PROJECT 0-2129
PRODUCT 2129-P1

PROJECT DELIVERY METHODS AND CONTRACTING APPROACHES: ASSESSMENT AND DESIGN-BUILD IMPLEMENTATION GUIDANCE

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AUGUST 2001

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Research Report Number 2129-P1

Research Project 0-2129
Project Title: Innovative Project Delivery Methods Available for Immediate Implementation in TxDOT

Conducted for the

TEXAS DEPARTMENT OF TRANSPORTATION

by the

CENTER FOR TRANSPORTATION RESEARCH

Bureau of Engineering Research

THE UNIVERSITY OF TEXAS AT AUSTIN

August 2001

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 guidebook provides an overview of the project delivery methods and assesses their use and criteria for selection. 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 given as are recommendations to improve the future effectiveness of implementing alternative project delivery methods.

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EXECUTIVE SUMMARY

The Texas Department of Transportation (TxDOT) initiated a research project with the Center for Transportation Research at The University of Texas at Austin to investigate the legal, regulatory, and policy implications of innovative project delivery methods. The results of this research are found in Research Report 0-2129-1, *Project Delivery Methods and Contracting Approaches Available for Immediate Implementation by the Texas Department of Transportation.* The overall 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. Although currently disallowed by law, TxDOT and the Texas legislature have shown a particular interest in the design-build (D-B) project delivery method. As a result and as a subtask to the above research project, this guidebook has been developed to provide an overview of the project delivery methods and contract approaches available to TxDOT, assess 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 and implement a pilot D-B program. Although not enacted into law in 2001, TxDOT should anticipate introduction of a similar bill during the next legislative session. A review and assessment of the experiences and documentation developed by other state departments of transportations (DOTs) in implementing a D-B process was conducted to provide guidance to undertake the pilot program. It is anticipated that TxDOT will have to change and modify its current practices to accommodate and effectively undertake the D-B project delivery method. 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, request for proposals, selection, management, etc.).

2. Assess the availability of the skills required for the use of D-B in the organization and determine gaps.
3. Train selected members of the organization in the use of the D-B project delivery system.
4. Optimize communication among all parties involved with D-B within TxDOT.
5. Optimize the pre-project planning process to address D-B requirements.
6. Select pilot D-B projects that have a relatively certain scope and contain well-known processes and technologies, i.e., those that are conducive to the D-B delivery method.
7. Ensure selection of qualified D-B contractors, using a standard process.
8. Develop succinct criteria specifications, adapted for D-B projects.
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.

This guide provides recommendations for implementing D-B, as well as documents developed by other state DOTs. Conclusions about requirements to implement D-B are given, including process, legal, and human resource considerations.

CHAPTER 1. INTRODUCTION

1.1 OVERVIEW

The Texas Department of Transportation (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. The overall 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. TxDOT and the Texas legislature have shown a particular interest in design-build (D-B) contracting. This guidebook has been developed to provide an overview of the contracting approaches and project delivery methods that are available, assess their use and criteria for selection, and provide guidance for implementing a D-B project delivery process.

Alternative project delivery and contracting methods are not intended to replace the standard design-bid-build method that is applicable to most projects. As a result, the goal of this guidebook is 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. This guidebook assumes D-B will eventually become one of the many project delivery methods and contracting approaches for use by TxDOT.[1] Although this report focuses on the D-B 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.

[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 approach to provide techniques for bidding, managing, and specifying a project. Further details and examples are discussed in Chapter 2.

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. 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).

The alternative project delivery and contracting approach model that Texas has established for school districts and higher education authorities has been successful. For example, the average total project duration on twenty-one D-B projects (eighteen buildings and three utility upgrades) decreased by 33 percent (Gallegos 2001). It is reasonable to believe that in response to this success the 77th Legislature feels 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.

This guidebook has been developed to inform TxDOT staff and others on the types of innovative project delivery methods and provide guidance on their selection and use. To a much lesser extent this report will discuss various contracting approaches that are currently being used for highway construction. The information provided in this document was obtained from an extensive literature review, seminar attendance, and interviews conducted from November 2001 through May 2001. Complete details of this research investigation are found in the companion to this guidebook, Research Report 2129-1. The succeeding sections of this report address the statement of task in the following manner. The remainder of Chapter 1 focuses on the reasons why innovative project delivery methods and contracting approaches have taken place. 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 describes the D-B method with an emphasis on the selection of candidate projects, the design-builder, contract administration, and closeout. Chapter 4 summarizes the findings and recommendations for this component of the project.

1.2 Traditional Project Delivery

The traditional project delivery method for highway construction projects in the United States has been design-bid-build (DBB). This method separates design and construction by both sequence and contract. Using this method, state departments of transportation (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.

Under current Texas law, 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

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).

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 2001). 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." 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.

Section 1307 of TEA-21 requires the FHWA to issue regulations for implementing these changes by June 2001 as D-B is considered an experimental practice because it does not comply with existing statutes for competitively bid construction contracts or qualifications-based engineering/design services (FHWA 1998). 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).

In Texas, alternative project delivery methods have been legislatively authorized for certain types of construction. As previously discussed, the education system can employ D-B and construction management arrangements for buildings and facilities and this authority recently has been granted to the GSC as well as cities and counties. The Texas Turnpike Authority (TTA) also has a broader range of procurement methods available than the traditional design-bid-build system. The Texas Transportation Code Annotated Chapter 361, Subchapter I authorizes TTA to enter exclusive development agreements (EDAs). The broad terms of §§ 361.301 and 361.302 seem to allow almost any type of delivery method, including D-B and turn-key construction. The Transportation Code only allows for TTA to enter into EDAs and this authority would be extended to any successor agency resulting from the November 2001 referendum to create the Texas Mobility Fund and provide a mechanism for toll road construction and operations.

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 time to prepare and gain the knowledge needed to make the most informed decisions relative to efficient and effective project delivery and contracting approaches.*

1.3 Evolving Practices

Various contracting approaches and project delivery practices are used in the highway industry. The American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Construction, along with the FHWA, have developed a catalogue of project delivery methods and contracting procedures that are discussed in detail in Chapter 2. 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 techniques and contracting practices 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.

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 system and the project finance method as variables to be considered by the engineer in the development and comparison of alternatives for the owner.

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 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 private 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 system, various contracting approaches and strategies such as constructability reviews, incentives/disincentives, and warranties are available, and TxDOT has 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 A—to the contracting strategies used and the contract provisions from the 1993 TxDOT Specifications Book. With the advent of several alternative project 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 Project Delivery Methods

2.2.1 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.

As mentioned earlier, federal statutes also 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 Federal Highway Administration (FHWA) considers D-B contracts experimental. FHWA's Special Experimental Project No. 14 (SEP-14) concept approval is necessary for all federally funded D-B projects.

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.

2.2.2 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.

2.2.3 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).

2.2.4 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. 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.

2.2.5 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 and the CM-at-risk 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).

2.2.6 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.

2.2.7 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.

2.2.8 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).

2.2.9 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. In addition, the Texas Transportation Code requires competitive bidding for highway improvement contracts,[2] 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.[3] 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.

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 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.

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

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

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).

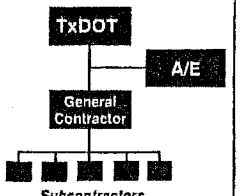
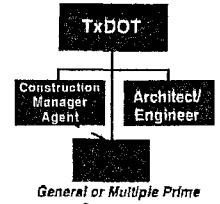
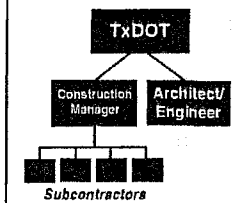
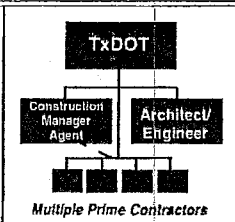
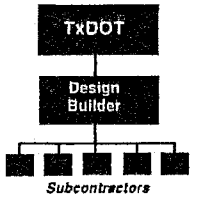
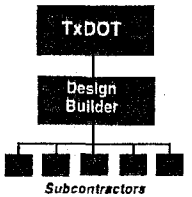
To a lesser extent, another area of Texas law could provide an obstacle for TxDOT adopting D-B contracting as a regular means of highway procurement. Texas Civil Statute, Article 3271(a), "Texas Engineering Practice Act," limits the practice of engineering to persons registered under the same, stating: "The privilege of practicing engineering [is] entrusted only to those persons duly licensed and practicing under the provisions of this Act."[4] 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.

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

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

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-constructioo 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 respoosibility • 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

2.3 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 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 listed below are further assessed and evaluated in the associated Center for Transportation Research (CTR) Research Report 2129-1, *Project Delivery Methods and Contracting Approaches Available for Implementation by the Texas Department of Transportation*. It should be noted that each of these contracting practices has been applied to projects in North America. **Each may be usable regardless of the project delivery method.**

2.3.1 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).

2.3.2 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. On the other hand, incentives are given to those contractors achieving significantly better results than required.

2.3.3 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).

2.3.4 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.

2.3.5 *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).

2.3.6 *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).

2.3.7 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.

2.3.8 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).

2.3.9 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.

2.3.10 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.

2.3.11 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).

2.3.12 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).

2.3.13 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).

2.3.14 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).

2.4 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, the potential for good management decisions on their use can be enhanced. The next chapter will focus on the D-B contract delivery method for adoption within TxDOT.

CHAPTER 3. DESIGN-BUILD PROCESS GUIDANCE

3.1 Introduction

Design-Build (D-B) has the potential to benefit the Texas Department of Transportation (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. As a result, TxDOT has requested the Center for Transportation Research (CTR) to explore the experiences and documentation developed by other state DOTs in implementing a D-B process and provide guidance to undertake the 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.

3.2 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 2001). Appendix B gives the most current list of D-B projects (150 in total) approved under SEP-14. 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.

3.3 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 are discussed in detail in the associated CTR Research Report 2129-1 and 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 also arise when an owner has an ill-prepared project and equally ill-defined D-B selection criteria.

As detailed in Research Report 2129-1, 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 2001).

3.4 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 3.1 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. An outline of an adapted process and the specific details developed are included in Appendix C.

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. 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 3.1 – 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.

3.5 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.

3.5.1 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 3.1. 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).

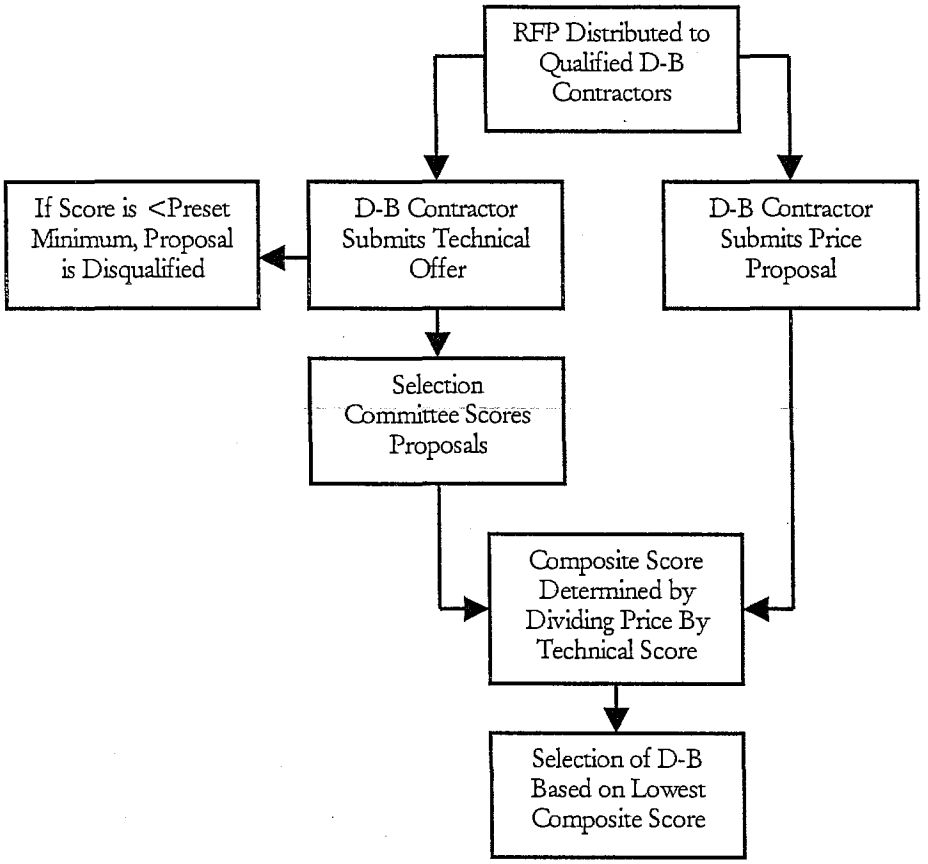


Figure 3.1 South Carolina DOT One-Step Best Value Selection (Adapted from Molenaar and Gransberg 2001)

3.5.2 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 below for illustration.

WSDOT begins its two-step selection process by advertising the RFQ, along with a draft RFP that details criteria for prequalifying. Figure 3.2 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).

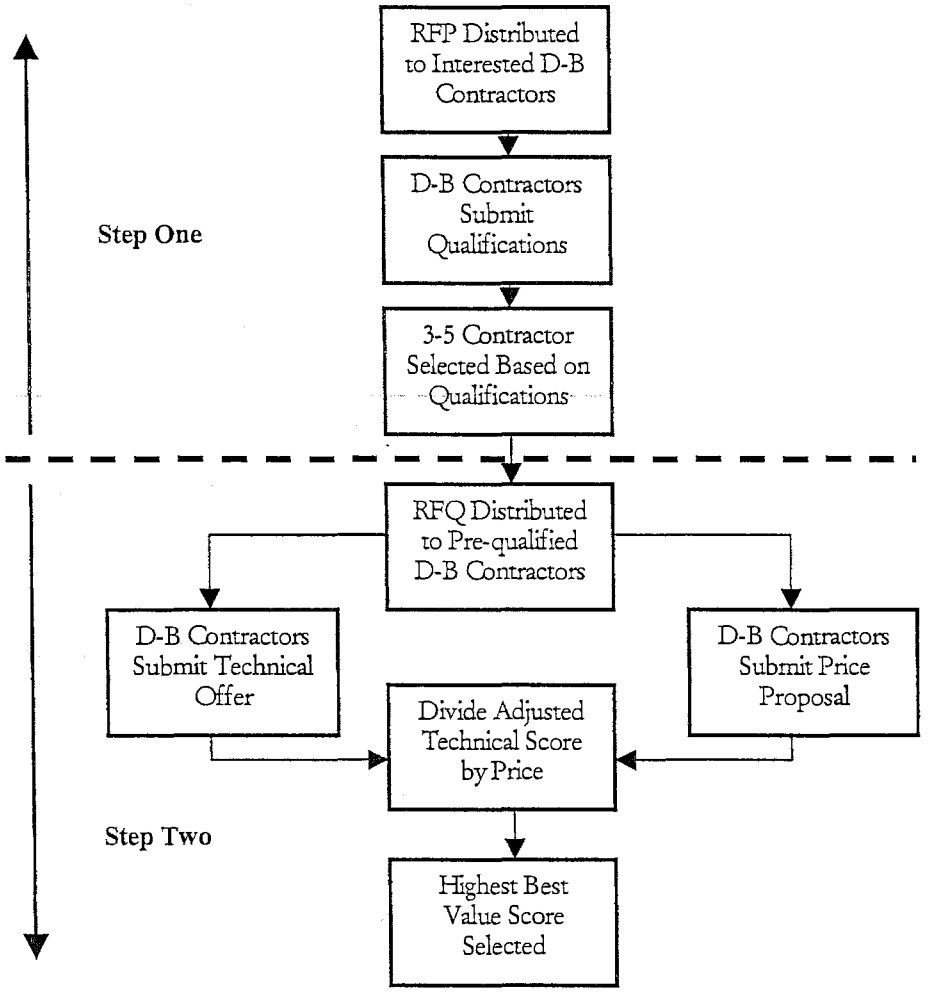


Figure 3.2 Washington DOT Two-Step, Best Value Selection (Adapted from Molenaar and Gransberg 2001)

3.6 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 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.

3.7 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 D 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. Both the delivery steps and the process map provide a draft baseline and will need modification as a D-B project delivery process is developed specifically for TxDOT. 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.

3.8 Design-Build Project Phases and Risk

The major tasks associated with a given project will be required regardless of the contracting method used. This is evident in a comparison of D-B with the typical DBB process as shown in Appendix E. 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 (Appendix D) shows four major phases as shown below in Figure 3.3, each of which is

discussed in the following sections. Each of the phases and the associated tasks is discussed below beginning with Preliminary Design and Environmental Documentation. Tasks are subsections of each phase and are depicted as boxes in Appendix D.

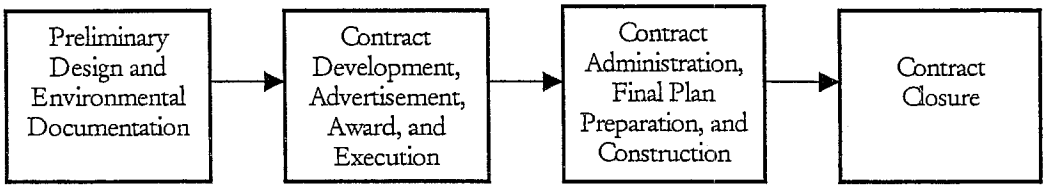


Figure 3.3 Major Phases of the Design-Build Process

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.

On the D-B Process Map shown in Appendix D, boxes above the line represent tasks that should be maintained by TxDOT for most D-B projects. A dashed box above the line represents a task that could be allocated to the design-builder depending on the results of a risk analysis on a project-specific basis. 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. A box positioned below the line represents a task that will be allocated to the design-builder. Dashed boxes below the line represent tasks that are preferred to be allocated to the design-builder, but may need to be kept based on a project-specific risk analysis.

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.

3.8.1 Preliminary Design and Environmental Documentation

This first phase of project development establishes criteria that determine a project's attributes. The criteria are developed as a balance between project need and the associated cost. Alternatives based on these criteria are formulated and evaluated regarding cost/benefit and site impacts. Some portion of this work must always be done internally by the owner to establish an adequate description of the desired end product. The level of effort and the level of development needed to establish this description are project dependent. The owner must perform the first step, which determines the nature of the project and the design parameters.

Collect Base Data

Collecting base data includes gathering enough basic information on the project to establish the scope of work. Typical tasks include establishment of appropriate survey control and performing necessary traffic analysis. One of the key areas is preliminary geotechnical data. Most DOTs provide geotechnical information to the contractor, which may become the basis for determining differing site conditions. This is an area of risk that could be allocated to the design-builder, because it transfers the liability of differing site conditions. However, without preliminary information in the proposal, every proposer would have to perform individual site investigations on which to base a price, or include a substantial contingency in the price to cover the risk, or both. Thus, the proposals received might not be directly comparable.

Without geotechnical information, the preliminary estimate could be significantly different than the proposal prices received. Therefore, the risks associated with initially determining the geotechnical aspects of the project should remain with TxDOT.

When a project has a geotechnical component, enough data must be presented to give a description of the geotechnical investigation already conducted and the need for additional data that may be required for completing the design. The criteria package needs to define geotechnical risks and how they will be handled as differing site conditions.

Generate and Evaluate Alternatives

After the preliminary scoping is completed and the base data are collected, the process requires a project-specific assessment of the risks and a determination of allocation of the project tasks. To evaluate and determine the feasibility of some alternatives, additional data (e.g., more geotechnical evaluation, traffic studies, etc.) may be needed. The specific level of development cannot be determined on a generic process basis. Each step of the process will require a risk and value assessment. Some tasks may require thorough development, while others can be defined adequately with minimal effort. The true value of allocating a task to the design-builder depends on balancing the risk transferred against the price charged. Allocating too much risk will distort the price of the task and reduce value.

Specific needs for the project should be delineated in the design criteria to ensure they are incorporated into the project. Many decisions that DOTs have customarily left flexible for the DBB method need to be made at the point of handoff. Unless carefully described, decision points embedded in the process after award could result in changes to the work and negotiated higher prices.

Verify Funding Adequacy

"Verification of funding adequacy" in a DBB method is usually done with the recognition that the degree of accuracy is dependent on the degree of project development. D-B contracting requires adjustments in the level of accuracy necessary for the funding decision. Instead of using the hard engineering estimate currently made after final design, decisions will be made that account for the risks from unknowns and the level of estimating accuracy.

Publish Environmental Document

The "publish environmental document" National Environmental Policy Act (NEPA) step in the process requires the consideration of all feasible alternatives. A selected alternative is required to finalize the environmental process. For projects with widely varying alternatives and extensive environmental impacts, involving the design-builder in performing the alternatives analysis could mean a large variance in the bid cost. Although historically small, there is a risk that a project may not exist after the public involvement and environmental impact evaluation.

For most projects, the environmental assessment, documentation, and processing tasks are completed by the DOT prior to awarding a D-B contract. This ensures conformance with NEPA and state environmental requirements and avoids the potential for conflicts of interest. Under certain circumstances, the environmental document preparation could be allocated to the design-builder. The allocation of this task to the design-builder should be carefully considered on a project-by-project basis. For projects with agreed-upon solutions and minor environmental impacts, the value of allocating the task might be attractive. However, in all cases, the state DOT and/or FHWA must make the final selection of the preferred alternative.

3.8.2 Contract Development, Advertisement, Award, and Execution

The second phase of the D-B process is the selection of the design-builder and is summarized below and described in detail in the draft example given in Appendix F.

This phase begins with the preparation of the documents required for the solicitation package. These documents describe the project, establish the technical requirements for designing and constructing the project (scope of work), describe the criteria and methods for selection of the design-builder, and describe the contract terms. These components are combined into a document that is similar to a DBB bid proposal package. An example of draft guidelines for developing the scope of work for D-B projects is presented in Appendix F. An advertisement soliciting interest in the project is published in much the same manner as current bid practices. Following advertisement, the selection of the design-builder is a two-step process.

Next, a proposal of qualifications and concept is solicited from any and all qualified and interested parties (see example given in Appendix G). Predetermined criteria (see example in Appendix H) are used to select five maximum proposers to prepare a Best Value Proposal (see example in Appendix I). The Best Value Proposal describes the technical approach and response to project-specific criteria, and the price for delivering the project, in two separate sealed envelopes. The price proposal represents the total cost for all work described in the contract documents and in the design-builder's technical proposal.

Presubmittal meetings are held to answer general questions related to the D-B process and the documents. All questions asked and answers provided are supplied in their entirety in writing to all proposers to eliminate the possibility of different information being given to different proposers.

A predetermined panel evaluates the technical component of each Best Value Proposal, and a score is produced based upon preestablished and preannounced criteria. Appendix J presents details of an evaluation team composition and roles. The price component is also evaluated for completeness and conformance with the bid requirements. The final selection is made by combining the technical and price components using a formula (see Appendix F for an example) that results in a best value selection (represented by the highest score). The subsequent award and execution of the D-B contract typically follow the same steps as with the DBB method.

3.8.3 Contract Administration, Final Plan Preparation, and Construction

This phase of the D-B process usually begins with a project kickoff meeting to review contract terms, discuss the project schedule, and establish communication links for beginning the project.

The final design of the project might begin immediately after the project kick-off meeting, or even sooner if allowed by the contract, and is based on the submitted and accepted proposal. Acquiring right-of-way is a task associated with the first phase of the DBB method. In the D-B method, the state DOT will almost always retain the responsibility for right-of-way acquisition. It is desirable that right-of-way needs be identified before the D-B contract is awarded.

Acquiring permits is often a task that is officially the responsibility of a state DOT. However, preparation of complete permit application packages, based on the impacts of the actual design, can be the responsibility of the design-builder. In certain cases, the design-builder could be made responsible for obtaining certain permits as the owner's agent.

The design-builder prepares plans, along with estimates, technical/special provisions, and as mentioned earlier, the permit applications. The design-builder often determines the need to prepare utility agreements and negotiate the terms of those agreements, if their design impacts utilities outside of the existing right-of-way. Utility relocations are dependent on the design and construction activities, thus, the risks and costs of such are under the control of the design-builder. State DOTs conduct plan review oversight as deemed necessary for conformance to the contract.

The DBB process of most state DOTs includes a design approval decision point that is not relevant to the D-B process. By awarding the D-B contract, the DOT is approving and accepting the design, thus, approval of design is inherent in the selection process. If the proposed design meets the requirements of the contract documents, no significant changes can be made without a corresponding contract change order. Under D-B, the design risk is placed with the design-builder, and the owner's review is solely to determine if the proposed design is being carried forward as per the intent of the contract documents.

Constructability and maintenance reviews usually occur simultaneously in the DBB process. In D-B contracting, constructability becomes the responsibility of the design-builder, as the designer and builder are combined on the same team and the owner carries no liability for whether a design is constructible. Whether a design meets the owner's needs for long-term maintenance is still relevant and should be considered in the preparation of the contract design criteria.

The next part of this phase is the beginning of construction and includes the traditional activities associated with DBB construction. In D-B contracting, some parts of construction could take place while design is underway. With a phased design of the project, phased construction could occur very near the start of the contract time. A pre-construction conference/meeting is used at this time to discuss contract administration and work

coordination with outside parties, such as utilities and permitting agencies. Under D-B, the design-builder is responsible for these activities.

The transition from DBB prescriptive specifications and plans to D-B performance specifications requires a change in methods of measurement of quality. Involvement by the owner during construction must be designed to minimize the effect on execution of the contract. Feedback from experienced stakeholders and other DOTs has indicated that extensive owner involvement during construction impacts the design-builder's ability to maintain production and schedule. A balance must be found that allows the owner to oversee the work being performed while leaving the responsibility for quality with the design-builder, although some monitoring and control functions must be kept under the DOT control to comply with FHWA policies.

In most D-B highway contracts, the design-builder's responsibilities include materials testing and construction inspection. Shop drawing review, which is a check on the fabrication drawings as compared to the design drawings, is also usually conducted by the design-builder. The designer of the facility must remain responsible for the fabrication and proper installation of the detailed components. Copies of the shop drawings will be forwarded to the owner for use in oversight and inspection.

Much of the construction documentation currently being collected under DBB will still be necessary under a D-B contract, such as materials certifications. Contracts usually contain provisions requiring the submittal of documentation in support of progress payment requests.

3.8.4 Contract Closure

The final phase of the D-B process is to close out the project. The tasks associated with the contract closure phase lie almost entirely with the owner who will establish substantial completion of the work as described in the standard specifications. Determination of final acceptance signifies the end of liquidated damages and provides a basis for determining final payment.

The responsibility of the owner to ensure that the terms of the contract have been met and documentation is in order should not be delegated. The design-builder, who has collected all the documentation throughout the duration of the contract, provides all the necessary

certifications and final project documentation not previously submitted, and the rest of the close-out phase often follows conventional DBB procedures.

CHAPTER 4. CONCLUSIONS

Although currently disallowed by law, TxDOT and the Texas legislature have shown an interest in the design-build (D-B) project delivery method. As a result, this guidebook has been developed to provide an overview of the project delivery methods and contract approaches that are available to TxDOT, assess 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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APPENDIX A – 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 B - 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

APPENDIX B - 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
	GA	Programmatic approval for modified design-build program	22-Dec-00		Low bid
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

APPENDIX B - 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
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
	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

APPENDIX B - 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
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
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

APPENDIX B - 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
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
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 C
Draft Design-Build Project Selection Criteria

Determining the assessment criteria for the consideration of candidate projects for delivery through Design-Build (D-B) is a critical component of the process. The criteria outlined below have been assembled from state DOT programs and other sources[1]. Although D-B could be used to deliver almost any project, selection of its use should be focused where it can be proven that the benefits exceed costs and risks. It is intended that project evaluation guidelines are used by a project selection team to assess when an alternative contracting method is appropriate, and if D-B is applicable. Consequently, D-B should be considered and used as one of the several project delivery methods available. The appropriate project delivery method should be selected based on each project's needs. Projects should not be tailored or forced to fit into a particular delivery method, because the success of the project may be jeopardized from the outset.

Testing a D-B program under a tight time frame requires the selection of projects from the existing inventory of projects. The reason to use D-B project delivery would be to realize any potential benefits the method is known to provide. For D-B, the expected benefits may include savings in time, or staff resources; capturing the potential innovation associated with an integrated team of designers and contractors; or achieving high quality finished products with minimal disruption to the public. A critical goal of an initial D-B program should be to clearly define the expected outcomes and then measure actual performance.

Project selection criteria provide a filter for screening an overall project list to identify candidate D-B projects. The selection of projects is based on a list of 21 questions that are included at the end of this appendix. The questions are developed around the possible risks, potential benefits and project attributes typically associated with successful D-B projects. A "Yes" response indicates the project might be suitable as a D-B project. An evaluation program should be completed on pilot D-B projects in order to provide data for revising the evaluation questions.

Source of Projects

The primary source of potential D-B projects will be the existing transportation improvement plan. Other projects may appear from time to time (e.g., emergency repairs, immediate replacement, unexpected maintenance), for which D-B contracting may be applicable. To determine if D-B contracting is appropriate for any project, the scope of the project has to be fully known and the expected outcomes adequately defined.

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[1] Sources: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual, South Dakota Department of Transportation; the August 2000 Draft Guidebook for Design Build Highway Project Development, Washington State Department of Transportation, by CH2MHILL; and the April 19, 2001 paper and presentation, Engineering the Procurement Phase to Achieve Best Value by Molenaar, K. R. and Johnson, D., E., at the National Design-Build Conference for Transportation.

Clearly defining a project is the first step in evaluating if D-B contracting is appropriate. The second step involves evaluating the scope of the project for potential benefits that may be obtained and for fatal flaws that make D-B contracting too risky for either the Department of Transportation (DOT) or the design-builder.

Potential Selection Criteria

Benchmark Projects

The availability of benchmark projects is important in the selection of the pilot projects. An excellent way to evaluate the benefits of D-B is to compare a D-B project with another similar project in the same District. Direct comparisons can then be made between the projects using criteria identified in the evaluation program.

Workload Leveling

At times, approved projects may exceed the capacity of staff for delivery under the traditional D-B-B process. D-B project delivery may be useful in placing a significant workload with design-builders for the delivery of an appropriate number of D-B projects. However, a DOT project development team is still required to assemble the solicitation package and evaluate the submittals.

Funding

Funding for highway construction projects is typically provided in phases. The funding for each phase: design, right-of-way, and construction, is typically available on an annual basis for when that phase will occur. The D-B project delivery method combines the phases of the project, requiring funding for the entire project to be available according to project schedule from the time of contract award. Because of the differing funding requirements, special procurement considerations may be required when using D-B.

Project Size

Project size has both positive and negative connotations for D-B. Larger dollar-value projects, usually offer the greatest overall potential benefits (and greatest risks). They may also limit the number of potential D-B participants.

The use of D-B by DOTs on smaller projects has been increasing with the expectation that D-B will achieve the benefits of reduced schedule, staff workload leveling, lower contracting costs, etc. Other benefits for the industry in applying D-B to smaller projects is that smaller firms can compete and gain experience in the method, and that firms involved with specialty work are provided the opportunity to participate.

No minimum or maximum project size limit has been established for D-B highway construction. Some states consider $70 to $100 million as the minimum size, while other states have tested very small projects, sometimes smaller than $1 million. Recently proposed rulemaking by the FHWA and legislation in Texas have considered $50 million as the minimize size. To date, the minimum project size for D-B has not been established or validated through field-testing.

Project Development Level

The existing level of project development should be considered when screening potential D-B projects. When the components of the project are well known, the benefits and risks may be better assessed. Basing a decision to use D-B on an uncertain project scope can result in significant flaws

during later phases of the project. An inadequately defined risk factor is unacceptable, and may require extensive change orders or reverting to a more conventional delivery system, potentially at significant cost. However, if the unacceptable risk were discovered during project development activities prior to award of a D-B contract, the negative impacts would be restricted to schedule, development cost, and staff workload.

Defining the appropriate stage of development for a project prior to selection for design-build contracting is a bit of a balancing act and is critical for success. Development through the preliminary design and environmental documentation phase is relatively common because it clarifies the project definition and reduces unknown conditions. However, opportunities to add innovation or save time may be significantly reduced by developing a project to this point. On the other hand, if contracted earlier to capture these benefits, the risks to a design-builder and the costs to a DOT may be high. A balance may be reached by mitigating the known project risks to manage the associated costs. Some areas where this may be possible are described below.

Geotechnical Conditions

Geotechnical conditions present one of the riskiest aspects for transportation projects. Preliminary estimates of project costs will be difficult for both the DOT and the design-builder if no geotechnical data are available. The DOT will typically generate and provide data on existing geotechnical conditions at the project site. The data may include drilling logs, geologic surveys, test pit observations, laboratory data, project records and other indications of existing features. Preliminary geotechnical engineering analyses may be performed on a project-specific basis as necessary to address feasibility issues and to define project design criteria. The geotechnical data will provide the basis for preparation of cost estimates, development of risk management plans, and determination of changed conditions.

NEPA Processes

National Environmental Protection Act (NEPA) processes can help define major features of the project. DOTs normally conduct the studies, prepare the documents and apply for the appropriate approvals, etc. This ensures that the clearances are received and mitigation requirements are known before the project proceeds. The design-builder could conduct the studies and prepare the applications for clearances. However, design-builder involvement in the environmental process requires strategies for handling the risks associated with review and approval times. Until the NEPA process is complete, progress beyond the preliminary design stage would proceed with significant risk to the design-builder. The length of time to obtain approval is uncertain. In fact, it is possible that the project may not obtain approval at all, and cancellation of the D-B contract is likely if this occurs. A risk management plan might consist of paying the design-builder for costs incurred to the point of cancellation.

Project Permits

Project permits present another step in project delivery. Even after an official approval of the environmental document has been received, it is still necessary to obtain a variety of permits for construction activities. Requirements vary from project to project, and from simple to complex, so each project should be assessed on its merits. The design-builder can prepare the applications for all permits based on their proposed work activities. It is reasonable to expect the design-builder to apply for all of the permits they can legally obtain, but the time necessary to acquire them may be beyond their control. In some cases, only the DOT can apply for and receive the permit. Responsibilities for permits should be defined up front.

Right-of-Way Acquisition

Typically, under D-B-B, right-of-way acquisition is complete, or imminent, at the time of contract execution. Most DOTs retain the responsibility for acquisition of right-of way for D-B projects. However, innovations in project configurations can be constrained if the right-of-way is explicitly defined prior to award of a D-B contract. Allowing the design-builder the opportunity to develop a design proposal without right-of-way constraints may be beneficial. A strategy to manage the risk of right-of-way costs and the time of procurement is necessary to control the unknowns. If the design-builder's proposal requires right-of-way beyond the defined limits, the design-builder will prepare the necessary documents to acquire the property (usually done by the DOT and within pre-established cost limits for the project).

Agreements

Third party intergovernmental agreements that may be affected by the D-B project are the responsibility of the DOT. Intergovernmental agreements should be completed prior to an award of a D-B contract and it is desirable that the agreements be in place at the time of award. Determination should be made on which party will notify utility companies located within the right-of-way to determine which might be affected by the project. The design-builder should develop information related to utility impacts or relocations and if their design impacts utilities outside of the existing right-of-way. Preparation of a Utility Agreement is normally required from the design-builder, who is also charged with affected parties coordination activities during execution of the work.

Public Endorsement

Project feasibility and environmental studies require public endorsement and the DOT owns the risk of public acceptance and cannot reasonably pass this on to the design-builder. DOTs need to determine, to the extent possible, public concerns regarding a project before entering a D-B contract.

Design Exceptions

Known design exceptions should be approved prior to solicitation of design-builders. The design-builder's best value proposal may include other design exceptions, which would be approved or rejected as part of the proposal evaluation. Subsequent design might include other design exceptions for which the design-builder must prepare appropriate documentation and application materials. The requests would be processed and approve if warranted, but the design-builder would remain responsible for associated schedule adjustments.

D-B Project Attributes

Candidate projects should be examined for unusual or unique requirements that could be effectively addressed by a design-builder. Examples of this might include severe right-of-way limitations, environmental mitigation, extensive traffic handling, narrow construction windows, sensitive staging, and so on.

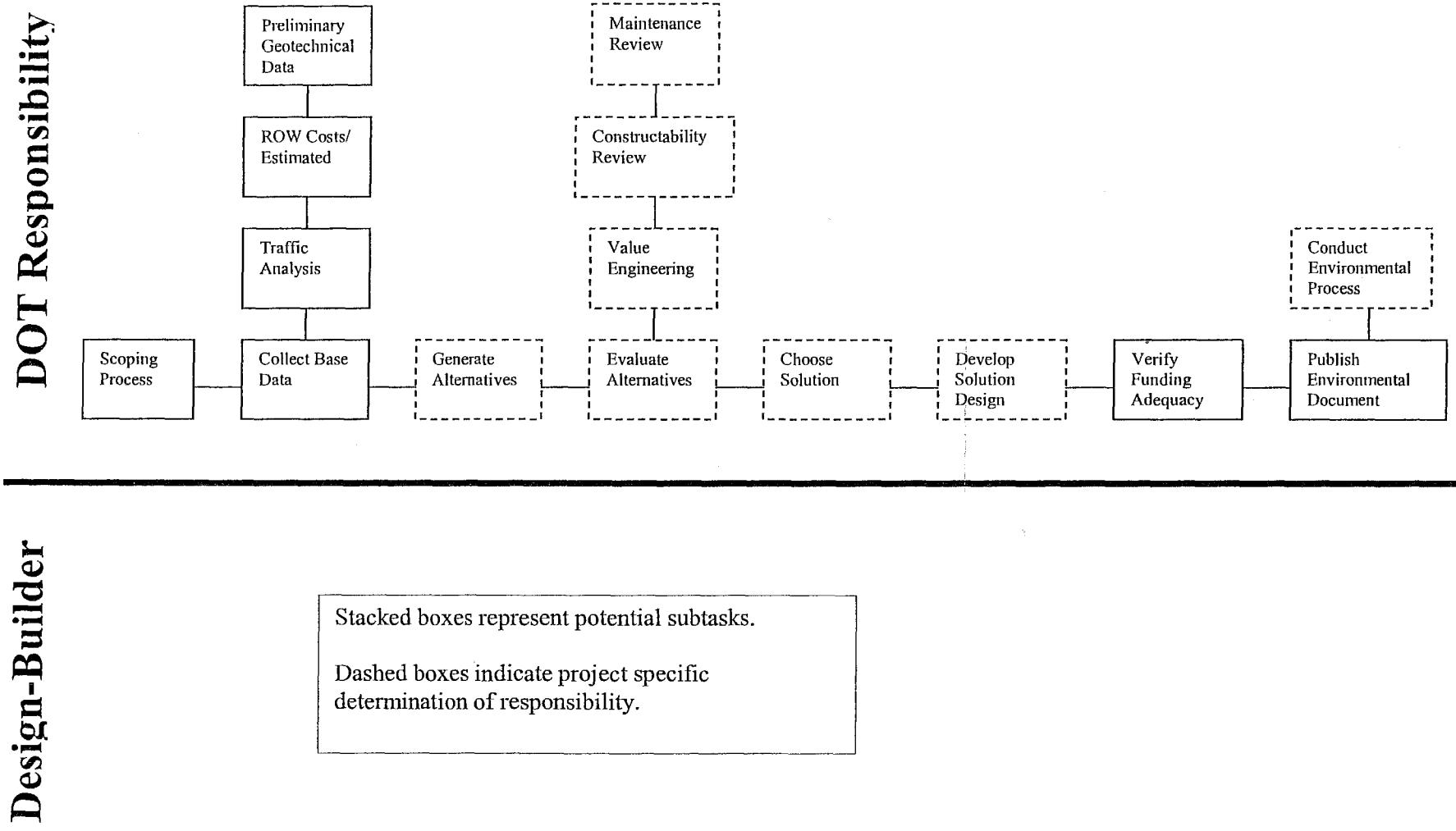
The project delivery schedule is typically the overriding issue for utilizing D-B contracting. By combining design and construction as one contract the work can sometimes be executed concurrently, thus saving calendar time. This often results in less impact to the public and may even reduce total costs. The actual benefits may be difficult to calculate but they are worth assessing when considering D-B contracting. The following table of questions uses the attributes of D-B as the criteria and issues to consider when attempting to identify projects for possible D-B selection.

Project Selection Criteria

	Yes	No
1. Does this project fit within the size limit set by applicable state and federal law?		
2. Has a similar project been completed in the region using non D-B methods so that benchmark data is available?		
3. Can a project team be assembled to respond to the delivery schedule?		
4. Is the project funded for Design?		
5. Is the project funded for right-of-way?		
6. Is the project funded for Construction?		
7. Is the geotechnical fieldwork complete?		
8. Is the NEPA process complete?		
9. Are permits acquired or predictable?		
10. Is right-of-way acquired or predictable?		
11. Are railroad agreements in place?		
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 a unique or unusual D-B feature?		
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)?		

Appendix D
Example Design-Build Process Map

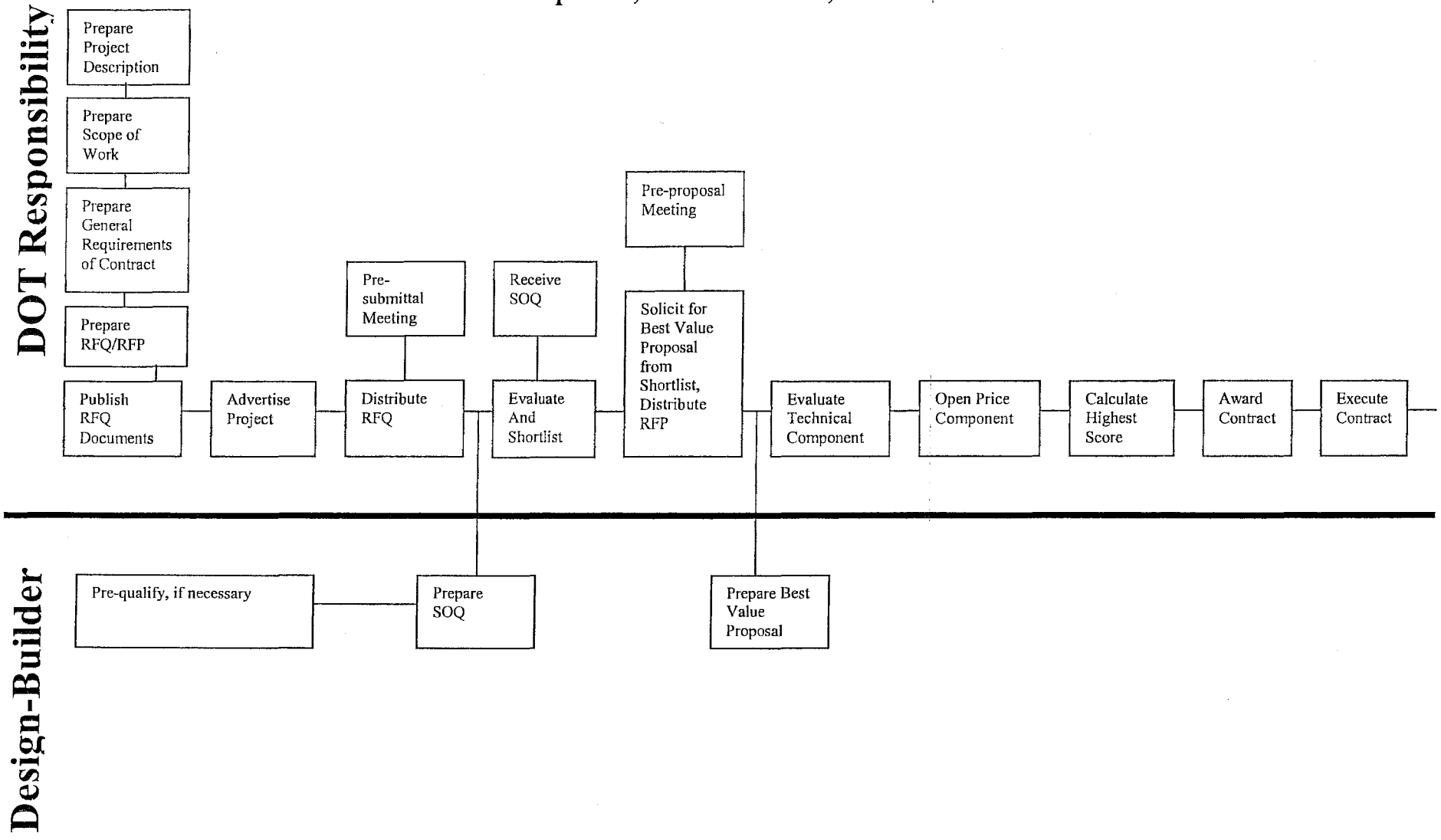
Preliminary Design and Environmental Documentation



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

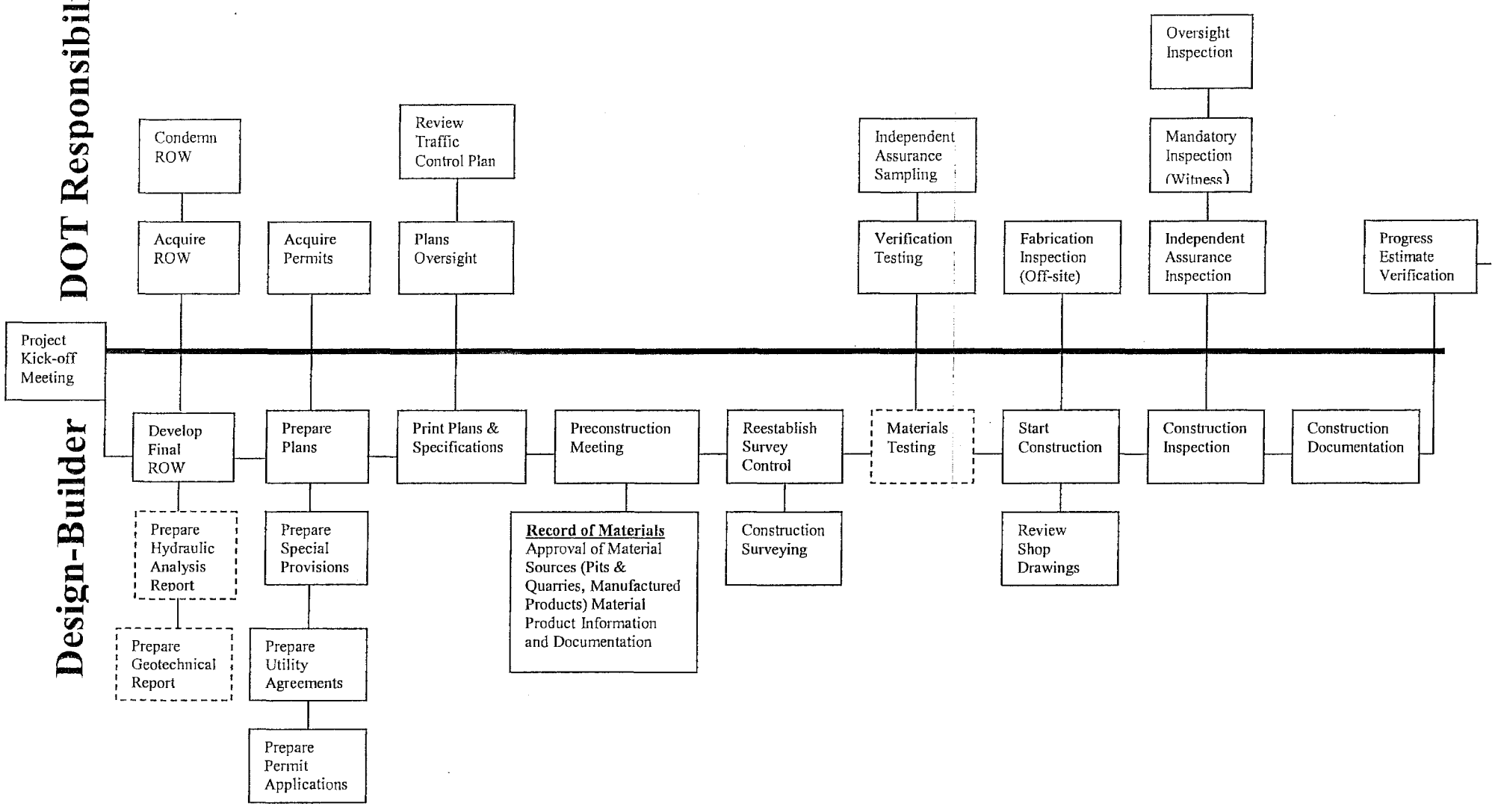
Appendix D, continued
Example Design-Build Process Map

Contract Development, Advertisement, Award and Execution



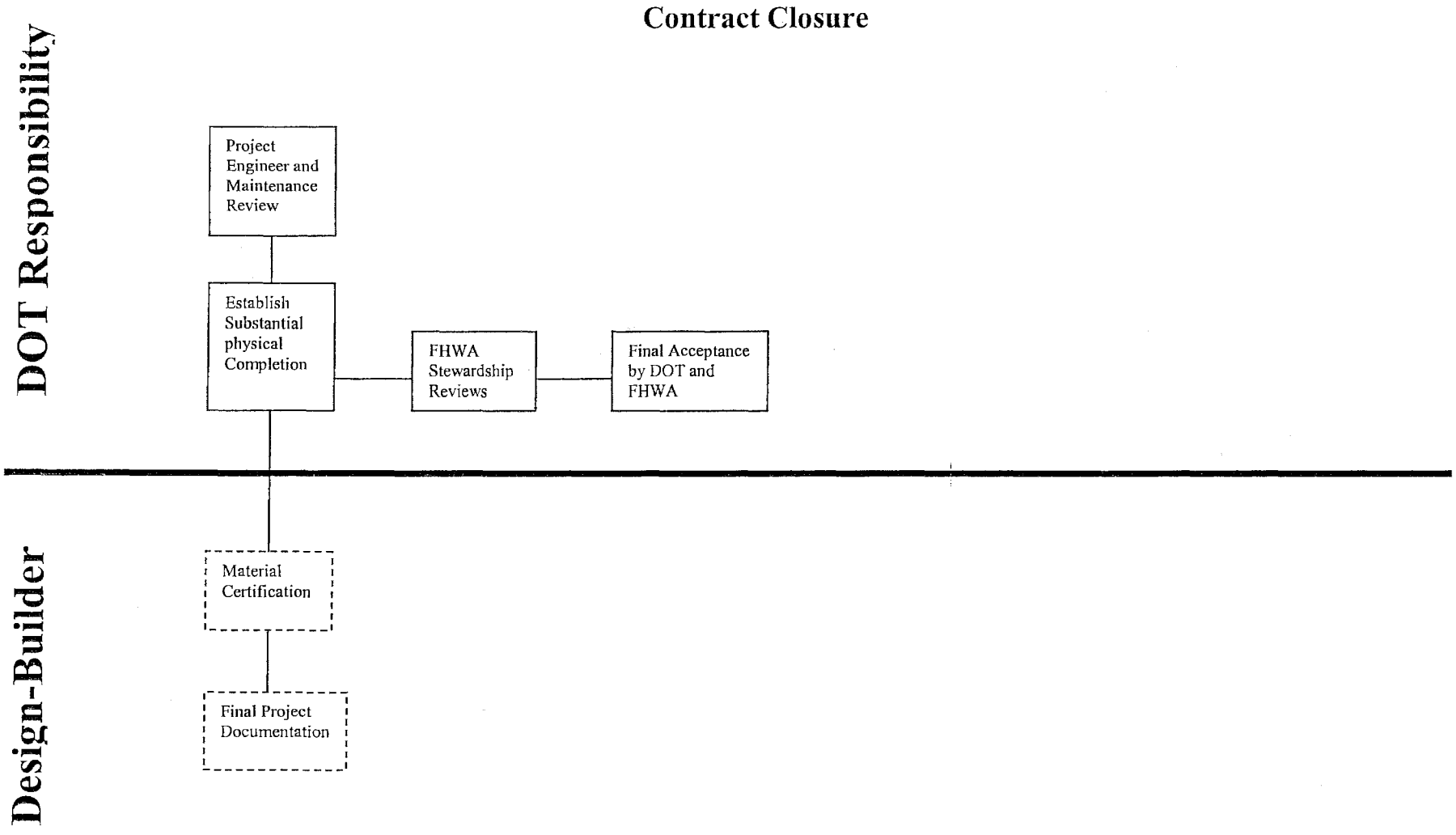
Appendix D, continued
Example Design-Build Process Map

Contract Administration and Construction



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

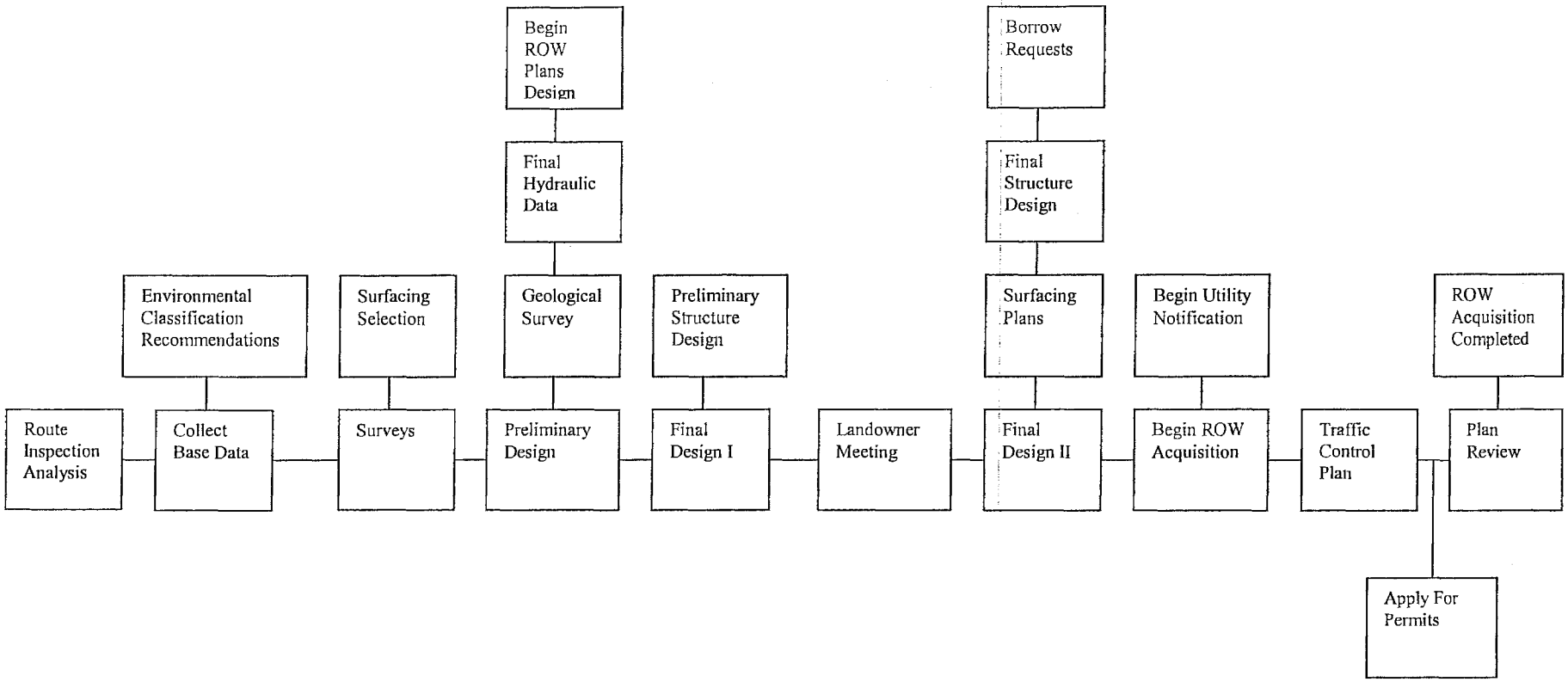
Appendix D, continued
Example Design-Build Process Map



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

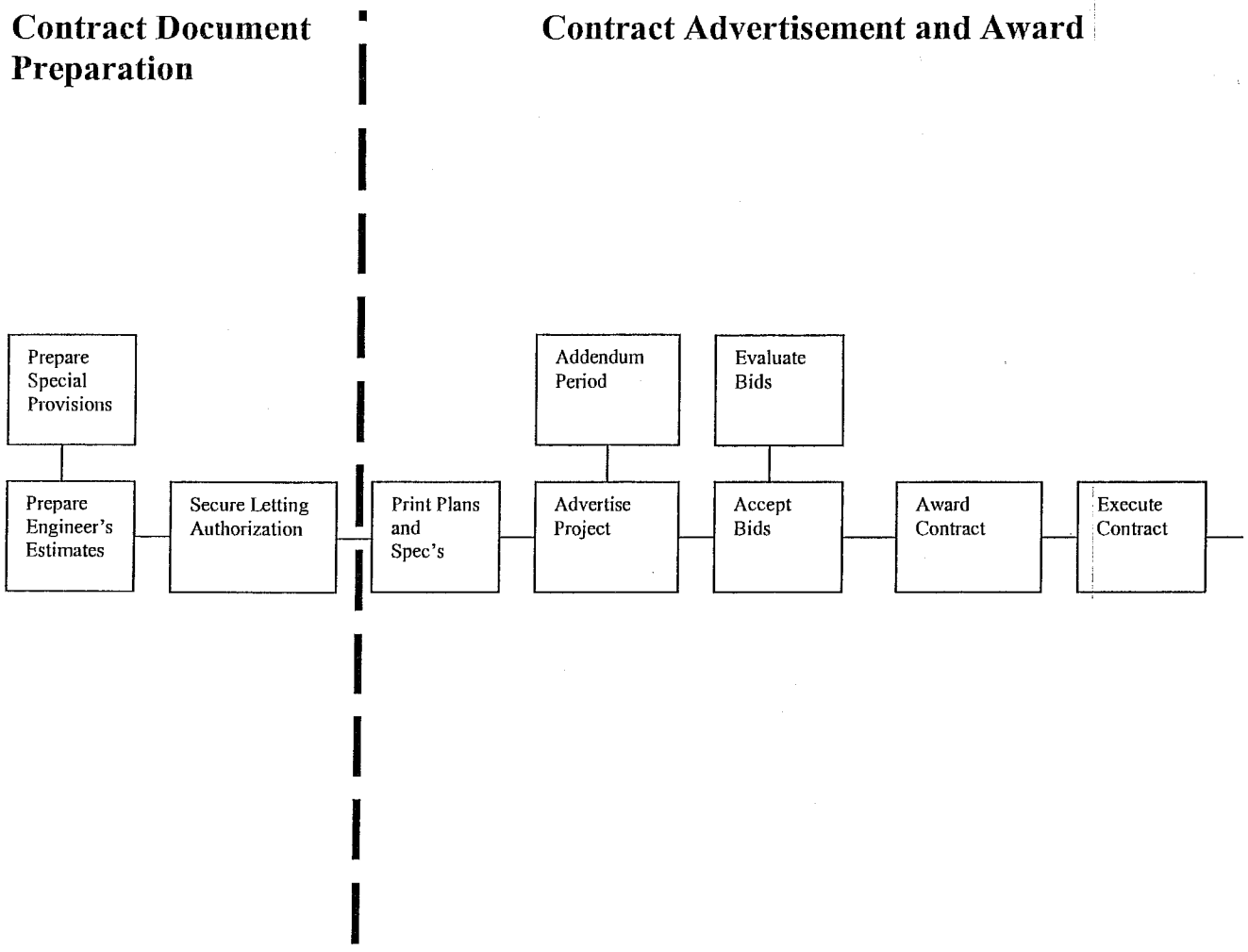
Appendix E
Generic Design-Bid-Build Process Map

Design



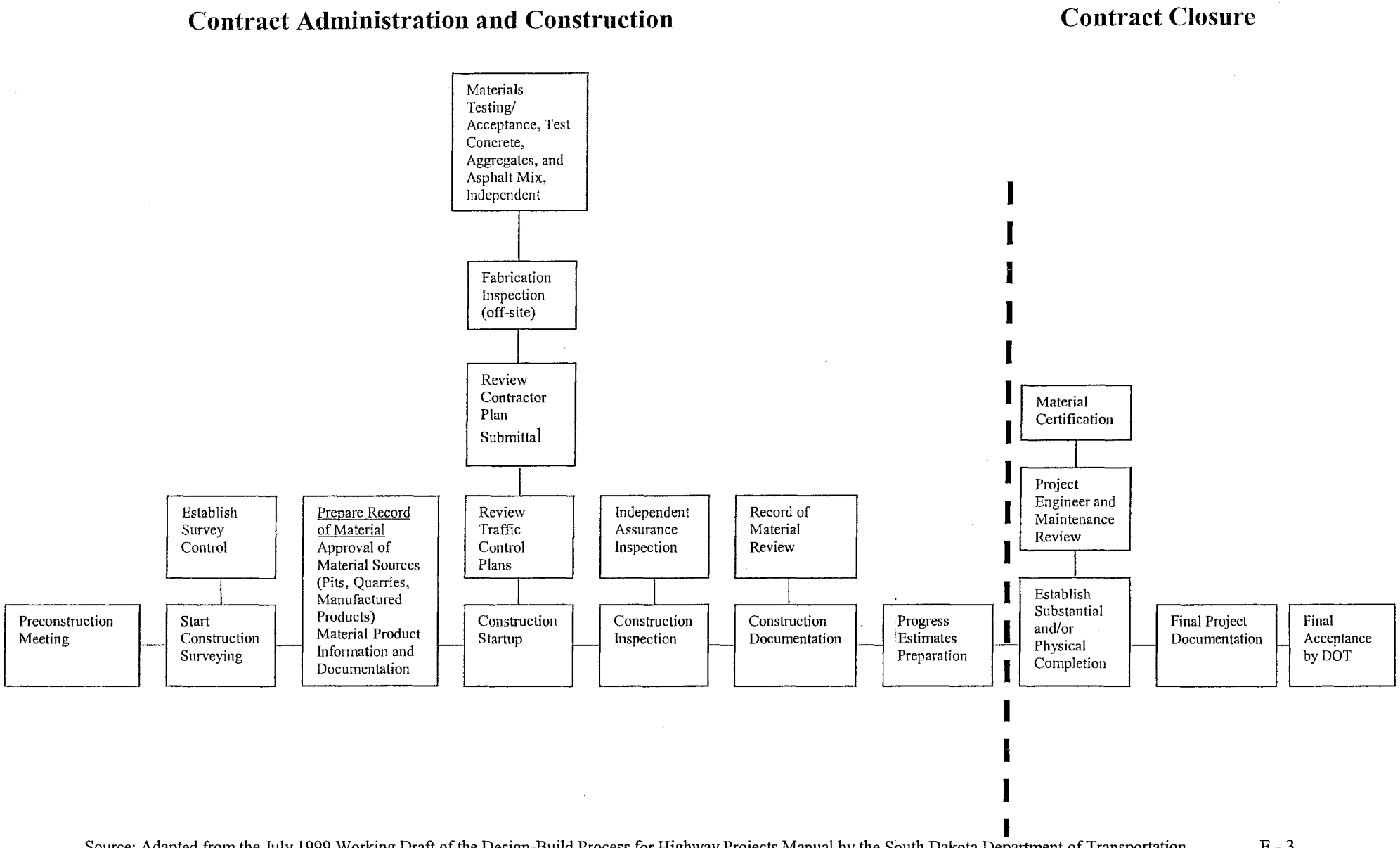
Source: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual by the South Dakota Department of Transportation.

Appendix E
Generic Design-Bid-Build Process Map



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

Appendix E
Generic Design-Bid-Build Process Map



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

Appendix F
Draft Design-Builder Selection Process[1]

This appendix is structured as a DOT-specific internal guidance document, and is an example of how a state DOT could meet the requirements for developing and following a design-builder selection process.

Purpose

In order to comply with the legislative requirements, the Department of Transportation shall select design-build firms to provide combined design and construction services for authorized highway construction projects in accordance with the following procedures.

Definitions

For purposes of this procedure the definitions contained in the legislation the following definitions apply:

(1) "Commission" is defined as the Transportation Commission.

(2) "Department" is defined as the Department of Transportation.

(3) "Firm" is defined as any individual, firm, partnership, corporation, association, joint venture, or other legal entity permitted by law to practice engineering, architecture or construction contracting in the state.

(4) "Project" is defined as that project described in the public announcement.

Minimum Qualification Requirements for Firms Providing Design-Build Services

Design-builders shall be registered with the Secretary of State prior to contract award. Where required by state or federal law, the design-builder shall be able to provide design or construction services by licensed or registered individuals.

[1] Sources: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual, South Dakota Department of Transportation.

Public Announcement Procedures

Except in emergency situations, the Department shall publish an announcement in accordance with applicable standards. The announcement shall set forth a general description of the project requiring design-build services and defining time frame and procedures for interested qualified firms to apply for consideration. The public announcement shall further state whether design-builders will be pre-qualified for the project.

Technical Review Committee

There shall be a Technical Review Committee (Committee) comprised of the following:

1. The State Highway Engineer, or his designee;
2. The Director of the Division of Operations, or his designee, and up to one additional member from the Division of Operations appointed by the Director of the Division of Operations; and
3. The Director of the Division of Planning and Engineering, or his designee, and up to three additional members to be appointed by the Director of the Division of Planning and Engineering from the areas of Materials and Surfacing, Bridge Design and Road Design.

The Committee shall have responsibility for determination of the most qualified offerors as provided in "Qualification of Design-Builders" and rating and scoring Qualitative Proposals as provided in "Competitive Selection of Design-Build Services".

Criteria Package and Request for Proposals

(1) The Department shall prepare a criteria package. The criteria developer may be either a private practitioner (selected in accordance with normal procedures for selecting design firms) or on the staff of the Department or other state agency. The criteria developer is prohibited from being part of the bidding entity. The criteria package may include the following:

a) Scope of work
b) Site survey;
c) Material quality standards;
d) Conceptual design criteria;
e) Design and construction schedules;
f) Site development requirements;
g) Stipulation of responsibilities for permits and utility, storm-water, and road connections;
h) Stipulation of responsibility for meeting environmental regulations;
i) Soil borings and geo-technical information;
j) Traffic control stipulations
k) Performance specifications; and
l) Statement of required compliance with codes and general technical specifications.

(2) The purpose of the criteria package is to furnish sufficient information for firms to prepare qualitative proposals and price proposals. The firm submitting the successful proposal shall

develop a detailed project design based on the criteria in the criteria package. Moreover, the firm shall construct the facility in accordance with the criteria package.

(3) The Request for Proposals ("RFP") shall consist of the criteria package, instructions to bidders, bid proposal forms, provisions for contracts, general and special conditions, and basis for evaluation of proposals.

Qualification of Design-Builders

(1) The Department shall qualify design-builders on a project-by-project basis.

(2) The Department shall advertise in accordance with applicable statutes for a Request for Qualifications ("RFQ") . The RFQ shall contain the following:

a) A general description of the project;
b) A description of the areas of qualification required for performance of the work, such as experience, management resources, and financial capability;
c) The basis upon which the most qualified offerors will be determined; and
d) Any other requirements the Department deems necessary.

Firms desiring to submit proposals on the design-build project shall submit a statement of qualifications setting forth the qualifications of the entities involved in the firm and providing any other information required by the RFQ.

(3) The Committee shall determine the relative ability of each D-B team to perform the services required for each project. The Committee shall base its determination upon the following:

(a) Experience with comparable projects;
(b) Financial and bonding capacity;
(c) Managerial resources;
(d) The abilities of the professional personnel;
(e) Past performance;
(f) Capacity to meet time and budget requirements;
(g) Knowledge of local or regional conditions
(h) Recent and current project workload; and
(i) The ability of the design and construction teams to complete the work in a timely and satisfactory manner.
(j) Submitted Pre-qualification form for team.

(4) The Committee shall select no more than five firms deemed to be most highly qualified to perform the required services, after considering the factors in (2) above. The Committee will report its selection of most highly qualified offerors to the State Highway Engineer.

(5) The State Highway Engineer shall issue RFPs to the most highly qualified firms selected by the Committee.

Competitive Selection of Design-Build Services

(1) Each firm submitting a proposal shall submit a Qualitative Proposal and a Price Proposal. Only firms receiving a RFP may submit proposals. Proposals shall be segmented into two packages;

(a) Qualitative Proposal. A qualitative proposal shall include preliminary design drawings, outline specifications, technical reports, calculations, permit requirements, management plan, schedule, and other data requested in response to the RFP. Qualitative proposals shall be submitted in a sealed package, which identifies the project and the design-builder on the outside of the package. Each firm shall place the words **"QUALITATIVE PROPOSAL"** on the outside of the package. Nothing contained in the qualitative package, except the project management plan set forth below shall identify the design-builder. The project management plan shall be submitted in a separate envelope within the qualitative proposal package.

(b) Price Proposal. Price proposals shall include one lump sum cost for all design and construction of the proposed project. Each firm shall submit its price proposal in a separate sealed package. Each firm shall place the words **"PRICE PROPOSAL"** on the outside of the package. Each firm shall also place its name, the project description, and any other information required by the RFP on the outside of the package. The Department shall secure price proposals until the time provided in "Best Value Selection", paragraph (1).

(2) Each qualitative proposal shall be assigned a number by the Bid Letting Engineer. The proposal, less the project management plan, shall be submitted to each member of the Committee with only the assigned number to identify the design-builder (it is intended that the Committee members not know the identity of the design-builder during the review and scoring of the technical and schedule aspects of the packages). The project management plan shall be submitted to the Committee members for review and scoring only after they have turned in their scores for the other portions of the qualitative proposal. The Committee members shall independently review the design concepts, preliminary designs and technical data submitted by each firm. The Committee members shall independently rate each firm's proposal based upon criteria established by the Committee for the project. At no time during the review and scoring process shall the Committee member confer with one another. The criteria may include the following format example, but shall be adjusted for the particular characteristics of the project prior to the advertisement of RFP:

1. Technical Criteria — Maximum Score: 65

2. Project-specific Management Plan — Maximum Score: 20

   A. Management Plan and Organization
   B. Resumes of Key Professional and Managerial Personnel
   C. Quality Assurance Plan
   D. Safety Plan
   E. Minority and Disadvantaged Business Participation Plan

3. Project Schedule — Maximum Score: 15

   A. Construction Schedule and Ability to Meet Schedule

B. Architecture and Engineering Design Schedule and Ability to Meet Schedule
C. Length of Construction and Design Schedule

Total Maximum Score: 100

(3) The Committee may adjust and refine all of the above criteria and the points assigned to each based on the project type and Department experience. The Committee may reduce the weight of management criteria or omit it entirely if it is sufficiently determinative in selection of the most qualified offerors under "Qualification of Design-Builders". The Committee may omit schedule as criteria when it is a fixed requirement in the RFP.

(4) The Committee members shall, without conferring with one another, submit their criteria scores for each design-builder to the State Highway Engineer. The State Highway Engineer will average the scores of the Committee members for each design-builder to arrive at a single score for each design-builder.

Best Value Selection and Award for Design-Build Services

(1) The State Highway Engineer shall set a date for publicly opening the price proposals, and shall notify all firms submitting price proposals at least seven calendar days prior to the opening date. The notification shall include the date, time, and place of the opening of price proposals and date for award of the project.

(2) The State Highway Engineer shall publicly open the sealed price proposals and divide each firm's proposed price by the qualitative score given by the Committee to obtain an "adjusted price". The firm selected will be that firm whose adjusted price is lowest. An example of the "best value" selection formula follows:

Firm	Qualitative Score	Proposed Price	Adjusted Price
A	90	$6.9 million	$7.67 million
B	79	$6.3 million	$7.97 million
C	84	$6.8 million	$8.09 million

(Award to Firm A at $6.9 million)

(3) Instead of requiring Qualitative Proposals and Price Proposals, the Department may establish a fixed dollar budget for the design-build project in the RFP. With a fixed price established for all proposers, each firm would submit only Qualitative Proposals. The Department would award the project to the firm receiving the highest qualitative score.

(4) The Department reserves the right to reject all proposals. The Commission shall either reject all proposals or approve an award to the firm with the lowest adjusted price. The State Highway Engineer will notify all proposers in writing of the Department's intent to enter into a contract with that firm.

(5) The Department shall enter into a contract with the firm selected as provided above. At the time of the award, the Department may negotiate minor changes for the purpose of clarifying the design criteria and work to be done, provided that the negotiated changes do not affect the ranking of the proposals based on their adjusted scored.

An Example D-B Request for Qualifications (RFQ)

The following is an example for illustration of concepts. Specific scoring, criteria, and pages allowed should be developed for each individual project.

Request for Qualifications (RFQ)
Design-Build Project

Summary of Layout and Scoring

	FORMAT & CONTENT	MAXIMUM POINTS	MAXIMUM PAGES
Part I	Introductory Letter	N/A	2
Part II	Evaluation Criteria		15
	A. Project Understanding, Approach & Budget	25	
	B. Design-Builder Project Team	30	
	C. Design-Builder Capabilities	30	
	D. Quality Control Program	15	
Part III.	Supportive Material	N/A	5
Part IV.	Design-Builders Information Form	N/A	
Part V.	Work History Form	N/A	2
	TOTALS	100	25

The Proposal is limited to a maximum twenty-five (25) pages, typed 12 point or larger font on single sided 8.5" X 11" paper (no other size paper is allowed). The page limitation applies to all sheets included in the submittal including, but not limited to: cover sheet, letter of transmittal, table of contents, dividers sheets, index, appendices, etc. If any of these forms are included they will count toward the maximum limitation of twenty-five (25) sheets. If the submittal does not meet all of these requirements, it shall be deemed non-responsive and rejected.

The following describes the content of each part.

Part I Introductory Letter

Introductory letter (maximum 2 pages) should be addressed to the Department of Transportation and should contain the following items:

- The design-builder's expression of interest in being selected for the project;
- A statement that the contractor member of the design-builder is/is not pre-qualified with the Department;
- A statement of the commitment of the key personnel identified in the submittal to the extent required to meet schedule and quality expectations;
- A statement that the design-builder will comply with policy on DBE requirements for the contract and the Department's non-discrimination policy;

- A statement detailing the legal structure of the design-builder's organization and/or consortium of firms;
- A summary of key points regarding the design-builder's qualifications;
- A statement that the design-builder will comply with all applicable federal, state, and local regulations;

Part II Evaluation Criteria

Information to be included in each section is itemized below (maximum 15 pages):

A. Project Understanding, Approach, and Budget (25 points)

1. Discuss your understanding of the traffic control required for the project, any major issues that need to be addressed, and your solution.
2. Discuss generally the tasks involved in this project. Identify special issues or problems that are likely to be encountered. Illustrate clearly and concisely your understanding of the technical and institutional elements that must be addressed by the design-builder.
3. Outline key community relations issues and how they will be addressed.
4. Outline your approach for dealing with the tasks and issues of this project. Provide a general schedule for these events.
5. Detail areas of opportunity for innovation on the project.
6. Explain your understanding of partnering and how it will be implemented on this project.
7. State that you, if selected, can provide the product detailed in the scope of work within the budget established in the scope of work.
8. Identify potential risk factors and methods of dealing with them

B. Design-Build Project Team (30 points)

1. Identify the legal structure of the design-builder and/or consortium of firms, preparing the Proposal of Qualifications. Describe the experience of the firm(s) as it relates to completing the proposed project.
2. Provide a work history. Include a minimum of five projects completed within the last five years for the contractor and design/consultant with a brief description of each project. Include a reference for each project listed. As a minimum the reference shall include a contact's name, current address, and telephone number.
3. Describe the organizational structure of the project, the management approach, and how each partner and major subcontractor fit into the structure.
4. Identify the Lead firm, the Project Manager, Key Staff and other members of the proposing team, their qualifications and experience and define the role each will perform in this project. Provide a brief resume that addresses the following:

   Design-Build Project Manager. Identify person(s) who (1) will be responsible for ensuring personnel and other resources are made available for this project; (2) will handle contractual matters, and; (3) will be ultimately responsible for the quality and timeliness of the design-

builder's performance. State that person's position and authority within the design-builder's organization. Discuss previous similar projects for which this person has performed a similar function. Identify that person's experience working with the Department, local agencies and regulatory agencies within the area of the proposed project.

Design Project Manager. Identify who will actively manage the design of this project. Identify any projects that person will be involved with concurrently and time committed to each project. List similar projects for which this person has performed a comparable function within the last five years. Discuss relevant experience, professional registrations, education and other components of qualifications applicable to this project. Identify that person's experience working with the Department, local agencies, and regulatory agencies within the area of the proposed project.

Contractor's Project Manager/Engineer. Identify who will actively manage the construction of this project. Identify any projects that person will be involved with concurrently and time committed to each project. List similar projects for which this person has performed a comparable function within the last five years. Discuss relevant experience, professional registrations, education and other components of qualifications applicable to this project. Person must have at least 10 years experience in the construction of similar projects. Identify that person's experience working with the Department, local agencies, and regulatory agencies within the area of the proposed project.

Project Engineer(s) and/or Other Key Personnel. Identify other key members of the project team including sub-consultants/subcontractors that provide special expertise or will perform key task. Describe their anticipated roles. Identify experience working with the Department, local agencies, and regulatory agency standards within the area of the proposed project.

5. Provide an organizational chart showing the interrelationships of members of the design-builder's organization.
6. Include specific experience in Design-Build projects. Include any team experience on similar or related projects.
7. State extent of principal involvement.
8. State qualifications and relevant experience of Sub-Consultant

C. Design-Builder Capabilities (30 points)

1. Indicate the resources that will be available, and from what source, to perform the work in this project. Indicate that appropriate resources will be committed to complete the project.
2. Define the methods the bidder has in place for addressing claims, contract modifications and schedule recovery to maintain the completion date.
3. Provide examples of projects in which the major participants have completed their task ahead of schedule and/or below budget. Explain how this was accomplished.
4. Discuss quantitatively how this project would impact the current and anticipated workload of the office that will perform this work. Is staffing up necessary? If so discuss which areas and how it will be accomplished.
5. Describe total project costs and the total value of change orders and claims for similar completed projects.

6. Describe any equipment or other resources the bidder has that will enhance their ability to accomplish this project.
7. Submit audited or reviewed financial statements in U.S. dollars for the last two fiscal years for the bidder and each major participant (Design Consultant and Contractor members).
8. Describe internal procedures for developing, monitoring, and maintaining project schedules.
9. Describe any expertise, increase in capacity, or special capabilities of members of your Design-Build team that are critical to your proposal.
10. Describe your internal procedures for providing partnering education and development.
11. Describe your experience working with the Department and local agencies within the area of the project.
12. Describe your experience acquiring the required permits for project completion.
13. List projects that have resulted in liquidated damages against any major participant of the team over the last five years
14. Describe the design-builder's financial capability/strength

D. Quality Control Program (15 points)

1. Identify design-builder's policies/procedures for quality control/quality assurance.
2. Describe the design-builder's internal quality control procedures.
3. Describe how the design-builder's quality control program would enhance the development of this project.

Part III Supportive Material

A brief overview of the design-builder's safety program plus documentation of past five years safety record on all construction projects should be provided (Citations- list circumstance and outcome). Additional information (maximum 5 Pages) may include organizational charts, capacity charts, graphs, photographs, maps, resumes, references, etc. No more than five (5) pages.

Part IV Design-Builder Information Form

Standard design-builder Informational form to be developed and required as part of submittal.

Part V Work History Form

Standard Work History form to be developed and required as part of submittal.

Appendix G
Request for Proposal Development, Draft Guideline[1]

Development of the request for proposal is a critical stage in the design-build (D-B) process since it determines the requirements for the project from procurement to close-out.

The request for proposal (RFP) consists of the criteria package, instructions to bidders, bid proposal forms, provisions for contracts, general and special conditions, and basis for evaluation of proposals.

The Department should prepare a design criteria package. The criteria developer may be either a private practitioner (selected in accordance with normal procedures for selecting design firms) or on the staff of the Department or other state agency. The criteria developer is prohibited from being part of the bidding entity. The criteria package may include the following:

a) Scope of work
b) Site survey;
c) Material quality standards;
d) Conceptual design criteria;
e) Design and construction schedules;
f) Site development requirements;
g) Stipulation of responsibilities for permits and utility, storm-water, and road connections;
h) Stipulation of responsibility for meeting environmental regulations;
i) Soil borings and geo-technical information;
j) Traffic control stipulations
k) Performance specifications; and
l) Statement of required compliance with codes and general technical specifications.

The purpose of the criteria package is to furnish sufficient information for firms to prepare qualitative proposals and price proposals. The firm submitting the successful proposal should develop a detailed project design based on the criteria in the criteria package. Moreover, the firm should construct the facility in accordance with the criteria package.

Scope of Work

The Scope of Work developed by the Department should include the design services required, the construction engineering requirements, the construction services required, and the Department's responsibilities.

The Scope of Work should furnish sufficient information for D-B proposers to prepare proposals (qualitative and price), including a summary of the Department's project objectives in the Project Description. The Project Description will be placed at the beginning of the Scope of Work.

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[1] Sources: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual, South Dakota Department of Transportation; the August 2000 Draft Guidebook for Design Build Highway Project Development, Washington State Department of Transportation, by CH2MHILL.

Project requirements should be described completely and in a manner that will be easily interpreted and understood. The Department should conduct adequate research and investigations to determine the facility requirements and to document them in an unambiguous manner.

In the event that there are questions concerning the Scope of Work requirements, the Department should contact all design-builders in writing to clarify. The D-B proposer to whom the D-B contract is awarded will be responsible for developing the project design based on the criteria and information contained in the RFP and for the construction of the facility in compliance with the plans and specifications.

The Scope of Work consists of several elements, each of which is described below.

Project Description

The Project Description consists of a brief project summary, which provides proposers with a fundamental understanding of the project. The description is similar to the type currently used in D-B-B public notifications and advertisements.

The Project Description is to provide a description of the project location, a brief description of the existing conditions and/or deficiency(ies), and a description of the anticipated type of work to be performed.

The Project Description provides an opportunity to delineate some of the significant and subtle changes to the typical D-B-B documentation that is required for D-B contracting. The information is typically provided in a summary format and does not contain specific contract requirements. If prepared at an early date, the Project Description can help the project development team to focus on the complete project as their typical tools for tracking the project details (plans and specifications) are removed. An outline for the project description format follows:

Describe the location of the project.

Include county and proximity to town or city, highway number, Mileage Reference Marker (MRM) limits.

Briefly describe the existing conditions and/or deficiency(ies)

Existing at-grade intersection with number of lanes approaching in each leg, "x" number of lane miles of "y" year old PCCP or ACP, existing "z" year built bridge of "w" number of "v" width lanes and type of bridge.

Describe the anticipated type of work to be performed (both in the design and construction phases)

Design elements to include: data collection including; traffic, geotechnical, right-of way plans, hydraulic report, preparation of utility agreements and permit application information, and construct such design while providing construction documentation and quality inspection services.

Staffing Requirements

Minimum staff training, experience, professional registration or other qualifications required for any aspect of the design or construction should be specified. These requirements should also be tied to the selection criteria in the RFQ. Provisions in the General Requirement will specify that the identified key personnel on the design-builder team cannot be arbitrarily substituted.

Information to be Furnished by the Department

The Scope of Work should include a section that details any information or services to be furnished by the Department. This includes any information (data, reports, etc.), support functions, (computer services, etc.), material, equipment information, testing device information, or other items that would affect the bid or technical approach. Also include available survey data, preliminary geotechnical information, bridge hydraulic reports, existing plans, right-of-way maps, etc. The Department must also determine who will provide the pavement borings and pavement design.

Generally, the Department should provide a typical section and/or preliminary layouts as a part of the design criteria. These layouts will provide the design-builder with enough information for the design-builder to produce the design documents.

Computer services or programs to be made available to the design-builder during the design and construction of the project should be designated in the Scope. The design-builder should list the computer services and programs that will be used during the execution of the contract. Computer software for drawing preparation and the ability to convert to a platform compatible with current Department software should be required.

The Department should require that the design is in accordance with Department Design Guides and drawings are done in accordance with the Plans Preparation Guide. Numerous iterations to change minor presentation differences should not be expected. The design and drawings should be in English dimensions.

Drawing Reviews

Licensed design professionals prepare the design. Their seal on the drawing represents certification that the design meets all applicable standards and is correct and accurate. Therefore, the Scope of Work should be clear that it is the responsibility of the design-builder to check and certify design. The Department should not perform an official review that might be interpreted as official acceptance or approval of the design, after the acceptance of the proposal. The Department review should confirm that the project elements meet scope of work and other contract provisions.

Survey Requirements

Survey information to be provided by the Department must be specified and provided as part of the design criteria. The Department should establish survey control as part of the preliminary site work to prepare the contract documents. Additional survey work required to complete the final design should be provided by the design-builder. Requirements related to completing the final survey work will be clearly defined and referenced to the Survey Manual.

Geotechnical Requirements

The Scope of Work should specify any geotechnical information or reports required by the Department. The Department should perform some preliminary geotechnical work in the preparation of the contract documents, to provide information necessary to develop the design as envisioned by the Scope of Work. Any additional geotechnical work necessary for the design-builder's specific proposal will be conducted by the design-builder. The Department should provide copies of any existing geotechnical information that is available to all short listed proposers in order to save time and expense.

Hydraulic Requirements

The Scope of Work should specify any hydraulic information or reports required by the Department. If the definition of the project is heavily dependent on the hydraulic information, the Department should perform some preliminary hydraulic work in the preparation of the contract documents. The Department will provide copies of any existing hydraulic information that is available to all short listed proposers.

Environmental Studies

The Scope of Work should specify any environmental studies, information, or reports required by the Department. The Department will complete the NEPA processes in the preparation of the contract documents, except in some individual cases where it is possible to include this step in the Scope of Work. The Department should provide copies of any existing environmental information that is available to all short listed proposers.

Permits

The Department will officially apply for the permits when the owner is required to be the applicant, but the design-builder will prepare all necessary permit application information. The coordination of the process needs to be defined in the Scope of Work. Clearly define the responsibility of the Department and design-builder in determining permit requirements, time allowed for permit decisions and application responsibilities.

All known permit requirements, especially those affecting construction options and costs, should be clearly defined and supplied to the design-builder as part of the RFP. This does not alleviate the design-builder's responsibility to prepare the necessary permit information or to modify existing project permits as necessary, nor does it indemnify the design-builder from thoroughly investigating additional permit requirements.

Utilities

The Department should begin discussions with utility companies to determine impact of the project, prior to soliciting design-build proposals. Known information should then be included as part of the Scope of Work. The design-builder will then be charged with developing information related to utility impacts or relocations, if their design impacts utilities outside of the existing right-of-way. Preparation of a Utility Agreement at the expense of the design-builder will be required. The design-builder will be charged with coordination activities with the affected parties during execution of the work.

The Scope of Work should clearly specify all utility efforts required of the design-builder. For example, if the design-builder is expected to use the Department's standard practices in coordinating with utility companies then the details must be provided in the scope or referenced to the appropriate documents. Questions during preparation of the proposals should be focused through a Department representative to coordinate among the affected utilities. Answers to questions will be provided in writing to all proposers. If each proposer contacts the Utilities individually, misunderstandings may ensue if the utilities make different presentations to each party.

The Department will notify all existing utilities within the right-of-way to provide a clear and accurate scope upon which the proposers can base their price proposals. The design-builder will be expected to use One Call as required by State law.

Easements/Right-of-Way

The Scope of Work should note that the design-builder is responsible for any temporary easements required for construction equipment, materials and operations. The Department will verify existing right-

of-way and determine any constraints on additional ROW. Right-of-way acquisition will be the responsibility of the Department. Time certain limits on the efforts by the Department to acquire the right-of-way will be specified. The Department will be responsible for condemnation of property when a settlement cannot be reached based on the procedures specified. A basis for the estimated cost of purchasing right-of-way must be defined.

Historically, concessions made in the negotiations of right-of-way settlements occasionally take the form of items to be constructed by the Department. Within the D-B contract scenario, such items would constitute contract change orders between the Department and the design-builder. Consequently, use of this type of negotiating tool is discouraged for a project being delivered by the D-B method.

Construction Engineering and Inspection (CEI) Services/Requirements

Construction engineering services required during the construction phase of the contract will be specified in the QC/QA Plan requirements. Review the details of the required plan for conformance with the Scope of Work.

Required Submittals

The design QC/QA Plan requirements delineate the submittal requirements for Department review. Review the details of the required plan for conformance with the Scope of Work.

Warranties

In the D-B process, the Department should consider the use of product warranties to minimize QA involvement during design and construction. Each component evaluated may have a different warrantee term, for example, pavement 5 years, bridge joint 10 years, landscaping 2 years, and so on. The performance of the product should be monitored using specific criteria that can be measured and/or tested, for example, pavement condition measured in total equivalent wheel loads rather than years. The warrantee terms should be consistent with the established criteria.

Appendix H
Example Amendments to Standard Specifications

Adoption of the design-build project delivery method requires state DOTs to amend their standard specifications. The following section is an example adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects, developed by the South Dakota Department of Transportation.

General Information, Definitions

The following statements must be included in the special provisions of the Request for Proposals (RFP):

- All references to "lowest responsible bidder" in the Standard Specifications are construed to mean "best value".
- All references to the "Contractor" in the Standard Specifications are construed to mean the "design-builder".
- All references to the "plans" in the Standard Specifications are construed to mean the "contract document".

The following definitions must be included in the special provisions of the RFP:

Best Value Proposal (BVP) – The design-builder's proposal with the lowest adjusted price when the Qualitative Proposal score and the Price Proposal score are combined.

Construction Documents - design-builder drawings (plans) and specifications giving a detailed and precise representation of the configurations and arrangements of the materials and items being constructed. Construction documents are not to be used for construction until they are released for construction. See Released for Construction Documents.

Contract Plans – The drawings (plans) which show the location, character, and dimensions of prescribed work, including layouts profiles, cross sections and other pertinent documents provided by the design-builder in response to the RFP.

Criteria Package - The purpose of the criteria package is to furnish sufficient information for firms to prepare qualitative proposals and price proposals.

Design-Builder - The firm, partnership, joint venture or organization which is contracted by the South Dakota Department of Transportation to provide design, construction, and quality control services for the project.

Design Document – design-builder drawings, specifications, calculations, records, reports or other documents, including shop drawings and special process procedures, which may be used for design, manufacture fabrication, installation, testing, examination and certification of items.

Final Inspection - Inspection by the Department of the construction work to determine whether the work conforms to approved plans and specifications and is physically complete.

Hold Point - Mandatory verification points identified within the inspection plan beyond which work cannot proceed until verification is performed and a written release is granted by SDDOT.

Independent Assurance Inspection (IAI)- An unbiased and independent inspection of the Contractor's Quality Control Systems and used to verify the reliability of the tests results obtained in the regular Quality Control sampling and testing activities. The results of the IA tests are not used as a basis of acceptance of material or work.

Independent Assurance Testing (IAT) - A test conducted to check the calibration of the testing equipment and processes being used. The IAT will be performed by SDDOT at a time and location to be determined. The minimum IAT frequency will be one test annually for each test procedure for each qualified tester.

Originator - The engineer, architect, planner, designer, or other person who develops a specific document. In the case of drawings, the Originator is the individual who provides the design information, sketches and instructions to the drafter.

Project Quality Management (QM) - Quality Management Team establishes and implements a QC/QA program and plan and provides the necessary infrastructure for the Quality Management system to be adaptable to all SDDOT needs.

Statement of Qualifications (SOQ) – The Design–Builder's response to the Request for Qualification (RFQ).

Qualification (Personnel) - The characteristics or abilities gained through training or experience or both, as measured against established written and performance tests, that qualify an individual to perform required functions. Individuals meeting the minimum requirements of Department's Material Testing and Inspection Certification program will be deemed qualified to perform the respective tests.

Qualitative Proposal (QP) – A proposal submitted to the Department that provides sufficient information to enable the Department to evaluate the capability of the Design –Builder to provide the desired services.

Quality Assurance (QA) - A program of planned policies, procedures, detailed responsibilities and systematic actions including inspection, testing and audits of the QC program necessary to provide adequate confidence that the QC and results meet the contract requirements. The Quality Assurance activities will normally be done by SDDOT when the design-builder's QC tests are used for acceptance decisions. However the design-builder should have in place his own QA procedures to independently check the QC program.

Quality Control (QC) - The actions by the design-builder for examining, witnessing, inspecting, checking, and testing of in-process or completed work, including check- out and installation activities, to determine conformity with specified requirements and acceptance of construction.

Released for Construction Documents - Those construction documents which have been certified to have met all requirements for construction and have been stamped "Released for Construction" by the Project Quality Manager, or official designer.

Request for Qualifications (RFQ) - The formal solicitation of the qualifications of firms, partnerships, joint venture and organizations wishing to submit their qualifications for consideration for the proposed Design-Build project.

Request for Proposals (RFP) - The formal solicitation of a detailed proposal of firms, partnerships, joint venture and organizations wishing to submit a proposal in accordance with the requirements outlined in the RFP scope of work. The RFP shall consist of the criteria package, instructions to bidders, bid proposal forms, provisions for contracts, general and special conditions, and basis for evaluation of proposals. The design-builder's proposal will normally include a design, cost estimate, design and construction schedule, QC/QA program and warranties.

Statistically - based Acceptance - Acceptance of the Contractor's QC test results through statistical comparison with Verification test results.

Verification Tests - Those tests performed by SDDOT on a random basis to verify the accuracy of the design-builder's Quality Control Tests. The verification tests will normally be performed at a frequency of 1 per 5 design-builder Quality Control tests.

Witness Point - A point in production where SDDOT personnel will be afforded the opportunity to inspect the work. Work may proceed beyond a witness point with or without action by the Department provided proper notification has been given.

Amendments to the Standard Specifications for Design/Build projects.

Section 1 – Definitions and Terms

Section 1.5 - The definition for Award is revised to read:

The formal decision of the Department to accept the best value proposal of the responsive bidders for the work.

1.22 The definition for Engineer is revised to read:

The State Highway Engineer acting directly or through the Director of Operation or through authorized representatives responsible for administration of the Contract Work.

1.32 The definition for Laboratory is revised to read:

Design-Builder's testing laboratories shall be either AASHTO accredited or meet the requirements specified in the Departments Materials Testing and Inspection Certification Program Manual.

1.37 The term for Plans is deleted.

Section 2.2 – Contents of Proposal Form

This section is deleted

Section 2.3– Issuance of Proposal Form

This section is deleted

Section 2.4– Interpretation of Quantities in Bid Proposal

This section is deleted

Section 2.5– Examination of Plans, Specifications, Special Provisions and Site of Work.

This section is deleted

Section 2.6 – Preparation of Proposal

Add the following after the first sentence of the first paragraph:

The RFP will request two separate submittals from the design-builders, each part shall be

submitted in separate sealed packages, clearly marked:

Package 1. Qualitative Proposal

Package 2. Price Proposal

Add the following between the first paragraph and the second paragraph:

The bidder shall submit a completed "Disadvantaged, Minority or Women's Business Enterprise Documentation" as required.

The bidder shall submit with the bid a list of:

1. Subcontractors who will perform work which amounts to more than 10 percent of the bid price, and
2. The work those subcontractors will perform on the contract.

If no subcontractor is listed, the bidder acknowledges that it does not intend to use any subcontractor whose work on the contract will exceed 10 percent of the bid price.

Section 2.7 – Irregular Proposals

Add the following at the end of the section:

G. The bidder fails to submit or properly complete a subcontractor list, if applicable, as required under Section 2.6.

H. The bidder fails to submit or properly complete a Disadvantaged, Minority or Women's Business Enterprise Documentation, if applicable, as required under Section 2.6.

Section 2.12 – Public Opening of Proposals

The section is revised to read as follows:

The Qualitative Proposal and the Price Proposal will be opened on separate days. Only the Price Proposal will be opened publicly. The Qualitative Proposal will be opened first. After the Qualitative Proposal has been evaluated and scored, the Price Proposal will be publicly opened. At that time, the Price Proposal amount and the Qualitative Proposal score will be combined into a final score.

Section 2.13 – Disqualification of Bidders

Section 2.13.A. is revised to read as follows:

A. More than one joint venture, partnership, corporation or other legal entity with a common member submit proposals for the same project (in such an instance, both bids will be rejected).

Section 3.1 – Consideration of Proposals

The first paragraph is deleted.

Section 3.2 – Award of Contract

The first sentence of the first paragraph is revised to read as follows:

The award of contract will be made within 30 calendar days after the opening of the Price Proposal to the responsible bidder with the best value proposal that complies with the requirements prescribed.

Section 3.4 – Return of Proposal Guaranty

The section is revised to read as follows:

When proposals have been examined and corrected as necessary, proposal bonds and deposits accompanying proposals ineligible for further consideration will be returned. All other proposal bonds and deposits will be held until the contract has been properly executed. When the contract has been properly executed, all remaining deposits or bonds, except those subject to forfeiture, will be returned.

Section 3.7 – Failure to Execute Contract

Change the last sentence of the section to read as follows:

Award may then be made to the best value proposal whose proposal complies with the requirements prescribed or the work may be re-advertised.

Section 4.1 – Intent of Contract

The section is revised to read as follows:

The intent of this contract is for the bidder to complete the design as well as construct the project. Therefore, the bidder shall be solely responsible for obtaining any additional survey data or other information that it may deem necessary, in its professional judgment, to provide the design required by these contract plans and specifications. The design-builder shall also furnish labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the construction documents.

Section 4.4 – Maintenance of Traffic

Delete Section 4.4 A. and replace it with the following:

A. Special Detours: Special Detours shall be designed and constructed by the design-builders team.

Section 4.5 – Rights in and Use of Materials Found on the Work

Delete the second sentence of the first paragraph.

Section 5.1 – Authority of the Engineer

Change the first paragraph of the section to read as follows:

Work shall be performed to the satisfaction of the Engineer. The Engineer will decide questions which may arise as to the quality and acceptability of materials furnished; all questions as to the acceptable fulfillment of the contract on the part of the design-builder; all questions in regards to payments under the contract including equitable adjustment. The Engineer's decision shall be final.

Section 5.2 – Plans and Working Drawings

Change the first and second paragraph of the section to read as follows:

The construction documents are defined in the Supplemental Specifications in the RFP. The construction documents shall be produced in accordance with the SDDOT Plans Preparation Manual and SDDOT design manuals. Any proposed alterations by the design-builder affecting the requirements and information in the contract plans shall be in writing and will require approval of the Engineer.

The design-builder shall submit supplemental working drawings as necessary to control the work. Except as noted, all drawings and other submittals shall be delivered directly to the Project Engineer. The drawings shall be provided far enough in advance of actual need to allow for review. If the Project Engineer elects to offer any comments, they will be submitted to the Contractor within 10 working days. The Engineers review shall not relieve the Contractor of responsibility under the contract for completion of the work.

Section 5.3 – Conformity with Plans and Specifications

Throughout this section, change the word "plans" to "construction documents".

Section 5.4 – Coordination of Plans, Specifications, Supplemental Specifications, and Special Provisions

Delete the first paragraph and replace it with the following:

The bidder's proposal, construction documents, contract provisions, standard specifications, standard plates, addenda, various certifications and affidavits, supplemental specifications, and subsurface boring logs (if any) are essential parts of the contract. These parts complement each other in describing a complete work. Any requirement in one part binds as if stated in all parts. The design-builder shall provide any work or materials clearly implied in the contract even if the contract does not mention it specifically.

Any inconsistency in the parts of the contract shall be resolved by following this order of precedence (e.g., 1 presiding over 2, 3, 4, 5, 6, and 7; 2 presiding over 3, 4, 5, 6, and 7; and so forth):

1. Addenda,
2. Proposal,
3. Special Provisions,
4. Design Documents,
5. Supplemental Specifications,
6. Standard Specifications, and
7. Standard Plates.

This order of precedence shall not apply when work is required by one part of the contract but omitted from another part or parts of the contract. The work required in one part must be furnished even if not mentioned in other parts of the contract.

If any part of the contract requires work that does not include a description for how the work is to be performed, the work shall be performed in accordance with standard trade practice(s). For purposes of

the contract, a standard trade practice is one having such regularity of observance in the trade as to justify an expectation that it will be observed by the Contractor in doing the work.

Section 5.5 – Cooperation by Contractor

Delete the first paragraph.

Section 5.8 – Construction Stakes, Lines and Grades

Delete this Section.

Section 5.9 – Authority and Duties of the Area Engineer

Change the section to read as follows:

As the representative of the Director of Operations, the Area Engineer has immediate and responsible charge of administration of the contract. The Area Engineer has the authority to reject defective material and work and to suspend work.

Section 5.12 – Removal of Unacceptable and Unauthorized Work

Revise the first and second paragraphs to read as follows:

Work which does not conform to the requirements of the contract will be considered unacceptable, and will be accepted or rejected under the provisions of Section 5.3 and/or the special provision for the QC/QA Plan. Unacceptable work, resulting from any cause, shall be removed immediately and replaced in an acceptable manner at the Contractors expense.

Work done without authorization beyond the lines shown on the construction documents, or extra work done without authority, will not be paid for under the provisions of the contract. At the Engineer's order, the design-builder shall immediately remedy, remove or dispose of unacceptable work or materials and all costs shall be at the Contractor's expense.

Section 6.3 – Samples, Tests, Cited Specifications

Revise the first sentence of the first paragraph to read as follows:

Prior to use, the design-builder shall notify the Engineer of all proposed materials. The design-builder shall deliver representative samples, (from the design-builder, producer, or fabricator) to the Engineer without charge before incorporating material into the work. In providing samples, the design-builder shall provide the Engineer with sufficient time and quantities for testing before use. The Engineer may require samples at any time.

Section 7.7 – Public Convenience and Safety

Revise the second paragraph to read as follows:

The design-builder shall be required to eliminate dust which causes a hazard or nuisance, by the application of water or other acceptable measures. All costs to provide dust control shall be incidental to the various contract items.

Section 7.18 – Furnishing of Right-of-Way

Add the following at the end of the section:

Should unavailable right-of-way have an impact on the design-builders operations, an extension of time will be considered in accordance with Section 8.6.

Section 8.1 – Subletting of Contract

Revise the section to read as follows:

The design-builder shall not sublet, sell, transfer, assign, or dispose of the contract or contracts or any portion of them, without written consent of the Engineer. The Contractor will be permitted to sublet up to 70 percent of the work, but shall perform work amounting to not less than 30 percent of the total contract cost with his own organization. Any items designated in the contract as "specialty items" may be performed by subcontract and the cost of designated specialty items performed by subcontract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor's own organization. The Contractor shall give assurance to the Engineer that all pertinent provisions of the prime contract including minimum wage for labor and DBE shall apply to the work sublet. Subcontract, or transfer of contract, shall not relieve the Contractor of his responsibilities and liability under the contract and bonds.

The Department will not consider as subcontracting the following; 1) any material produced outside the project limits including but not limited to the production of sand, gravel, crushed stone, batched concrete aggregates, ready mix concrete, off-site fabricated structural steel, other off-site fabricated items, and any materials delivered by established and recognized commercial plants; or 2) delivery of these materials to the work site in vehicles owned or operated by such plants or by recognized independent or commercial hauling companies. Project limits is defined as being with a 2 miles radius of the project proper.

Section 8.2 – Notice to Proceed

Revise the section to read as follows:

The written notice to proceed with the work is issued as a part of the notification of award. The design-builder shall not begin work prior to the date of the contract award. The design-builder shall notify Department at least seven days before beginning construction work.

Section 8.3 – Prosecution and Progress

Revise the section to read as follows:

The design-builder shall diligently pursue the work to the final acceptance date within the time specified in the contract.

The design-builder shall submit a preliminary progress schedule (first 60 working days) to the Engineer no later than five calendar days after the date the contract is executed. This preliminary schedule shall show work to be performed during the first 60 working days of the contract.

The design-builder shall submit five copies of the progress schedule (total working days) to the Engineer no later than 30 calendar days after the date the contract is executed. This schedule and any supplemental schedule shall show: (1) final acceptance of all work within the specified contract time, (2) the proposed order of work, and (3) projected starting and completion times for major phases of the work and for the total project. The schedule shall be developed by a critical path method. The design-builder shall provide sufficient material, equipment, and labor to meet the completion times in this schedule.

The design-builder shall submit supplemental progress schedules when requested by the Project Engineer or as required by any provision of the contract. These supplemental schedules shall reflect any changes in the proposed order of the work, any construction delays, or other conditions that may affect the progress of the work. The design-builder shall provide the Project Engineer with the supplemental progress schedules within ten calendar days of receiving written notice of the request.

The original and all supplemental progress schedules shall not conflict with any time and order-of-work requirement in the contract.

If the Engineer deems that the original or any necessary supplemental progress schedule does not provide the information required in this section, the Department may withhold progress payments until a schedule containing the required information has been submitted by the design-builder and approved by the Engineer.

Section 8.6 – Determination and Extension of Contract Time

Revise the section to read as follows:

The time allowed for the completion of the work included in the contract will be stated in the proposal form and contract, and will be known as the "Contract Time". The Contractor shall complete all physical contract work in the number of days or by the date stated in the contract provisions or as extended by the Engineer.

If for reasons beyond the Contractor's control the work cannot be completed within the contract time as specified, the Contractor may make a written request for an extension of contract time. The written request shall be made at any time prior to the expiration of the contract time as extended. Extensions of contract time will only be given for extraordinary circumstances that substantially impact the critical items of work and will not be allowed on a monetary basis for overruns or added work. Time extensions will only be made when the Contractor can document a delay to the critical path and justify a time extension request due to changes made by the Department. The Contractor's time extension request shall set forth the reasons that will justify an extension of time. The Time Extension Committee will review the written request for determination of contract time extension.

The Time Extension Committee will consist of the Department Secretary, Director of Engineering & Planning, Director of Fiscal and Public Assistance, and the State Highway Engineer. If after review/decision by the Time Extension Committee, the Contractor does not believe that the correct procedures were followed, a request for a hearing by the Transportation Commission may be made by the Contractor. However, the Transportation Commission will only determine whether or not the correct procedures were followed and it may ask the Time Extension Committee to review it's decision in light of procedural omissions noted.

The Contractor shall immediately notify the Engineer in writing when it becomes evident that there will be a delay in obtaining critical materials. Delays due to slow delivery of materials from the supplier or fabricator, material delayed for reasons of late ordering, financial considerations or other causes which could have been foreseen and prevented will be considered as within the Contractor's control. However, delays in delivery of materials to the Contractor due to some unusual market condition caused by an industry wide strike, national disaster, area-wide shortage, or other reason beyond the control of the Contractor, Subcontractor or Supplier, will be considered a basis for granting additional time. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time.

If the Time Extension Committee finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, they may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion. If the information submitted justifies additional time a Construction Change Order increasing the contract time will be prepared.

When final acceptance has been duly made as prescribed in Section 5.16, the daily time charge will cease.

Appendix I
Best Value Proposal Requirements, Draft

This appendix proposes the information that selected design-builders must include in the best value proposals for the project and is adapted from requirements developed by state DOTs and other sources[1]. Each best value proposal will include two separate elements: a qualitative proposal and a price proposal. Prior to preparation of proposals, the Department will arrange and conduct a pre-proposal meeting and a formal site visit for all short-listed design-builders. The meeting's purpose is to ensure each design-builder's understanding of the project and to review field conditions, identifying any improvements, corrective measures, or other changes that should be incorporated in the design, but that had not existed or may have been overlooked in developing the project description and scope of work. At least three (3) days before the pre-proposal meeting, proposers shall submit to the submittal address, two (2) copies of questions and issues, which they want, discussed at the pre-proposal meeting.

Qualitative Proposal Requirements

General

Each short-listed design-builder that wishes to be considered for work on the project shall submit a Qualitative Proposal. The proposal shall include sufficient information to enable the Department to evaluate the capability of the design-builder to provide the desired services. The design shall be sufficiently defined by drawings, narrative, and outline specification to enable the Department to evaluate the level of quality of the proposed design and construction based on the Scope of Work requirements. Discussions of past performance on other projects shall be minimized except as they relate to the proposed work.

Qualitative Proposals will be evaluated as outlined in Appendix D, Design-Builder Selection Process. An example of a Qualitative Proposal Evaluation Form, which might be used to rank the individual Qualitative Proposals, is included at the end of this appendix. Information to be provided in the Qualitative Proposal is outlined herein.

Responsible Office

Each short listed design-builder shall describe the legal business structure of the organization, which is proposed for the project, and whether the design-builder is a single entity, a joint venture or an association comprised of two or more firms. If an association, state which team member is legally responsible for the work.

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[1] Sources: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual, South Dakota Department of Transportation; the August 2000 Draft Guidebook for Design Build Highway Project Development, Washington State Department of Transportation, by CH2MHILL; and the April 19, 2001 paper and presentation, Engineering the Procurement Phase to Achieve Best Value by Molenaar, K. R. and Johnson, D., E., at the National Design-Build Conference for Transportation.

Staffing Plan

The design-builder shall submit a staffing plan which clearly illustrates the key elements of the organizational structure proposed to accomplish the management, design, technical, construction, administrative, and inspection services required. Key personnel within each area of required services shall be identified and past experience of each, as it relates to this project, shall be presented in resume format. Resumes for key personnel shall list all current project assignments (and the current status of these assignments, including dates of termination), and the percentage of each individual's time that is being committed to this project during the scheduled design and construction phases.

Previous Experience

The design-builder shall provide examples of, and references for, past projects that illustrate design and/or construction experience, using only examples that have relevance to this project. Areas to emphasize include design and construction of highway transportation construction projects, Design-Build experience of key personnel and whether construction personnel and Design Professionals have worked together on previous Design-Build efforts. Cite specific examples.

Project Approach

The design-builder shall provide information regarding the following:

Quality Control - explain the quality control policies and procedures used in both the design segment and construction segment to assure complete and accurate drawings and quality construction.

Safety Plan - Include a brief outline of design-builder's safety program for construction, including the name of person responsible for job safety.

On-Site Storage Requirements - the design-builder should describe all storage requirements, including requirements for subcontractors.

Schedule of Events

A summary Critical Path Method schedule of anticipated major milestones and their associated phasing with other activities shall be provided in the Qualitative Proposal. Provide schedule logic, show Critical Path, and show "float" for all activities not on the Critical Path.

At a minimum, this schedule must include the following items:

- Anticipated Award Date
- Schedule of Design Activities
- Anticipated Design Reviews by the Department
- Target Dates For Information Required of the Department
- Geotechnical Investigations
- Permitting (list each permit separately)
- Start of Construction
- Major Construction Activities/Milestones (including Hold and Witness points)
- Final acceptance Date for All Work*

*This date shall become the calendar date for completion of the Contract, modified only by approved Change Orders for extensions of time.

The design-builder shall provide examples of, and references for, several recent projects that demonstrate adherence to the project schedule. If the design-builder is an association or joint venture comprised of a contractor and design consultants, the information shall be provided for both entities.

Clarifications and Exclusions

Clarifications and exclusions, if any, must be clearly identified in a separate section of the Qualitative Proposal, so that they can be reflected in the evaluation and scoring of Qualitative Proposals.

Other Appropriate Data

Other data demonstrating the ability of the design-builder to provide the desired services may be included in the Qualitative Proposal.

Required Drawings/Documentation

Each short listed design-builder shall present sufficient drawings and other documentation to ensure complete comprehension of the design solution, including, but not limited to, the following:

1. Site Plan per Department requirements
    a. Clearly depict all new and existing site features, including existing features to be removed.
    b. Clearly depict traffic control plans and sequence of operations.
    d. Show site utilities, storm drainage elements and grading details.
2. Elevations per Department requirements
    a. Submit elevations of all sides of the project, showing all materials.
3. Written Narrative: Provide a narrative confirming compliance with Scope of Work or such other basis of design for engineering, and construction concepts, and the structural systems to be used as deemed appropriate by the design-builder.
4. Code Provisions: The Qualitative Proposal shall include as a minimum, the following Code Data relative to the applicant's proposed design:
5. Specifications: Provide a description of deviations, if any, proposed for each specification section furnished in the Scope of Work.

Submittal Requirements

XX copies of the Qualitative Proposal shall be submitted in bound volume on standard 8.5" x 11" paper. Charts and exhibits may be larger, but must be folded to the standard size. Design drawings shall be on 11" x 17" paper and bound in a separate section of the Qualitative Proposal. For legibility, lettering size shall be such as to be not less than 1/16" on the drawings. Proposals will not be returned to applicants.

Deliver the Qualitative Proposals to the address by XX: XX p.m., local time, on enter date for receipt of bids.

Price Proposal Requirements

Price proposals for Design-Build projects will be lump sum bids, submitted separately from Qualitative Proposals, and kept separate and evaluated separately. Details for price proposals will be project specific.

Proposal Documents

Included in this section are Qualitative and Price Proposal documents that must be completed by the Design/Build applicant. The DBE utilization requirements are addressed in the Special Provisions section of this Scope of Work. Copies of the following blank documents are included:

1. Bid Inserts
2. Proposal Signatures
3. Bid or Proposal Bond
4. Contractor's Non-Collusion Affidavit
5. DBE Assurance and Intended DBE Participation Form
6. Design/Build Contract Form
7. Design/Build Performance and Payment Bond
8. Subcontractor List

The design-builder shall deliver their proposal at the time and place to be determined by the Department. The proposal shall consist of two parts; part one shall be the qualitative proposal; part two shall be the price proposal. Part one shall be delivered in the format previously described. Part two shall be placed in a sealed envelope separate from part one and delivered simultaneously.

The Qualitative Proposal Evaluation Form included on the next several pages is a sample for discussion purposes only. It is an example of what might be used by the Qualitative Evaluation Board to score the qualitative quality of the individual design-builder's Qualitative Proposals.

Example Qualitative Proposal Evaluation Form

Design-Builder

Project Title:

Evaluated by: **Date:** _____

A. Technical Solutions (30 points total)

____ A.1 Site Work (12 points)

- Design shall be based on all information and systems presented in the Scope of Work
- List codes, standards and permits requiring design compliance
- Proposed changes, if any, to data
- Supporting comments

____ A.2 Landscape Provisions (6 points)

- Design shall be based on information and systems presented in the Scope of Work.
- Proposed changes, if any, to data
- Supporting comments

____ A.3 Structural System (12 points)

- Design shall be based on information and systems presented in the Scope of Work.
- List codes and standards requiring design compliance
- Proposed changes, if any, to data
- Supporting comments

_____ Total Technical Solutions

B. Management and Organizational Qualifications (45 points total)

____ B.1 Design Consultants Experience (5 points)

- List of relevant design projects
- Relevant experience of key personnel from each discipline
- Available areas of unique expertise required for this project
- Experience with conditions and codes in project area
- Supporting comments

____ B.2 Contractor's Construction Experience (5 points)

- List of relevant construction projects
- Relevant experience of key personnel from each discipline
- Available areas of unique expertise required for this project
- Experience with conditions and codes in project area
- Supporting comments

____ B.3 Design-Builder's Design/Build Experience (6 points)

- List of relevant design/build projects by Designer
- List of relevant design/build projects by Builder
- List of relevant design/build projects by this design-builder

- References given for such relevant design/build projects
- Supporting comments

____ B.4 Design-Builder's Organization and Key Personnel (8 points)

- Design-Builder's business structure
- Design-Builder's financial strength
- Design-Builder's organization chart
- Relevant experience of key personnel and resumes
- Time commitment of key personnel to this project
- DBE participation program
- Supporting comments

____ B.5 Design-Builder's Management Programs (10 points)

- Cost Control/Value Engineering plan
- Scheduling experience and history on similar projects
- Site safety and fire prevention plan
- Air and noise pollution prevention plan
- Drug and alcohol abuse policy and history
- Supporting comments

____ B.6 Design-Builder's Quality Assurance Program (8 points)

- Quality Control/Quality Assurance plan for design activities
- Quality Control/Quality Assurance plan for construction activities
- Relevant experience of key QC/QA personnel and resumes
- Supporting comments

_____ Total Management And Organizational Qualifications

C. Workplan/Schedule (25 points total)

____ C.1 Design Consultants Design Schedule (5 points)

- Ability to meet schedule (resources, manpower)
- Demonstrated schedule adherence on similar projects
- Time commitment of key personnel
- Supporting comments

____ C.2 Contractor's Construction Schedule (8 points)

- Ability to meet schedule (resources, manpower, equipment)
- Demonstrated schedule adherence on similar projects
- Time commitment of key personnel
- Coordination of design and construction activities
- Identification of long lead time items
- Scheduled allowance for permitting activities
- Supporting comments

____ C.3 Design-Builder's Total Schedule (12 points)

- Schedule shall reflect all investigations, surveys, design, permitting, preparation of construction documents, reviews, construction, inspections, testing, preparation of record and other documents, and all other required activities from Notice To Proceed to Final acceptance.

- Scheduled allowance - 2 points will be awarded for each 30-day period less than the maximum allowable construction phase schedule of XXX calendar days
- Supporting comments

_____ Total Workplan/Schedule

_____ Total Qualitative Evaluation Score

Appendix J
Evaluation Team Function and Responsibilities, Draft

This appendix[1] incorporates a generic evaluation team description and structure used by the Washington and South Dakota Department of transportations, and the intended use is for two-step design-build (D-B) procurement process. In the two-step D-B process, three products will be submitted that require evaluation, the Statement of Qualifications (SOQ), the Qualitative Proposal, and the Price Proposal. Different team members participate at different times and to different degrees, but the key participants are involved in all decisions. Until technical component and price component scores are combined, no single person should see both components. The Department should exercise the utmost security to avoid the possibility of prejudice based on price or technical ability. Continuity through the selection phase is essential to efficiently and fairly select a best value proposal.

Evaluation Team Composition

The composition and expertise of the Evaluation Team must be specifically tailored to fit the evaluation criteria in the RFQ and RFP. The SOQ and the BVPs will be formulated according to the selection and evaluation criteria. If a component of the project has no evaluation criteria associated with it, the evaluation is for contract compliance only. The team organization is intended to be generic, with inherent flexibility to be reduced or expanded according to specific project needs. The organization of the Evaluation Team must start at the top. Each layer determines the need for successive lower layers. The responsibilities for the correct formulation of the team could pass to each successive layer as members realize a need for support. Alternatively, the Selection Official could be responsible for the formulation of the entire team. The breadth and depth of the appropriate team is based on the individual capabilities of each layer's constituents.

Key Elements

Staffing

The Evaluation Team will likely consist primarily of Department staff. Participation in the evaluation process by representatives of the contracting and consulting industries is recommended. Participants from other agencies (FHWA, local agencies) may be appropriate and beneficial and should be considered on a project specific basis.

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[1] Sources: Adapted from the July 1999 Working Draft of the Design-Build Process for Highway Projects Manual, South Dakota Department of Transportation; the August 2000 Draft Guidebook for Design Build Highway Project Development, Washington State Department of Transportation, by CH2MHILL; and other sources.

Preparation and Training

It is recommended that each person assigned a role in the evaluation process be required to attend a training session. The training is to educate participants on their roles and responsibilities as evaluators. The guidelines developed by the Selection Official will be presented and discussed so that the interpretation of the criteria is clear and consistent among all evaluators.

Confidentiality and Security

Critical to the validity of the evaluation and selection process is the absolute necessity for confidentiality. Each participant in the evaluation process should sign a "Confidentiality and Non-Disclosure Agreement, No Conflict of Interest Statement." All proposal documents should be stored in a secured space during non-working hours, and reviewed in a common, secured area during the day. All evaluation notes and comments should be stored in the same manner.

Oral Presentations

After BVPs are submitted, each design-builder is allowed to make an oral presentation to all of the participants in the evaluation process, with the exception of the Price Evaluation Team, if a Price Evaluation Team is being used. The presentations afford the design-builders the opportunity to highlight the significant aspects of their qualitative proposals and their understanding of the RFP requirements. Oral presentations provide the evaluators an overall perspective of the project and set the tone for each proposal prior to review of specific details.

Application of D-B Evaluation Guidelines

Following is a description of the evaluation team constituents and a recommendation for their participation. The organization chart should be compared to the proposal criteria to determine coverage for the areas to be evaluated. The specific project components should be used to determine what sub-factors of the technical solutions factor apply to the project.

Selection Official

The Selection Official (SO) should have authority over both project development and construction where the proposed project is located. The role of the SO is to oversee formulation of the team, shepherd the proposals through the process, officiate over evaluation team disputes, and make the final determination of the selection. The decisions are based on the recommendations of the Proposal Evaluation Board (PEB).

The PEB should be comprised of mid-level District management and an outside mid-ranking official. The responsibilities of the PEB include formulating the recommended constituents of the Qualitative Evaluation Board (QEB) and Price Evaluation Team (if necessary). Their recommendations are approved by the SO. The PEB should also oversee the subsequent recommendations of the QEB for Major Factor Evaluation Team members.

During the evaluation, the PEB should review the recommendation of the QEB. They will have the authority to concur with the recommendation or challenge it. Upon establishing the final order of the design-builder's proposals based on the technical component scores, the PEB would receive the evaluation of the price component from the PET.

The PEB is responsible for combining the technical scores with the prices to generate the final BVP score. The determination of the highest scored design-builder is passed to the Selection Official with a recommendation to select.

Qualitative Evaluation Board

The QEB is formed by the PEB through concurrence and approval of the SO. The QEB role is to assess (and challenge, if deemed appropriate) the ratings of each of the technical advisor teams and recommend an accumulated score for each BVP to the PEB. Multiple scores from multiple reviewers of the same criteria will be consolidated into an average or accumulated score based on pre-determined criteria. The accumulated scores are used to rank the D-B Team's technical scores in descending order.

The membership of the QEB should consist of

- Project Engineer, or other as appropriate
- Operations Engineer, or other as appropriate
- Representative(s) from HQ DOT design-build team, or other(s) as appropriate
- A representative from each of the four Major Evaluation Factor Teams (below)
- Technical experts as deemed necessary for the project

Major Evaluation Factor Teams

The Major Evaluation Factor Teams are formulated in support of the QEB and are responsible for the technical evaluation of each proposal's components. The assignments of the teams are made from the QEB and ratified by the PEB. The teams solicit technical expert input from the subgroup technical advisors of their own discretion to support their assessment of the assigned project component. Proposals are dissected into each of their major factors, and the team members evaluate only that component of each proposal within their expertise. The individual component scores are accumulated and processed by the QEB. The anticipated organization of the three teams consists of:

- Management and Organizational Qualifications, with expertise consisting of:
  - Construction administration
  - Project design consultant liaison or administration
  - Contract administration
  - Representative from transportation contracting industry
  - Representative from transportation consulting industry
- Work Plan/Schedule, with expertise consisting of:
  - Construction administration
  - Project development (design)
  - CPM experience
  - Representative from transportation contracting industry
  - Representative from transportation consulting industry
- Technical Solutions, with expertise consisting of:
  - Construction administration
  - Project development (design)

Technical Expertise Advisors or Teams

Subgroup areas anticipated for specific projects consist of one or more individuals with expertise in the individual areas delineated in the proposal. The role of these advisors or teams will be to provide expert technical advice on specific areas of the proposal, as requested by the Technical Solutions Team. The recommended team size would be not less than two individuals for each subfactor, one representing design and the other construction.