Traffic Control System	03-Sep-96	$1.500	BVFB
145	UT	I-15 Reconstruction Project	18-Jun-96	$1,325.000	Best Value
146	UT	Legacy West Davis Highway , Farmington to Salt Lake City, 19.3 km	14-Apr-98	TBD	Best Value
147	UT	SR-176 lake Powell vehicle / passenger ferry system	27-Aug-99	$2.650	Best Value
	UT	Program approval for a best-value design-build program *	14-Apr-98		
148	WA	SR 500 and Thurston Way - new interchange	05-Apr-99		
149	WA	Tacoma Narrows Bridge	02-Aug-00		Pub/Priv. Partner.
150	WI	CIty of Milwaukee, Menominee Valley Viaduct	04-Feb-00		High Comp Score
			Total	**$2,632.010**	

APPENDIX F

50-STATE SURVEY OF PUBLIC AGENCY DESIGN-BUILD AUTHORITY

SOURCE: Smith, Nancy C. Handout provided at the 2000 Design Build Institute of America Annual Conference. Ms. Smith is a partner at Nossaman, Guthner, Knox & Elliott, LLP, a law and consulting firm internationally recognized for advising state departments of transportation, turnpike authorities, transit agencies and developers on solutions to large transportation and other infrastructure challenges. As a work in progress, the author requests that changes and updates be sent to Ms. Smith, Phone (213) 612-7837; Fax (213) 612-7801; Email nsmith@nossaman.com.

State	Authority/Jurisdiction	Citation
Alabama	No specific legislation	
Alaska	Authorization for all agencies for projects using state funds, subject to determination by chief procurement officer	Alaska Stat. §36.30.200
Arizona	Authorization for State Transportation Board (also has public-private partnership authority); pilot projects by Department of Transportation; counties over 1,500,000; Stadium Districts	Ariz. Rev. Stat. §§28-305, 28-6713 and 28-6923 1999 Ariz. Sess. Laws 207, H.B. 2274 (adopted 5/12/99) amending 1998 Ariz. Sess. Laws 278 Ariz. Rev. State. §48-4204; 2000 Ariz. Sess. Laws 135 (BH 2340)
Arkansas	No specific legislation	
California	Authorization for specific agencies to use design-build; various city charters allow design-build (including San Diego and Chula Vista); a number of agencies have used design-build without legislative authorization; general legislation permitting design-build has been proposed more than once but thus far not adopted; Caltrans has legislative authorization for public-private partnerships and an office facility in San Bernardino, and has done at least one design-build project under its emergency authority.	Cal. Pub. Cont. Code §10708 (universities) Cal. Pub. Cont. Code §§20133 and 20175 (Counties of Alameda, Contra Costa, Sacramento, Santa Clara, Solano, Sonoma, Tulare; expires 2006) Cal. Pub. Cont. Code §20221.1 (BART airport extension) Cal. Pub. Cont. Code §§20209.5 et seq. (transit operators) Cal. Pub. Cont. Code §20301.5 (Santa Clara Valley Transportation Authority) Cal. Pub. Res. Code §§5080.50-5080.56 (Department of Parks and Recreation, for specified project) Cal. Pub. Util. Code §§132400 et seq. (Los Angeles to Pasadena Blue Line Construction Authority) Etc.
Colorado	Authorization for Department of Transportation	Colo. Rev. Stat. §§4b-25; 4b-51 et seq.
Connecticut	Authorization for State, housing authorities, municipalities/public-private urban development, higher education	Conn. Gen. Stat. Ann. §§4b-24; 4b-51 et seq. 1999 Conn. Acts 241 §31(5) Conn. Gen. Stat. Ann. §8-22 Conn. Gen. Stat. Ann. §7-483 1998 Conn. Acts 255 §6(a) 1998 Conn. Acts 250, §§33-34
Delaware	Authorization for Solid Waste Authority, Department of Transportation	Del. Code Ann. Tit. 7 §6404 Del. Code Ann. Tit. 2 §2003
District of Columbia	Authorization for Convention Center Authority and other agencies	D.C. Code Ann. §9-819(e) D.C. Mun. Regs. Tit. 27, §2607.2
Florida	Authorization for State, Counties, Department of Transportation, Education	Fla. Stat. Ann. §287.055

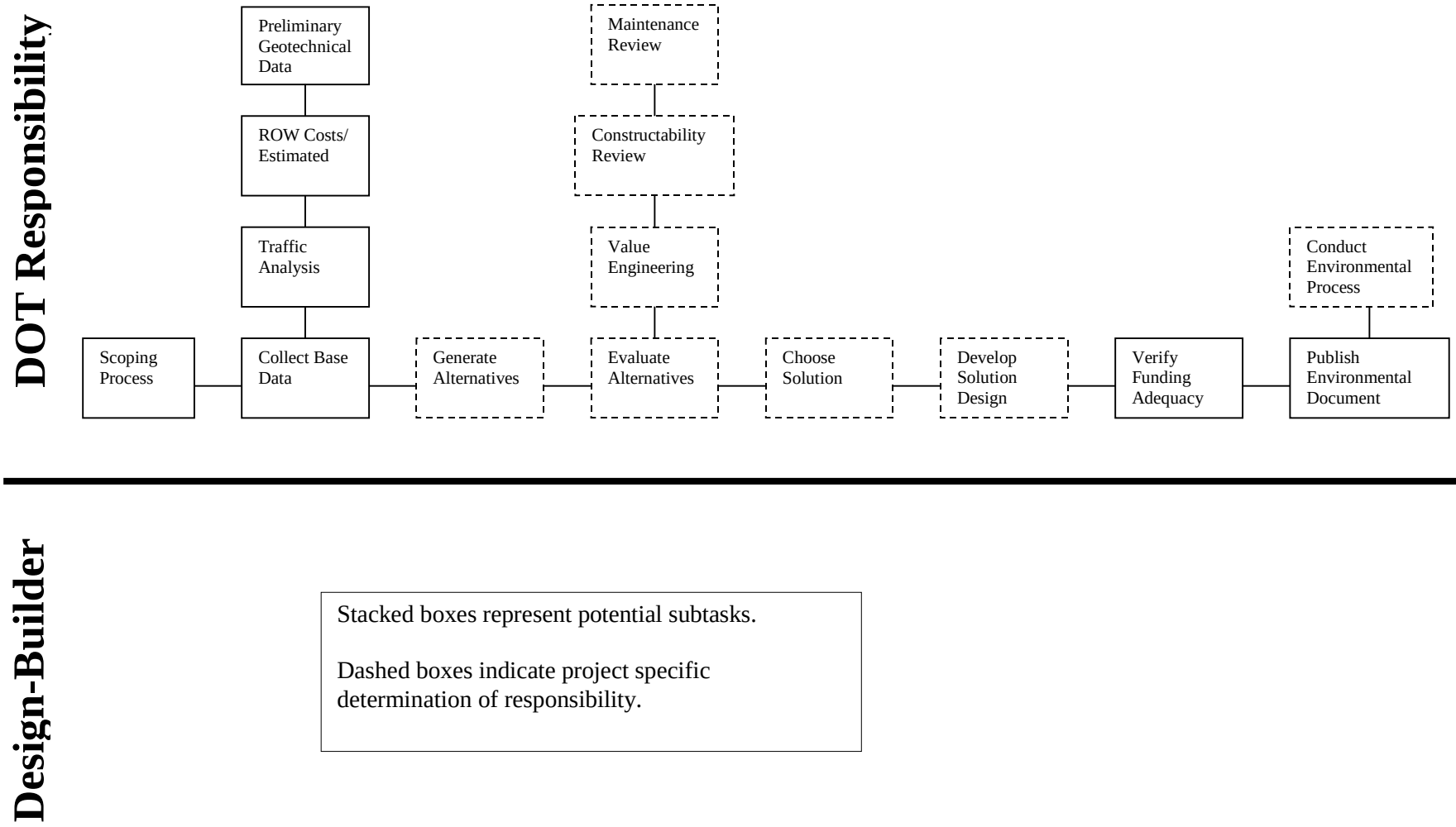
State	Authority/Jurisdiction	Citation
		Fla. Stat. Ann. §255.20 Fla. Stat. Ann. §337.11(7) Fla. Stat. Ann. §§235.211 and 235.217(3)(a)
Georgia	No specific legislation	
Hawaii	Authorization for all governmental bodies; separate authorization for Honolulu Convention Center Authority and Honolulu Transit Authority	Haw. Rev. Stat. §§103-303 and 103D-304 Haw. Rev. Stat. 206X-7 1990 Haw. Sess. Laws 183 and 184
Idaho	Authorization for State and Department of Administration	Idaho Code §67-2309 Idaho Code §§67-5711A
Illinois	Authorization for State and Regional Transportation Authority	30 Ill. Comp. Stat. 535/75 70 Ill. Comp. Stat. 36/4.06(b)
Indiana	No specific legislation	
Iowa	No specific legislation	
Kansas	Authorization for turnpike authority; Attorney General has opined that design-build may be possible for other agencies as well	Kan. Stat. Ann. §68-2001 et seq. Op. Kan. Att'y Gen. 62 (1978)
Kentucky	Authorization for State and higher educational facilities	Ky. Rev. Stat. Ann. §45A.045(11) Ky. Rev. Stat §164A.575(9)
Louisiana	Authorization for Resource Recovery and Development Authority and housing authorities	La. Rev. Stat. Ann §30:2307(A)(19) La. Rev. Stat. Ann. §40:431; La. Atty. Gen. Op. No. 83-799
Maine	No specific legislation	
Maryland	Authorization for capital projects and Washington Suburban Sanitary District; design-build has also been used for light rail projects	Md. Code Ann. State Fin. & Proc. §3-602(g)(1) Md. Ann. Code Art. 29 §3-102
Massachusetts	Authorization for: certain capital facility projects, improvement of court facilities, development agreement for the Route 3 North project, pilot program for Mass. Bay Transportation Authority	Mass. Gen. Laws Ann. Ch. 29 §7E; Ch. 149, §44A 1998 Mass. Acts Ch. 189 1999 Mass. Acts Ch. 53 2000 Mass. Acts Ch. 125
Michigan	Various agencies have used design-build without specific authorizing legislation, including the State Office of Management and Budget and the Michigan Department of Transportation, the City of Detroit, Wayne County, Wayne State University and Ferris State University	
Minnesota	Authorization for: bike/pedestrian paths and bridges, water/wastewater projects, amateur sports facilities, light rail transit facilities; in 1995 Ramsey County was given authorization for a pilot project	Minn. Stat. Ann. §160.262 Minn. Stat. Ann. §471.371(2) Minn. Stat. Ann. §§240A.03 and 473.556 Minn. Stat. Ann. §473.3993 1995 Minn. Sess. Laws Ch. 248, S.F. 1246
Mississippi	Authorization for wastewater and solid waste projects	Miss. Code Ann. §§49-17-205 and 49-17-345 Miss. Code Ann. §31-7-13(m)(ix)
Missouri	No specific legislation	
Montana	Authorization for Department of Transportation	Mont. Code Ann. §60-2-112
Nebraska	No specific legislation	
Nevada	Authorization for: water/wastewater facilities over $100,000,000; other projects (except underground utilities) over $30,000,000; large county projects over $5,000,000 by large counties; wetlands restoration; certain specialty work	Nev. Rev. Stat. §§338.1711 through 338.1727 and 408.3875 through 408.3887, effective until 9/30/03
New Hampshire	Authorization for capital budget projects	N.H. Rev. Stat. Ann. §228:4(I)(f)
New Jersey	No specific legislation; NJDOT and New Jersey Transit have used design-build based on existing authority	

State	Authority/Jurisdiction	Citation
New Mexico	Authorization for public agencies in general, Highway Department pilot program	N.M. Stat. Ann. §§67-3-43, 67-3-55 N.M. Stat Ann. §§13-1-109, 13-1-111, 13-1-119.1 and 13-1-120 et seq. 1999 N.M. Laws §1, ch. 97
New York	Authorization for Solid Waste Management, State University, H.U.D. financed turnkey projects; certain agencies (including the City of New York) have used design-build without specific legislative authorization	N.Y. Gen. Mun. Law §120-w N.Y. Educ. Law §§373 and 376 Marino v. Town of Ramapo, 326 N.Y.S. 2 162
North Carolina	Authorization for Department of Corrections, Department of Transportation, Department of Transportation "CARAT" System	1991 N.C. Sess. Laws 689, S.239(f), as amended by 1991 N.C. Sess Laws 1044, S.41(b) N.C. Gen. Stat. §136-28.1(j); 1999 H.B. 1630, ratified on 7/13/00, will become N.C. Gen. Stat. §136-89.168 et seq. 1993 N.C. Sess. Laws 321, S.162 1997 N.C. Sess. Laws 443, S.32.11
North Dakota	No specific legislation	
Ohio	Authorization for state and local agencies, Department of Transportation, H.U.D. financed turnkey projects	Ohio Rev. Code Ann. §§4703.182 and 4733.161 Ohio Rev. Code Ann. §5517.011 as amended by 1999 H.B. 163 U.S. Constructors and Consultants v. Cuyahoga Metropolitan Housing Authority, 300 N.E.2d 452 (1973)
Oklahoma	No specific legislation	
Oregon	Authorization for Department of Transportation (tollway projects and public-private partnerships)	1995 Or. Laws S.B. 626; Or. Rev. Stat. §383.005
Pennsylvania	Authorization for State	Pa. Stat. Ann. tit. 71 §1618; tit. 62 §§103 and 322; Public Law 1227, No. 281
Rhode Island	No specific legislation	
South Carolina	Authorization for Department of Transportation to enter into partnership agreements for financing and development of highways, roads, streets and bridges	S.C. Code Ann. §57-3-200
South Dakota	Authorization for public works projects	S.D. Codified Laws §§5-18-1 and 5-18-26 et seq.; §36-18A-11
Tennessee	Authorization for State and State Building Commission, special assessment improvements and Public building authorities	Tenn. Code Ann. §§12-3-202, 12-3-203 and 12-10-124; §4-15-102(c)(1) Tenn. Code Ann. §7-32-107 1995 Tenn. Pub. Acts Ch. 74 (S.B. 1481)
Texas	Authorization for development agreements by Texas Turnpike Authority Division of the Texas DOT; specific design-build authorization for education facilities; contracts by other agencies without specific authorization (including Texas Parks and Wildlife Department Infrastructure Division)	Tex. Transp. Code Ann. Ch. 361, subch. I 1995 Tex. Sess. Law Serv. 2207 Tex. Educ. Code Ann. §§44.031, 44.036, and 51.780
Utah	Authorization for all agencies; separate legislation applicable to Department of Transportation	Utah Code Ann. §63-56-36.1 Utah Code Ann. §§13-8-2, 63-56-5, 63-56-21 and 63-56-43.1
Vermont	Authorization for State	Vt. Stat. Ann. Tit. 29 §161, as amended by 2000 Vt. Acts & Resolves 148 (H. 850)
Virginia	Authorization for all state agencies; various local agencies; public-private authorization	Va. Code Ann. §§11-37, 11-41 et seq., 11-46, 53.1-95.18;

State	Authority/Jurisdiction	Citation
	for VDOT	56-556 et seq.
Washington	Authorization for: Department of General Administration (one project), state universities, large cities and counties; Solid waste projects; Department of Transportation has public-private partnership authorization	Wash. Rev. Code Ann. §39.10.050 (effective until 7/1/01) Wash. Rev. Code Ann. §36.58.090 Wash. Rev. Code Ann. §§47-46.010 et seq.
West Virginia	Authorization for state/county/local projects; turnkey projects for the Public Energy Authority; energy-savings contracts for county boards of education	W. Va. Code §§5-22A-1 et seq., 5G-1-3 W. Va. Code §5D-1-5(15) W. Va. Code §18-5-9a(c)
Wisconsin	Authorization for State, Counties (for Sheriff's Department Training Academy), Department of Transportation	Wis. Stat. Ann. §§13.48(19) and 16.855 Wis. Stat. Ann. §59.79(13) Wis. Stat. Ann. §84.11(5n) et seq.
Wyoming	No specific legislation	

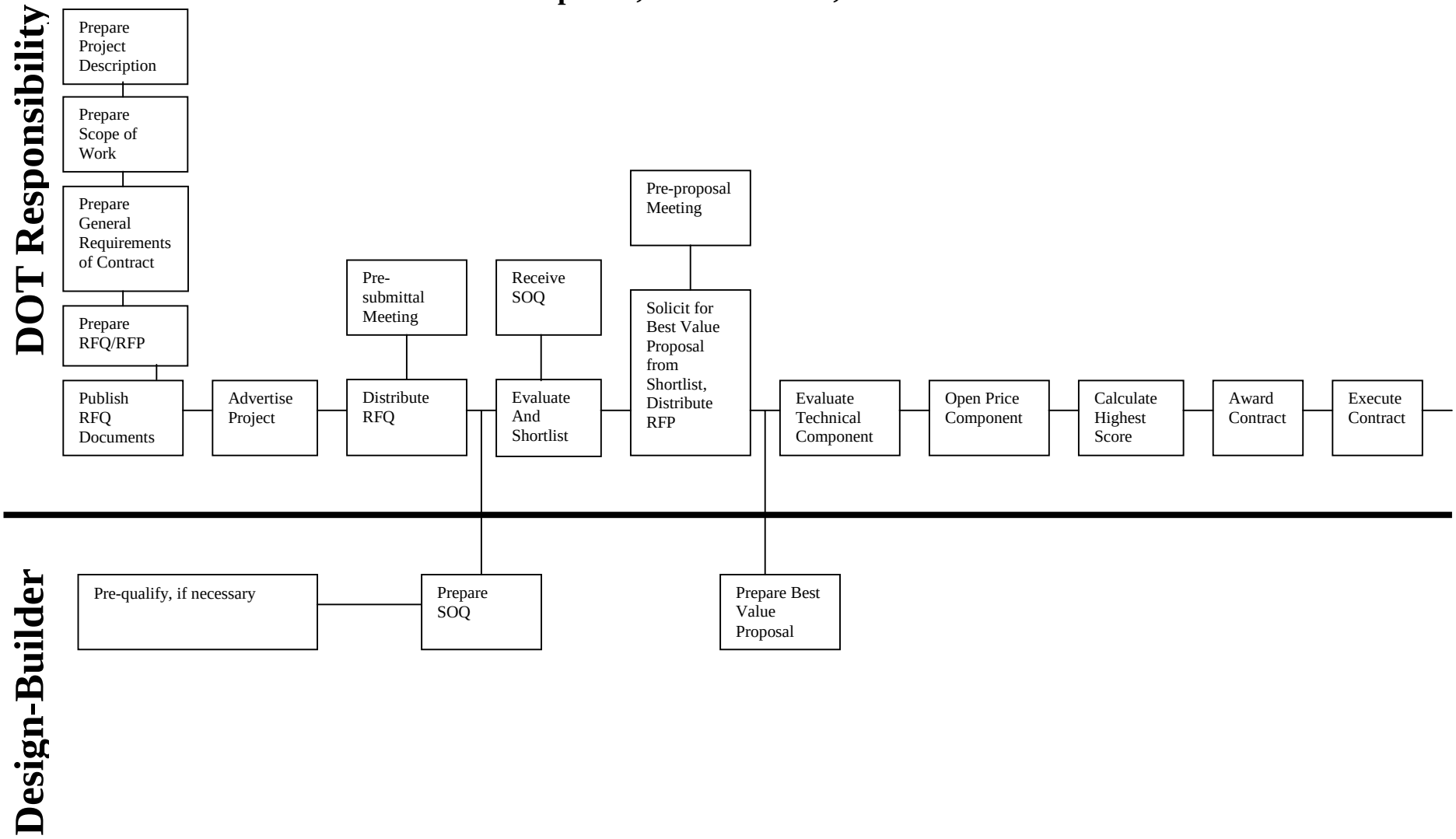
Appendix G
Example Design-Build Process Map

Preliminary Design and Environmental Documentation



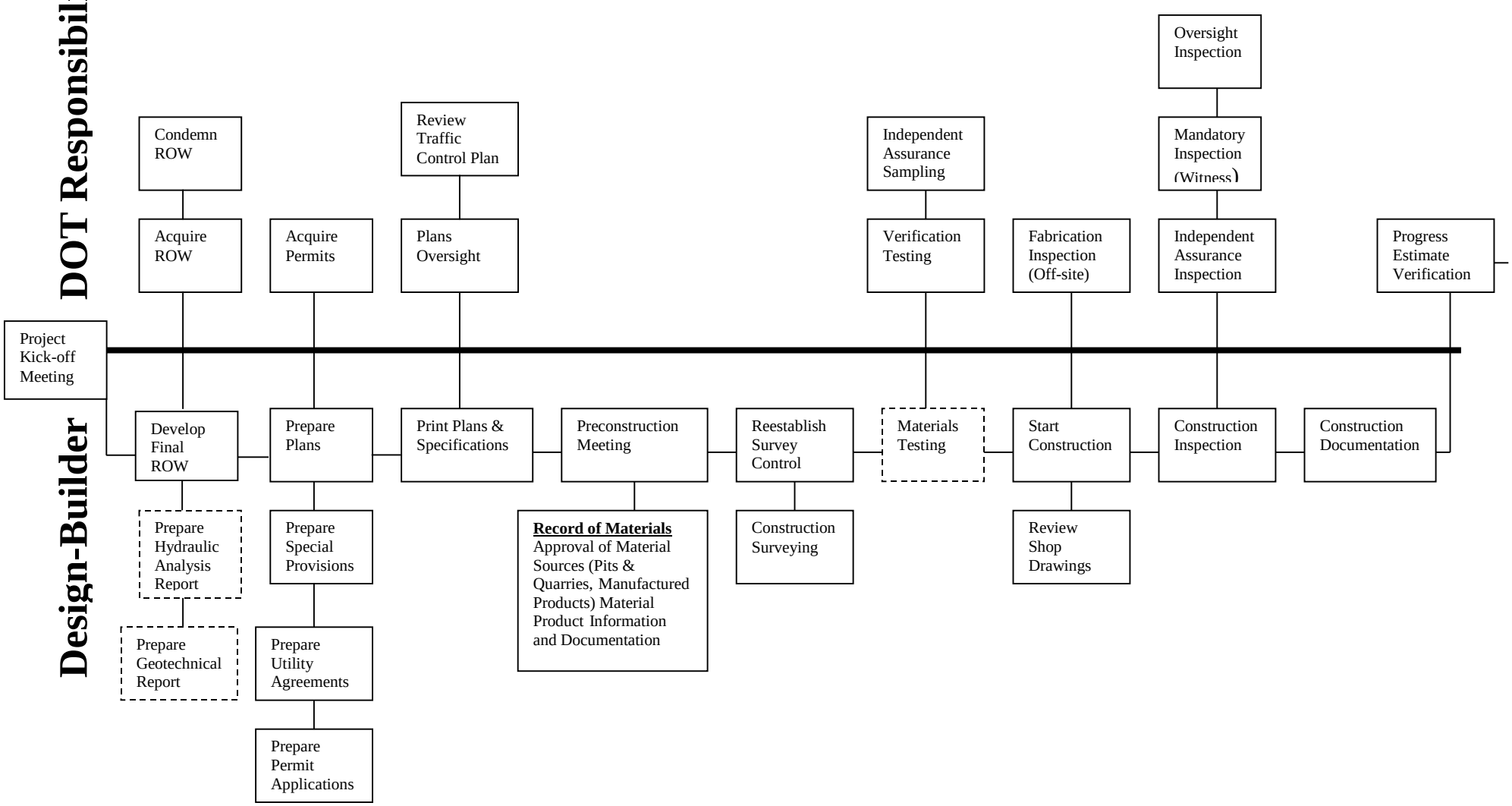
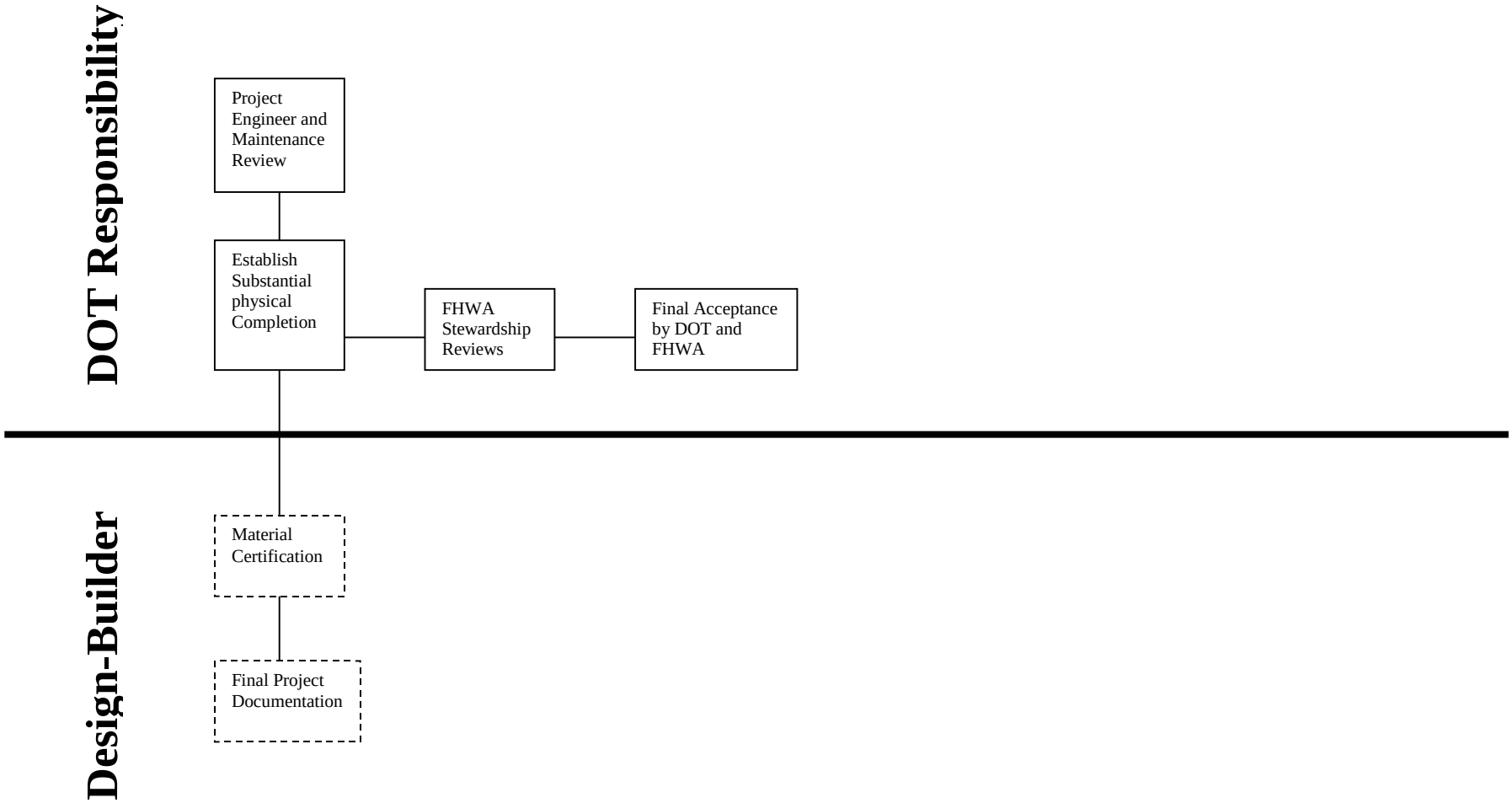
Source: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual by the South Dakota Department of Transportation.

Contract Development, Advertisement, Award and Execution



Example Design-Build Process Map

Contract Administration and Construction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