GEORGIA DOT RESEARCH PROJECT RP10-23

FINAL REPORT

RECOMMENDED GUIDE FOR NEXT GENERATION OF TRANSPORTATION DESIGN BUILD PROCUREMENT AND CONTRACTING IN THE STATE OF GEORGIA

Georgia Department of Transportation

GDOT Research Project No. RP10-23

Final Report

RECOMMENDED GUIDE FOR NEXT GENERATION OF TRANSPORTATION DESIGN BUILD PROCUREMENT AND CONTRACTING IN THE STATE OF GEORGIA

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16. Abstract:
The overall objective of this research project is to develop a systematic approach that evaluates the appropriateness of Design Build Project Delivery System for a transportation project. State DOTs can benefit from this systematic assessment approach and better implement the Design Build Project Delivery System in highway construction programs by selecting the projects that are the most appropriate candidates for Design Build. The authors initially analyzed and documented state of practice of Design Build across State DOTs in the United States. Several structured interviews with representatives from three State DOTs (CDOT, VDOT, and FDOT) were also conducted to further enhance understanding about the state of practice in using Design Build Project Delivery System in these DOTs. The detailed interviews of these three State DOTs helped the research team understand that a systematic, transparent, and consistent approach towards the application of Design Build Project Delivery System is critical in the success of Design Build programs in State DOTs. The most pertinent findings of this research are:

1. A systematic approach that evaluates the appropriateness of Design Build Project Delivery System for a transportation project;
2. A systematic high-level risk allocation for Design Build projects;
3. A systematic approach that evaluates the appropriateness of procurement methods for a Design Build project; and
4. A Design Build Guidebook that describes the process of evaluating the appropriateness of Design Build Project Delivery System, initial risk allocation in Design Build contracts, and assessment and selection of procurement methods for Design Build projects.

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACC	Alternative Configuration Concepts
AN	Advance Notification
ARE	Additional Requested Elements
ASD	Administrative Service Division
ASDB	Adjusted Score Design Build Bid Process
ATC	Alternative Technical Concepts
BAFO	Best and Final Offer
CDOT	Colorado Department of Transportation
CEI	Certified Environmental Inspector
CEQ	Council on Environmental Quality
CM at Risk	Construction Manager-at-Risk
CM/GC	Construction Manager/General Contractor
CMG	Contracts Management Group
DBIA	Design Build Institute of America
DDE	District Design Engineer
DOT	Department of Transportation
EC	Evaluation Committee
EDC	Every Day Counts
FASTER	Funding Advancement for Surface Transportation and Economic Recovery
FCO	Fixed Capital Outlay
FDOT	Florida Department of Transportation
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact

FS	Florida Statutes
GDOT	Georgia Department of Transportation
IFB	Invitation for Bids
ITP	Instructions to Proposers
ITS	Intelligent Transportation System
LBDB	Low Bid Design Build
LOI	Letters of Interest
LOS	Level of Service
MOT	Maintenance of Traffic
NEPA	National Environmental Policy Act
NMSA	Non-Major State Action
PM-IPD	Project Manager – Innovative Project Delivery
PD&E	Project Development and Environment
PDP	Plan Development Process
PEB	Proposal Evaluation Board
PET	Price Evaluation Team
PM-IPD	Project Manager - Innovative Project Delivery Division
PSURA	Project Specific Utility Relocation Agreement
QA	Quality Assurance
QC	Quality Control
RFP	Request for Proposals
RFQ	Request for Qualifications
ROW	Right of Way
SAFETEALU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SEIR	State Environmental Impact Report

SEP	Special Experimental Project
SO	Selection Official
SOQ	Statement of Qualifications
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TCT	Technical Composite Team
TEA	Transportation Equity Act
TET	Technical Evaluation Teams
TIFIA	Transportation Infrastructure Finance and Innovation Act
TRC	Technical Review Committee
UA/O	Utility Agency/Owner
VDOT	Virginia Department of Transportation
VE	Value Engineering

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CHAPTER 1 EXECUTIVE SUMMARY

STUDY PURPOSE

The demand for continued transportation infrastructure investments places increased pressure on State Departments of Transportation (DOTs) to expedite the delivery of projects and programs. In addition to reducing delivery schedule, State DOTs must also maintain high quality while minimizing cost of delivering projects. Innovative techniques, such as Design Build Project Delivery System have been shown to offer the potential to help State DOTs better serve these needs by accelerating critical phases of projects and delivering transportation projects more cost-effectively. Design Build Project Delivery System facilitates collaborative efforts among State DOTs, designers and contractors, as well as other project stakeholders. Design Build Project Delivery System integrates various resources involved in the development of a transportation project. By doing so, it creates the opportunity for a more expedited and cost-effective project delivery compared to traditional Design Bid Build Project Delivery System that contractually insulates the project participants while leaving the State DOT with most of the project risks.

It is noted that Design Build Project Delivery System is not appropriate for every transportation project. In certain cases, the traditional Design Bid Build can still be the most appropriate Project Delivery System that can meet the State DOT’s specific cost, time, and quality goals for a transportation project. Therefore, in order to enhance its efficiency to deliver transportation projects, State DOTs should select Design Build for a project only if it is expected to produce the best outcome for the project (e.g., reduce project delivery schedule, facilitate innovation, reduce project delivery cost, etc.).

Several factors can affect the outcome of a project including the unique characteristics of each project, project risks, and the owner’s organizational capabilities. The interactions among these factors complicate the process of evaluating the suitability of Design Build Project Delivery System for a project. State DOTs need a systematic and transparent approach that considers these factors and evaluates the appropriateness of Design Build Project Delivery System for the project. This evaluation process should determine whether the identified project risks could be effectively managed if the Design Build Project Delivery System was selected for the project. The evaluation process should also help State DOTs identify the suitable procurement method for choosing the most qualified Design Build Team for the proposed Design Build project. This research project is aimed at fulfilling the need for a systematic approach to assess the suitability of Design Build for a transportation project.

BRIEF STATEMENT OF PRIMARY FINDINGS

1. STATE OF PRACTICE OF DESIGN BUILD ACROSS STATE DOTS IN THE UNITED STATES

A comprehensive review of academic and professional literature was conducted, in order to analyze and document the emerging trends in using Design Build Project Delivery System. A scanning process was conducted on State DOT websites regarding documented state of practice related to Design Build Project Delivery System. The results of scanning process indicate that the use of Design Build Project Delivery System is mostly driven by the State DOTs' need to achieve aggressive delivery schedules for their projects. Encouraging innovation, reducing cost, enhancing quality, maximizing the use of available funds, and managing project complexity are other key factors driving the use of Design Build Project Delivery System by State DOTs. This scanning process led to the conclusion that, although State DOTs have uniform understanding of Design Build Project Delivery System and its strengths and weaknesses, the implementation of Design Build is varied. There are a few States DOTs, such as Florida, Virginia, and Colorado that have utilized Design Build in several projects of various sizes and types, while others have experimented with just a few Design Build projects. It was found out that State DOTs, which are the most progressive in utilizing Design Build Project Delivery System, are constantly developing new procedures that support and promote the use of Design Build. This is an important deviation from the common practice of modifying existing Design Bid Build processes and contracts, which are not inherently appropriate for delivering projects using Design Build Project Delivery Systems.

2. State of Practice of Design Build in Florida, Virginia, Colorado Departments of Transportation

Following the nation-wide scanning process, several structured interviews were conducted with representatives from three State DOTs, CDOT, VDOT, and FDOT, to further enhance understanding about the state of practice in using Design Build Project Delivery System in these DOTs. The interviewed State DOTs acknowledged that using Design Build has consistently helped them shorten the project schedule, achieve cost certainty in the early stages of the project, and facilitate the use of innovative design and construction methods and techniques.

State DOTs participating in this review recognized that Design Build Project Delivery System is not appropriate for every transportation project. They emphasized on the great value of a systematic and transparent approach that can help them determine whether Design Build is the appropriate Project Delivery System for a proposed project. All three State DOTs expressed the great need for a formal and comprehensive risk analysis tool that helps them develop an optimized risk management plan. They also underlined the need for an evaluation procedure that helps them identify the suitable procurement method for choosing the most qualified Design Build Team for a proposed Design Build project.

3. A Systematic Approach that Evaluates the Appropriateness of Design Build Project Delivery System for a Transportation Project

A systematic approach was developed as one of the major deliverables of this research project. The proposed approach helps State DOTs identify their strategic objectives and decide whether the use of Design Build Project Delivery System is aligned with the Department's strategic objectives. The Department can use the proposed approach as a basis for identifying and articulating the project-specific goals. Using the proposed approach, the Department can also identify any deal-breaker issues that may hinder the implementation of Design Build. The Department can then use a formal SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis framework to determine the suitability of Design Build Project Delivery System for a transportation project. Several issues are considered in the SWOT analysis including project delivery schedule, innovation, level of design, project delivery cost, quality, staff experience, and marketplace conditions, competition, and Design Build Team experience.

4. A SYSTEMATIC HIGH-LEVEL RISK ALLOCATION FOR DESIGN BUILD PROJECTS

The proposed approach also provides a template for the high-level risk assessment that can be used as a guide to identify project risks as well as the opportunities to mitigate them. This can help the Department determine whether the project risks can be effectively managed if the Design Build Project Delivery System is selected for the project.

5. A SYSTEMATIC APPROACH THAT EVALUATES THE APPROPRIATENESS OF PROCUREMENT METHODS FOR A DESIGN BUILD PROJECT

In case, the previous steps indicate that Design Build is a proper Project Delivery System for the project, the Department can use the proposed approach to make two critical decisions regarding the procurement method: (1) What should be the basis for proposal evaluation; and (2) Whether the procurement should be one-phase (RFP only) or two-phase (RFQ and RFP).

APPLICATION AND IMPLEMENTATION

The systematic approach developed in this research can help State DOTs in transparent and consistent implementation of Design Build Project Delivery System. Proper selection of projects for Design Build Project Delivery System, development of appropriate risk allocation matrices, and a selection approach for suitable procurement methods are important subjects that facilitate the growth of Design Build programs in State DOTs with younger history of Design Build. State DOTs with mature Design Build programs can consider the utilization of the proposed systematic approach as part of their ongoing efforts to streamline and optimize their Design Build practices.

The Georgia Department of Transportation (GDOT) has already started utilizing this tool in the assessment of candidate Design Build projects.

The entire SWOT analysis is automated in a Java Applet tool that is specifically developed for GDOT. This tool is currently used in the Office of Innovative Program Delivery for the assessment of Design Build Project Delivery System for GDOT transportation projects. A Java Applet tool is developed to facilitate this process of initial risk assessment and risk allocation. The project evaluator can use this Java tool to determine the level of each risk and decide the risk will be allocated to which party. Color-coded risks are used as a visual tool to enhance the process of initial risk assessment for Design Build projects. Comments boxes are used to identify whether each risk factor can be managed using Design Build Project Delivery System. Risk allocation matrices will be the basis to outline proper clauses for Design Build contracts.

CHAPTER 2 INTRODUCTION

State Departments of Transportation (DOTs) across the nation are seeking innovative strategies that can help them lower the costs and time required to design and construct transportation projects while maintaining or improving project quality. Innovative Project Delivery Systems are among the commonly-used strategies for achieving this objective. The term “Project Delivery System” refers to all the contractual relations, roles, and responsibilities of the entities involved in a project. It defines the process by which a construction project is comprehensively designed and constructed. Sanvido and Konchar (1997) define three fundamental Project Delivery Systems: Design Bid Build, Design Build, and Construction Manager/General Contractor (CM/GC) or Construction Manager at Risk (CM at Risk). Specific to each Project Delivery System are the activities related to the project scope definition, organization of designers, constructors and various consultants, sequencing of design and construction operations, execution of design and construction, and closeout and start-up (Touran et al. 2011).

DESIGN BUILD PROJECT DELIVERY SYSTEM

Design Build is a relatively new Project Delivery System that is growingly applied or considered by State DOTs (FHWA Current Design-Build Practices for Transportation Projects 2009). Design Build is a Project Delivery System under which one entity, which is known as the Design Build Team, is contractually responsible for both design and construction phases of the project (Beard et al. 2001; Songer and Molenaar 1997).

Design Build contracts can have many different forms. The Design Build Team may be formed by a single firm, a consortium, or a joint venture. Nevertheless, the fundamental element of Design Build Delivery System remains that one entity assumes primary responsibility for design and construction of the project under one contract. This can streamline coordination between the design and construction teams. It can reduce owners' administrative burdens by eliminating the need to coordinate or arbitrate between separate design and construction entities.

With the primary designer and the contractor working as a team, scheduling considerations can be addressed up front, often leading to more efficient project implementation. The Design Build Team has the ability to compress the project delivery schedule by creating an overlap between design and construction activities or starting the construction process before the design is finalized. This is a major advantage of Design Build compared with the traditional Design Bid Build Project Delivery System where design and construction phases must be undertaken in sequence. Two studies involving over 600 Design Build projects in the private sector showed a 30% increase in project delivery speed and 6% reduction in unit cost compared to Design Bid Build projects (Gransberg and Barton 2007). This time-saving advantage makes Design Build Project Delivery System the prime candidate for projects where fast track implementation is a priority (Touran et al. 2011).

Design Build can also promote the use of new methods, techniques and technologies in order to overcome project complexities, expedite the project delivery, reduce project costs, and/or enhance quality (Songer and Molenaar 1996). The collaboration and coordination between the designer and the contractor helps the Design Build Team identify and optimize innovative designs and construction methods or techniques. The innovative design and construction methods, techniques, or technologies can be included in Design Build Teams' proposals in order to gain a competitive advantage in the selection process, or as part of the project implementation phase in order to expedite the project delivery, reduce implementation costs, or enhance quality. Design Build contracts are commonly on a fixed-price basis. This provides owners with cost certainty at a relatively early stage of project planning. This is particularly beneficial for projects facing budget limitations and can be a key factor in obtaining project financing.

HISTORY OF DESIGN BUILD PROJECT DELIVERY SYSTEM FOR STATE DOT PROJECTS

Since the late 20th century, the use of Design Build Project Delivery System has been expanded rapidly in the private sector for vertical buildings (FHWA Current Design-Build Practices for Transportation Projects 2009). Interest in Design Build has spread at a modest pace in the public sector for primarily vertical projects (Molenaar et al. 2010a; Gransberg and Barton 2007). The public agencies' top motivations for pursuing Design Build Project Delivery System are the possibility to reduce project delivery schedule and improve the cycle-time performance of projects (Gibson et al. 2007).

Design Build Project Delivery System is relatively new to many State DOTs. In 1990, the FHWA established the Special Experimental Project Number 14 (SEP-14) – Innovative Contracting. This act allowed State DOTs to test and evaluate a variety of approved Innovative Project Delivery Systems. Between 1990 and 2002, under SEP-14, about 300 projects representing $14 billion were proposed for Design Build Project Delivery System by transportation agencies in 32 States, the District of Columbia, and the Virgin Islands. In 1998, the Transportation Equity Act for the 21st Century (TEA-21) became the new authorization legislation for the nation's surface transportation programs. Included in TEA-21 was Section 1307 (c), which required FHWA to develop and issue regulations describing the Agency's approval criteria and procedures. The Design Build Contracting: Final Rule was published in the Federal Register on December 10, 2002 and became effective on January 9, 2003.

Design Build has proven to be a successful Project Delivery System for implementing transportation projects. The FHWA's 2006 Report to Congress, titled: "Design Build Effectiveness Study" concluded that Design Build can reduce the project delivery duration (by as much as 14%) and may produce project savings while maintaining the same level of quality as the traditional Design Bid Build Project Delivery System. Nevertheless, several State DOTs were still facing regulatory barriers to the adoption of Design Build Project Delivery System (FHWA 2006a).

In 2007, Section 1503 of the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEALU) included revised regulations that allow contracting agencies to issue Design Build Request for Proposal (RFP) documents, award contracts, and issue notices-to-proceed for preliminary design work prior to the conclusion of the National Environmental Policy Act (NEPA) process. This along with similar regulatory changes at the State level, were aimed at increasing State DOTs' flexibility to utilize Design Build Project Delivery System for their transportation projects.

STATUTORY ENVIRONMENT FOR DESIGN BUILD PROJECT DELIVERY SYSTEM

The Design Build Institute of America (DBIA) tracks States that have adopted Design Build legislation. As Figure 2.1 illustrates, there is growing trend in the adoption of Design Build legislation for transportation projects across the United States. Most recently, State legislators in New York and Connecticut granted their respective State DOTs the legislative approval to use Design Build Project Delivery System for transportation infrastructure projects. According to the DBIA, the increase in authorizing legislation over the past few years was due to the release of federal stimulus funds for transportation projects and the need to construct these projects in a timely manner. As of 2012, there are only three State DOTs (Oklahoma, Nebraska, and Iowa) that have not received legislative approval to use Design Build Project Delivery System for transportation projects.

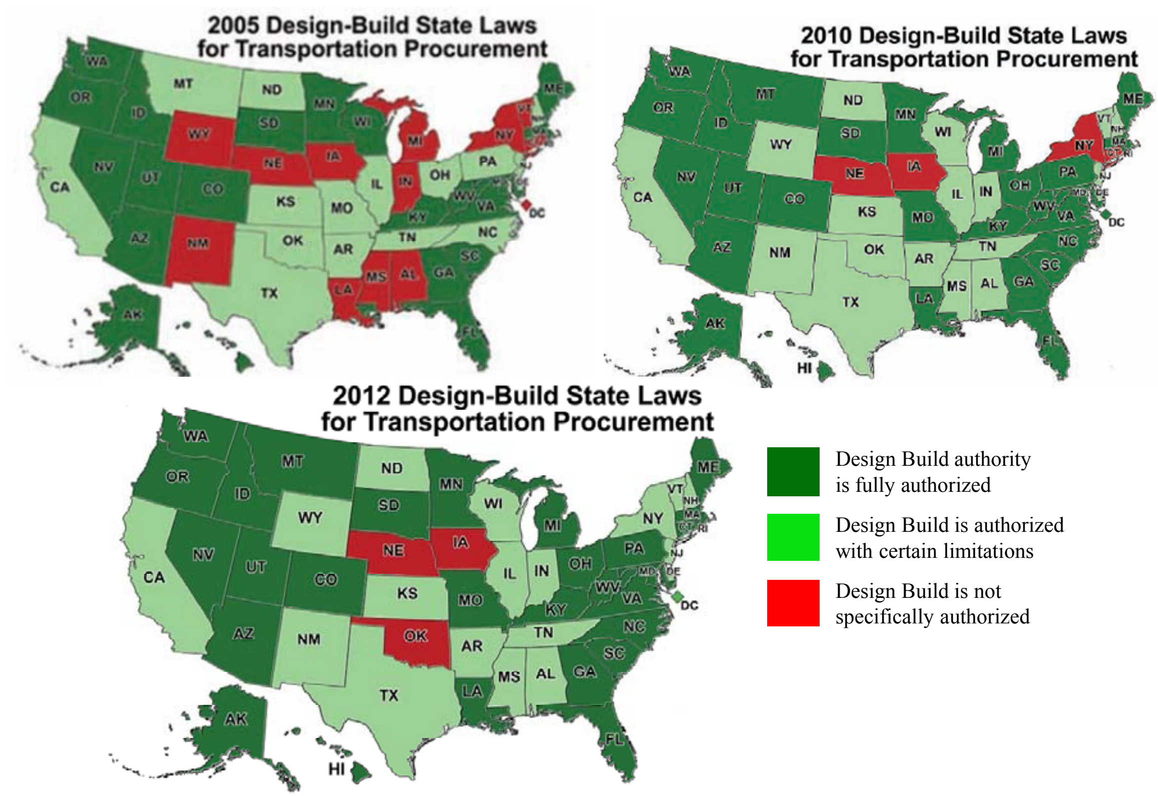


FIGURE 2.1

Design Build State Laws for Transportation Project in 2005, 2010 and 2012 (Copyright of DBIA 2005, 2010, and 2012)

Although Design Bid Build is still the prevalent Project Delivery System used by State DOTs, evidence of Design Build use can be found on all kinds of projects, ranging from green-field construction to pure maintenance contracts of existing roads. As shown in Figure 2.2, a 2007 survey by the American Association of State Highway and Transportation Officials (AASHTO) revealed that over 700 Design Build projects were proposed, active or completed by 39 states (AASHTO 2007).

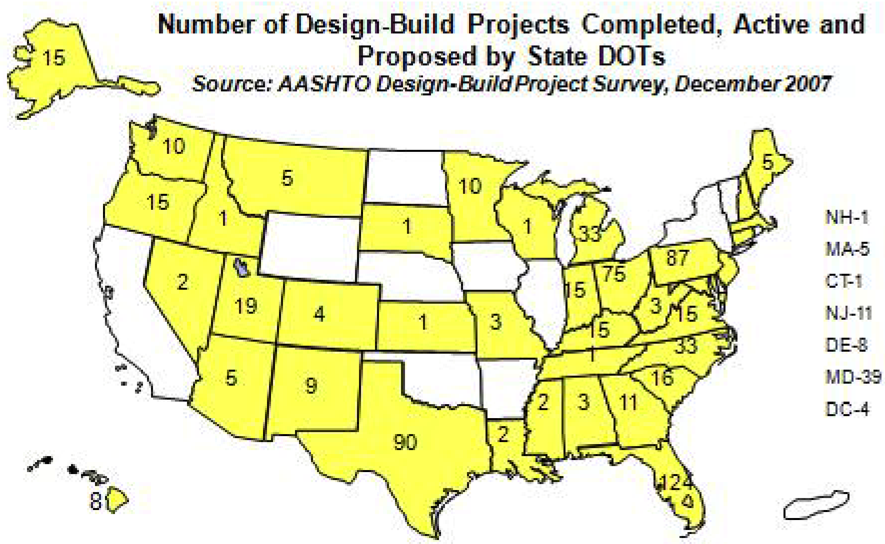


FIGURE 2.2

Number of Design Build Projects Completed, Active and Proposed by State DOTs as of 2007

(Source: Copyright of AASHTO 2007)

Even though Design Build Project Delivery System has several advantages, it is not appropriate for every transportation project (Gransberg et al. 2006). Considering the State DOT's specific cost, time, and quality goals for each project, the traditional Design Bid Build is still the most appropriate Project Delivery System for many projects. For instance, the Design Build Project Delivery System may not be appropriate for projects that do not involve much design work or are not too technically challenging (e.g., resurfacing an existing roadway) since they would derive little benefit from integrating the work of the designer and the contractor (Louisiana Department of Transportation 2009). According to the Design Build guidelines of Florida Department of Transportation (2012) and the Design Build policy and procedure of North Carolina Department of Transportation (2011), the following project types may not be appropriate candidates for Design Build Project Delivery System:

- Projects where there are a lot of third-party constraints, such as right of way and utilities;
- Projects where there are especially sensitive environmental (including both natural and human) issues;
- Projects that are too specialized to attract competition; and
- Projects that involve significant unknowns regarding utilities, subsoil conditions, right of way, etc.

The decision concerning the use of Design Build Project Delivery System for a project should be made in the early phase of the project. At the early phase of project development, it is not an easy task to determine the appropriateness of Design Build Project Delivery System due to the lack of clear information regarding the characteristics of the project. In order to increase its efficiency in delivering transportation projects, a State DOT should select Design Build for a project only if it is expected to produce the best outcome for the project (i.e., reduce the project delivery schedule, facilitate innovation, reduce project delivery cost, etc.). Several factors can affect the outcome of a project including the unique characteristics of each project, project risks, and the owner's organizational capabilities. The interactions among these factors complicate the process of evaluating the suitability of Design Build Project Delivery System for a project.

This condition gives rise to the need for a systematic approach to determine if Design Build is the appropriate Project Delivery System for a project. This systematic approach should take into account the specific project characteristics, as well as the State DOT's strategic and project-specific goals, for the evaluation of Design Build Project Delivery System. The Department needs to assess whether the identified project risks could be effectively managed if the Design Build Project Delivery System was selected for the project. This research project is designed to fulfill the need for a systematic approach for the assessment of Design Build Project Delivery System for developing transportation projects.

RESEARCH OBJECTIVE

The overall objective of this research project is to develop a systematic approach that evaluates the appropriateness of Design Build Project Delivery System for a transportation project. State DOTs can benefit from this systematic assessment approach and better implement the Design Build Project Delivery System in highway construction programs by selecting the projects that are the most appropriate candidates for Design Build. Specific research tasks are designed in order to achieve the research objective as follows:

- Conduct a comprehensive literature review regarding the Design Build Project Delivery System.
- Review the current practice of Design Build Project Delivery System in State DOTs across the nation.
- Scan Design Build programs in 3 State DOTs: Florida, Virginia, and Colorado.
- Create a systematic approach to:
    - Evaluate the appropriateness of Design Build Project Delivery System for a transportation project.
    - Develop initial risk identification, assessment, and allocation matrices for transportation Design Build projects.
    - Evaluate the appropriateness of procurement methods for transportation Design Build projects.

The findings and products of these research tasks are presented in the following chapters.

CHAPTER 3 LITERATURE REVIEW

This chapter presents the results of comprehensive literature review. There is a body of knowledge in Project Delivery Systems that can be used to identify best practices for the assessment of suitability of Design Build Project Delivery System for transportation projects. The literature review is intended to examine and document the state of practice in utilizing Design Build Project Delivery System as documented in the academic and professional literature, State DOTs' project procurement documents, and survey data. The literature review is organized in three areas:

- Benefits of Design Build Project Delivery System from the owner's (e.g., State DOT's) standpoint,
- Significant factors in the selection of Design Build Project Delivery System for a project, and
- Existing processes for the assessment of Project Delivery Systems.

The results of the literature review are summarized below.

BENEFITS OF DESIGN BUILD PROJECT DELIVERY SYSTEM FROM THE OWNER'S STANDPOINT

Several studies were conducted to determine what motivate owners to consider Design Build Project Delivery System as an Innovative Project Delivery System for developing projects. For instance, Roth (1995) compared six Design Bid Build and six Design Build Navy childcare facilities built through the MILCON process. Using this small sample, Roth found that the use of Design Build significantly reduced design and construction costs. The results also showed that cost growth was decreased for Design Build projects.

Bennett et al. (1996) studied a cross-section of building projects to evaluate the performance of Design Build projects in terms of cost, quality and time against the performance of projects developed using Design Bid Build or Construction Manager/General Contractor (CM/GC) Project Delivery System. The key findings of this study in terms of benefits of Design Build are the following:

- Shorten Duration: Holding other variables constant, the construction speed of Design Build projects was 12% faster than Design Bid Build or CM/GC projects. Likewise, for Design Build projects, overall project delivery speed – considering the design and construction phases – was 30% faster than Design Bid Build or CM/GC projects.
- Establish Schedule: It was found out that the use of Design Build Project Delivery System increased the certainty of completion time due to the early involvement of contractor in the design process.
- Reduce Cost: It was shown that Design Build projects were at least 13% cheaper compared to Design Bid Build and CM/GC projects.
- Establish Cost: When the owner's requirements were specified in details, the use of Design Build Project Delivery System brought high level of cost certainty. The analysis showed that 75% of Design Build projects were completed within 5% of budget compared to 63% of projects delivered using the other Project Delivery Systems.
- Enhance Quality: Design Build performed consistently better in meeting the quality requirements specifically for complex or innovative buildings.

Based on the literature review and survey of public owners, Songer & Molenaar (1996) identified several objectives that promote the use of the Design Build Project Delivery System:

- Establish Cost: Secure a project cost before the start of detailed design.

- Reduce Cost: Decrease the overall project cost as compared to other Project Delivery Systems (Design Bid Build, Construction Manager-at-Risk (CM at Risk), etc.).
- Establish Schedule: Secure a project schedule before the start of detailed design.
- Shorten Duration: Decrease the overall project completion time as compared to other procurement methods.
- Reduce Claims: Decrease litigation due to separate design and construction entities.
- Cope with Large Project Size/Complexity: Manage large or complex projects through one contract rather than multiple contracts.
- Enhance Constructability/Innovation: Introduce construction knowledge into design early in the process.

Sanvido and Konchar (1997), and subsequently, Konchar and Sanvido (1998), empirically compared cost, schedule, and quality performance of Design Build, Design Bid Build, CM at Risk projects, using actual construction data from 351 building projects in 37 States. This study was performed for the Construction Industry Institute (CII). Sanvido and Konchar used multiple linear regression models and identified that Design Build Project Delivery System outperformed Design Bid Build and CM at Risk on cost and schedule. The key findings of this study in terms of benefits of Design Build are the following:

- Reduce Cost: The analysis indicated that the unit cost of Design Build projects was at least 6% less than the unit price of Design Bid Build projects and 4.5% less than the unit cost of CM at risk projects.
- Establish Cost: It was found out that using Design Build Project Delivery System increased the chance of finishing the project within 5% of the original budget of the project.

- Shorten Duration: In terms of delivery speed (i.e., the rate at which the construction team built its facility – measured in sq. ft. completed per month), Design Build projects were at least 33% faster than Design Bid Build projects and 23% faster than CM at Risk projects.
- Establish Schedule: It was found out that using the Design Build project Delivery System reduced the possibility of schedule growth as compared to the total as-planned time.
- Maintain Quality: The research indicated that Design Build Project Delivery system yielded quality that was at least equal to or better than the other Project Delivery Systems.

Molenaar et al. (1999) studied 104 public-sector Design Build projects. Although they did not compare a similar sample of Design Bid Build projects within the same organization, their results provide important analysis of cost, time, and quality data for Design Build projects. They concluded that nearly 60% of Design Build projects were completed within 2% or better of the original budget (i.e., cost reduction). Also, 77% of projects were completed within 2% or better of the original schedule (i.e., schedule reduction). The case studies conducted as part of this research indicated that the majority of the Design Build projects conformed to owners' expectations.

Uhlik and Eller (1999) provided a detailed description of perceived benefits of using Design Build versus Design Bid Build Project Delivery System for constructing military medical projects. Nevertheless, they did not provide empirical data. They argued that using Design Build would decrease the time and cost of designing and building new military medical facilities.

In a study commissioned by the National Institute of Standards and Technology (NIST), Thomas et al. (2002) assessed and documented the economic impacts of adopting Design Build Project Delivery System. They used the CII Benchmarking and Metrics database, and compared the performance of Design Build and Design Bid Build projects based on the information submitted by either owners or contractors. The study identified the benefits of Design Build Project Delivery System compared to Design Bid Build Project Delivery System as the following:

- Establish Schedule: Design Build projects generally outperformed Design Bid Build projects in schedule-related metrics. Specifically, the schedule growth and the startup schedule growth of Design Build projects were significantly lower than those of Design Bid Build projects.
- Shorten Duration: Design Build projects had significantly lower average startup phase and overall durations compared to Design Bid Build projects.
- Reduce Cost: Design Build projects generally showed better performance in all cost-related metrics compared to Design Bid Build projects. For Design Build projects, the cost factor of the construction phase (i.e., the ratio of the actual cost of the construction phase to the actual total cost of the project) was significantly lower than that of Design Bid Build projects. Better performance was observed among Design Build projects when comparing cost factor of the startup phase (i.e., the ratio of the actual cost of the startup phase to the actual total cost of the project) to that of Design Bid Build projects. These findings indicate that one of the advantages of the Design Build Project Delivery System is that enhanced communications among project participants allowed for a smooth flow between different phases of the project life cycle.
- Increase Safety: Compared to Design Bid Build projects, Design Build projects had a slightly lower Recordable Incidence Rate (RIR).
- Reduce Change Orders and Reworks: Design Build projects significantly outperformed Design Bid Build projects in both change orders and reworks. It was concluded that better communication flow inherent in the Design Build Project Delivery System reduced the need for changes.
- Improve Project Management Practices: Design Build projects had better scores in pre-project planning, project change management, team building, and zero accident

techniques compared to Design Bid Build projects. Design Build projects scored slightly higher in constructability compared to Design Bid Build projects.

Allen et al. (2002) analyzed 110 U.S. Navy construction projects and found that Design Build projects performed more efficiently than Design Bid Build projects with 18% less cost growth and 60% less time growth.

Similarly, Gransberg et al. (2003) compared 54 Design Bid Build projects with 34 Design Build projects and discovered that Design Build projects had 16.4% less cost growth and 19.0% less time growth compared to similar Design Bid Build projects.

Ibbs et al. (2003) presented a quantitative comparison of Project Delivery Systems. They analyzed 67 projects (30 projects of which greater than $50 million) based on project management factors, such as change in project cost or project schedule. They concluded that Design Build projects outperformed Design Bid Build projects with respect to time.

Warne (2005) studied 21 Design Build highway projects across the country ranging in size from $83 million to $1.3 billion. The performance assessment of Design Build highway projects showed that Design Build projects had better price certainty compared to Design Bid Build projects. The majority of Design Build projects were also completed ahead of schedule.

The "Recommended AASHTO Design-Build Procurement Guide" prepared by Molenaar et al. (2005) is intended to assist state transportation agencies in the Design Build procurement process. The guide encourages the use of a "stand-alone" General Conditions for design-build contracts, which is intended to expedite the development process and promote consistency. In 2008, AASHTO used the findings of this study and published the "AASHTO Guide for Design-Build Procurement". Both Molenaar et al. (2005) and AASHTO (2008) studies described the benefits of Design Build in the areas of schedule, cost, quality, and innovation as the following:

- Shorter duration: Design-Build enables fast-tracking and overlapping of design and construction activities. Numerous studies in the highway and building sectors have documented that Design Build results in expedited delivery of projects.

- Earlier schedule certainty: Design Build enables early initiation of construction activities in the project development process. As a result, the construction completion date can be identified and fixed earlier in the development process.
- Initial cost: Accurate estimates of Design Build project costs based on the preliminary design is difficult. However, there is evidence that Design Build projects have lower initial costs and no significant cost increase.
- Early cost certainty: Design Build projects are often contracted on a lump sum basis before the final design is complete. Hence, Design Build helps agencies to have cost certainty early in the project development process.
- Less cost growth: Due to the use of lump sum contracts and transfer of the responsibility of design and construction to the Design Build Team, Design Build contracts have less cost growth.
- Equal or better quality: Since Design Build Teams are competing in a competitive environment; they have to meet certain standards and requirements. Design Build does not change the fact that designers and constructors have to meet the quality standards and performance requirements. Agencies can also evaluate Design Build Teams based on the quality requirements. Hence, Design Build projects result in equal or better quality.
- Quality in procurement: Agencies have the ability to procure Design Build projects through Best Value procurement methods to evaluate proposals based on non-price factors and assess the qualifications of bidders.
- Better constructability: Design Build requires early involvement of the contractor on the project. The contractor can provide inputs on the project design that can result in innovative solutions and improve the project constructability.

- Less impact on traveling public: Design Build projects have less impact on the traveling public because of the shorter duration and the use of innovative solutions resulting from the early contractor involvement in the design process.

In 2006, FHWA published the “Design Build Effectiveness Study” (FHWA 2006a) that was based primarily on responses received from surveys sent to Design Build programs and project managers in agencies participating in the SEP-14 program. The findings of this study, which analyzed the Design Build project performance using descriptive statistics, are the following:

- Shorten duration: Design Build projects achieved shorter total project duration and construction duration than what were originally planned. Design Build project managers estimated an average decrease of 14% in delivery time compared to Design Bid Build Project Delivery System. Actual data for the surveyed Design Build projects indicated an average drop of 1% between planned and actual total project durations. A comparison between the survey results for a subset of Design Build projects and similar Design Bid Build projects showed a 9% difference in total project duration and a 13% difference in construction phase duration between the two types of Project Delivery System, with the Design Build projects having the shorter durations.
- Reduce cost: On average, the managers of Design Build projects surveyed in this study estimated that Design Build Project Delivery System reduced the total cost of projects by 3 percent.
- Enhance project quality: Survey responses indicated that application of Design Build project delivery had no differential impact on project quality in the opinion of survey respondents. In fact, 93% of Design Build projects performed at the same level of quality as those delivered by Design Bid Build.

Shrestha et al. (2007) compared the performance of Design Build and Design Bid Build highway projects on projects worth more than $50 million in cost. Design Build projects were selected from all over the U.S. whereas Design Bid Build projects were selected from the state of Texas. For this analysis, the total sample size was 15. The statistical analysis showed that the average cost growth for Design Build projects was significantly lower than that of Design Bid Build projects.

Del Puerto et al. (2008) used the literature review and survey of owners and Design Build professionals to identify the perceived benefits of Design Build Project Delivery System as the following:

- Decrease the overall project completion time as compared to other Project Delivery Systems.
- Secure a project cost before the start of detailed design.
- Establish a single point of responsibility for design and construction.
- Obtain creative solutions for the project.
- Involve builder in the design process.
- Facilitate Best Value Selection to select the team that offers the most benefits to the owner (i.e., price is not the only factor considered).
- Decrease the overall project cost as compared to other Project Delivery Systems.
- Enhance quality.

Hale et al. (2009) compared a set of 38 Design Build and 39 Design Bid Build projects developed by a U.S. public sector organization; and reported that Design Build Project Delivery System was superior to Design Bid Build due to less time required for project completion and less increase in both time and cost.

Touran et al. (2011) used literature review and survey of public transit owners to identify the owners' objectives for utilizing Design Build Project Delivery System:

- Reduce/compress/accelerate project delivery period.
- Encourage innovation.

- Establish project budget at an early stage of design development.
- Get early construction contractor involvement.
- Enhance flexibility during the construction phase.

Since owners including State DOTs select Design Build as an alternative to the conventional Design Bid Build Project Delivery System, it is appropriate to identify the factors that motivate State DOTs to select Design Build Project Delivery System for transportation projects. This identification can be used as an important part of constructing a systematic approach to evaluate the appropriateness of Design Build Project Delivery System for a transportation project.

The research team scanned existing practices in State DOTs, in order to identify what have motivated State DOTs to select Design Build Project Delivery System for their projects. The major source of information for State DOT scanning was official State DOT websites. The research team studied State DOTs' Design Build Guidelines and Manuals, Design Build RFQ and RFP Templates, and any other relevant documents that were available to the public through official State DOT websites. The research team conducted rigorous content analysis on these sources to identify main factors motivating State DOTs to consider Design Build Project Delivery System. The information collected through the content analysis is used to rank these motivating factors considering the frequency of their appearances in different State DOTs' manuals. It was interesting to find out that 18 State DOTs – which are authorized to use Design Build – do not provide any explicit objective and/or motivation for selecting Design Build Project Delivery System in their online materials available at State DOT websites. 29 State DOTS present useful information in their online sources regarding the Department objectives for applying Design Build Project Delivery System. Figure 3.1 shows the results of content analysis, which identifies the main factors that motivate these 29 State DOTs to select Design Build Project Delivery System for a transportation project.

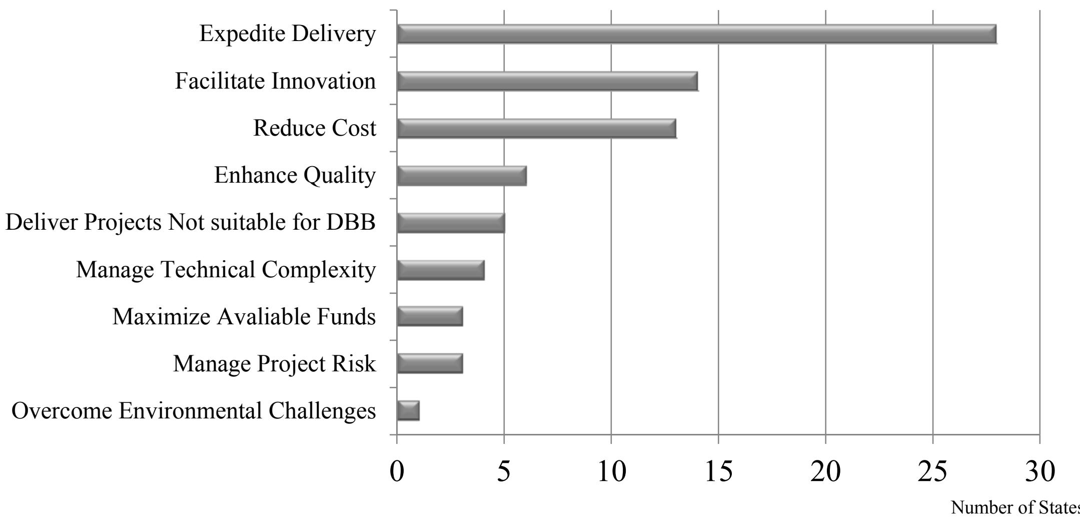


FIGURE 3.1

Main Factors That Motivate State Dots to Select Design Build Project Delivery System (Source: 29 State Dots' Design Build Guidelines and Manuals)

It can be seen that approximately all 29 State DOTs identifies "Expedite Delivery" as the main motivation for selecting Design Build Project Delivery System. "Facilitate Innovation" and "Reduce Cost" are considered as the next two important motivating factors within these 29 State DOTs. Other motivating factors, in order, are "Enhance Quality", "Deliver Projects Not Suitable for Design Bid Build", "Manage Technical Complexity", "Maximize Available Funds", "Manage Project Risk", and "Overcome Environmental Challenges".

In addition, the research team conducted a thorough literature review and identified main factors that have been considered significant for considering Design Build Project Delivery System for a transportation project.

SIGNIFICANT FACTORS IN THE SELECTION OF DESIGN BUILD PROJECT DELIVERY SYSTEM FOR A PROJECT

There is a growing body of knowledge that focuses on the selection of appropriate Project Delivery System in different industry sectors. Nevertheless, the research efforts focusing on selecting Design Build Project Delivery System for a transportation project have been relatively limited so far. The existing literature recommends the presence of specific primary factors that should be considered in the selection of Design Build as an alternative to other Project Delivery Systems. For instance, Vesay (1991) presented the results of a review of the public sector owners' selection procedures and concluded that the Design Build is best used when:

- Project scope is well-defined.
- Design is close to the industry standard or slightly more complex.
- Time is of essence.
- Owner's experience is limited.
- Project team's experience is high.
- Expected quality is higher than the industry standard.
- Cost is critical.
- Project risk is low to medium.

Potter and Sanvido (1994) reviewed the public sector owners' selection procedures and presented the following factors that drive the selection of Design Build Project Delivery System:

- Completion Time
- Project Cost
- Quality
- Complexity
- Scope definition

- Project Size

Songer and Molenaar (1996) demonstrated that owners typically select Design Build over Design Bid Build due to any of the following reasons:

- Shortening project duration
- Establishing cost
- Reducing cost
- Increasing constructability/innovation,
- Establishing schedule
- Reducing claims
- Managing large project size/complexity

Through conducting a detailed survey, Alhazmi and McCaffer (2000) established a list of owners' requirements that can impact the selection of a Project Delivery System. The list of owners' requirements is developed in four major categories: cost, time, quality, and general. Each category includes several requirements as the following:

- Total cost of the project
    - Capital cost
    - Maintenance cost
    - Prequalification cost
    - Cost overrun
    - Reduction of financial risk
- Time
    - Construction time
    - The early start of construction activity
    - Planning and designing time

- Rapid response to new client needs
- Minimization of activities interference
- Speed of construction
- Time overrun

- Quality
  - Design reliability and durability
  - Design innovation
  - Systems guarantees
  - Suitability for the intended uses
  - Flexibility
  - Aesthetics

- General needs
  - Parties' involvement
  - Allocation of responsibilities
  - Professional team performance
  - Cooperation and motivation
  - Safety
  - Accountability
  - Existing building operation/disruption caused

Through a review of several projects, Tookey et al. (2001) concluded that owner's requirements with regard to cost, time, and quality often impact the decision of Project Delivery System selection. Detailed interviews with owners indicated that for Design Build projects, time and budget were the main drivers for the selection of Design Build Project Delivery System. It was concluded that owners' requirements were mostly directed towards benefiting from contracting with a single entity.

Chan et al. (2001a) used literature review and Delphi method and showed that the following factors drive the selection of the Design Build Project Delivery System:

- Price competition: How important is it to choose the project team by price competition, so increasing the likelihood of a low price?
- Time available: How important is early completion to the success of the project?
- Time predictability: To what extent does the owner require a specific completion date at the start of the project?
- Availability of competent contractors: How important is it to have a plentiful supply of competent contractors to work for the procurement system?
- Clear end user's requirements: How capably is the client able to state his or her requirements clearly and precisely at the tender stage?
- Complexity: Is the project highly specialized, technologically advanced, or highly serviced?
- Certainty of cost without fluctuation: How important is a firm price at the beginning of construction?
- Flexibility for changes: To what extent does the owner expect the project to have frequent changes in the design and construction once the work has begun on site?
- Risk management: To what extent does the owner need risk avoidance in the event of time, cost, design liability, and quality slippage?
- Responsibility: To what extent does the owner wish to have a single point of responsibility for the completion of the design and construction of the project?
- Familiarity: How important is it for the client to choose a familiar system to deliver the project?

Oyetunji and Anderson (2001) identified the following factors that are considered important in selecting Project Delivery System:

- Control cost growth.
- Ensure lowest cost.
- Delay or minimize expenditure rate.
- Facilitate early cost estimate.
- Reduce risk or transfer risk to contractor.
- Control time growth.
- Ensure shortest schedule.
- Promote early procurement.
- Ease change incorporation.
- Capitalize on expected low levels of changes.
- Protect confidentiality.
- Capitalize on familiar project conditions.
- Maintain owner's controlling role.
- Maintain owner's involvement.
- Define project scope appropriately.
- Coordinate project complexity and innovation efficiently.

Warne and Beard (2005) presented information aimed at assisting owners in the selection of appropriate Project Delivery System given their needs and specific project goals. They identified key factors impacting the selection of Project Delivery System as quality, cost control, design expertise, schedule, specific product or outcome, risk, legal requirements, political direction, safety and security, and sustainability.

Mahdi and Alreshaid (2005) reviewed literature and identified thirty four factors that may affect the selection of a proper Project Delivery System. They conducted structured interviews with selected experts in order to identify the relative importance of these factors. These factors were categorized into seven areas with several subcategories as the following:

- Owner characteristics
    - Owner’s control over design: Ability or desire to take responsibility for managing the design. Does the owner have in-house design resources qualified to manage the design professionals?
    - Owner’s understanding of the project scope: The owner, designer, and contractor share a clear understanding of functional and technical performance required in the finished project.
    - Owner’s benefits from cost saving: Is the owner getting a benefit from cost saving?
    - Owner’s involvement in project details: Does the owner wish to have complete involvement in the project details?
    - Applicability: Possibility of applying different Project Delivery Systems by the owner.
- Project characteristics
    - Precise cost estimate before contract signing: Owner’s need for a more precise cost estimate before contract signing in case there is a limited budget.
    - Time reduction: Is there time to complete the design development stage prior to starting construction?
    - Tight project milestone or deadlines: By determining if the project requires a schedule that can only be maintained by overlapping design and construction phases.
    - Cost saving: Identifying the possibility of cost saving for each alternative delivery option.
    - Project budget: The Project has a fixed cost before it is submitted to the designer.
    - Ability to define the project scope: Owner has a precise understanding of the project scope before it is submitted to the designer.
    - Project size and complexity: The size and monetary amount of the project as compared to others available for designers and contractors.

- Design characteristics
  - Potential for design changes during construction: Is there significant potential for changes during the construction phase?
  - Design quality: Is it available in house or does the owner need outside resources to verify the design quality?
  - Flexibility to redesign after construction cost commitment: Is significant amount of flexibility required after commitment to a contractor?
  - Effectiveness and constructability of the design: Value Engineering (VE).
- Regulatory
  - Allowance for competitive bidding
  - Desired contractual relationship: It depends on the owner's selection of the construction entity and the contractual relationship created that will affect what information is required to be provided and when.
  - Regulatory and statutory requirements: Do laws, rules, regulations, etc. permit the use of an alternative Project Delivery System?
  - Complexity of decision making
  - Reduction in administrative staff: The owner has a project manager or staff that can be dedicated to the specific Project Delivery System.
  - Expertise required: Experience with the particular Project Delivery System.
  - Funding cycle: Is the project funding available for construction at initiation of the design?
- Contractor characteristics
  - Availability of experience required to carry out the delivery option: The number of local designers, contractors, and Design Build firms with appropriate experience.
  - Familiarity and establishment.
  - Coordination and communications.

    - Clarity of defined roles.
- Risk
    - Risk allocation and risk management improvement: the owner prefers to shift some of the traditional risks (e.g., design errors and omissions) to the Design Build Team.
- Claims and disputes
    - Conflicts of Interest.
    - Type of contract: Whether the project is being awarded as lump sum, unit price, guaranteed maximum price, fixed fee, or other.
    - Claims and disputes between designer and builder/the single point of responsibility: Does the owner desire to hold a single entity responsible for coordination, collaboration, and productivity of the entire project?

Molenaar et al (2005) and the "AASHTO Guide for Design-Build Procurement" (2008) recommend that the selection of Design Build projects should be based on the following central premise: "Select projects with characteristics that provide significant benefit using design-build project delivery. Once identified, develop the evaluation plan and project scope to confirm that the benefits are real, the negative impacts are minimal, and the risks are manageable." Further, both studies recommend choosing Design Build by an agency should be based on the following reasons:

- A compressed schedule is required
- Schedule certainty is required
- Early cost certainty is required
- The project scope is well defined
- Project quality can be defined though minimum design
- Opportunity for innovation exists
- Minimal third party risks exist

Based on a review of several surveys and benchmarks, Mafakheri et al. (2007) identified several factors influencing the selection decision of a Project Delivery System for a project as the following:

- Cost
- Schedule
- Quality (aesthetic and physical quality)
- Complexity (standard, repetitive, or complex and unique design)
- Scope change
- Owner's experience
- Value engineering as well as additional requirements such as maximizing the operational return on investment (ROI) and/or facility life-cycle value
- Availability of enough funding at the early stage of the project
- Risk management
- Uniqueness
- External approvals
- Project size
- Culture

Chan (2007) identified several factors that are considered important in selecting Project Delivery System as the following:

- Speed
- Flexibility
- Quality level
- Complexity
- Risk avoidance

- Price competition
- Point of responsibility

del Puerto et al. (2008) used literature review and survey of owners and Design Build professionals and concluded that the following considerations influence the owner's decision about using Design Build Project Delivery System:

- Innovation
- Cost savings and early cost establishment
- Schedule reduction
- Selection based Design Build Team's qualifications
- Single point of responsibility
- Best Value selection
- Quality

Touran et al. (2009a and 2009b) determined the factors that impact selecting Project Delivery System for airport and transit projects as the following:

- Project size/complexity
- Schedule compression
- Schedule growth control
- Early cost precision
- Cost control
- Risk management/allocation
- Lifecycle costs
- Maintainability
- Staff experience/capability
- Owners' control of project

- Security
- Control of impact on passengers and operations
- Third-party stakeholder input to design and construction
- Competition and local talent
- Disadvantaged business enterprise (DBE)/small business impacts
- Legal and statutory constraints
- Sustainability and leadership in energy and environmental design (LEED) certification
- Adversarial relationships
- Construction claims

Love et al. (2012) defined the following nine assessment criteria and respective questions for selecting Project Delivery System in public sector projects:

- Time: Is early completion required?
- Certainty of time: Is project completion time important?
- Certainty of cost: Is a firm price needed before any commitment to construction is given?
- Price competition: Is the selection of the construction team based on price only consideration important?
- Flexibility: Are variations necessary after work begins in site?
- Complexity: Does the building need to be highly specialized, technologically advanced, or highly serviced?
- Quality: Is high-quality product (in terms of material and workmanship and design concept) important?
- Responsibility: Is a single point of responsibility desired by the client? Is direct responsibility to the client from the designer and cost consultant desired?
- Risk: Is the transfer of the risk of cost and time slippage important?

Molenaar et al. (2012) identified the following eight assessment criteria for selecting Project Deliver System for transportation projects:

- Delivery schedule: Overall project schedule from scoping through design, construction, and opening to the public.
- Complexity and innovation: Potential applicability of new designs or processes to resolve complex technical issues.
- Level of design: Percentage of design completion at the time of the project delivery procurement.
- Cost: Financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.
- Risk: Initial assessment of project risks addressing them in the selection of the Project Delivery System.
- Staff experience/availability: Owner's staff experience and availability as it relates to the Project Delivery Systems.
- Level of oversight and control: Amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process.
- Competition and contractor experience: Level of competition, experience, and availability in the marketplace and its capacity for the project.

The research team reviewed the abovementioned articles to identify the key factors that drive the selection of Design Build as the Project Delivery System for a project. This literature review leads to the production of a list of the Design Build selection factors for consideration.

As it can be observed, Time and Cost factors are generally considered as the major factors in the selection decision for Design Build Project Delivery System. Issues related to Innovation, Quality and Scope are among the most important factors in the Design Build selection. Other important factors in selecting Design Build Project Delivery System for a project are: Experience, Early

Involvement, Best Value Selection, Single Point of Responsibility, Claim Reduction, Project risk, and Flexibility. Table 3.1 summarizes the major factors important in Design build Project Delivery Selection as identified by the reviewed literature.

TABLE 3.1

Summary of the Selection Factors for Design Build Projects

Design Build Selection Factors	Vessay (1991)	Potter & Sanvido (1994)	Songer & Molenaar (1997)	Alhazmi & McCaffer (2000)	Chan et al. (2001)	Oyetunji & Anderson (2001)	Tookey et al. (2001)	Warne & Beard (2005)	Mahdi & Alreshaid (2005)	Mafakheri et al. (2007)	Chan (2007)	del Puerto et al. (2008)	Touran et al. (2011)	Love et al. (2012)	Molenaar et al. (2012)
Time	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cost	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quality		✓		✓	✓		✓	✓	✓	✓	✓	✓		✓	
Complexity	✓	✓	✓		✓	✓			✓	✓			✓	✓	✓
Risk Management	✓			✓	✓	✓		✓		✓	✓		✓	✓	✓
Flexibility				✓	✓	✓			✓		✓			✓	
Owner’s Experience & Competency	✓				✓	✓			✓	✓			✓		✓
Innovation			✓	✓		✓						✓			✓
Size		✓	✓						✓	✓			✓		
Project Teams’ Experience & Competency	✓				✓			✓	✓						✓
Scope	✓	✓			✓	✓									
Claims Management			✓						✓				✓		
Safety and Security				✓				✓					✓		
Level of Design									✓						✓
Best Value Selection												✓			
Regulatory Requirements								✓	✓	✓			✓		
Single Point of Responsibility					✓	✓	✓		✓		✓	✓		✓	
Early Involvement						✓									

PROCESSES FOR SELECTION OF THE APPROPRIATE PROJECT DELIVERY SYSTEM

The review of literature showed that there have been several efforts by researchers to propose methods for selection of the appropriate Project Delivery System for a project. Gordon (1994) emphasized on the importance of selecting the appropriate Project Delivery System for the project and argued that a careful selection of Project Delivery System results in cost savings and a smooth construction process. Gordon (1994) proposed a flowchart-based Project Delivery System selection approach that considers parameters, such as time constraints, preconstruction service needs, risk aversion, and availability of appropriate contractors. The process starts with the analysis of the project, and owner and market drivers in the stated order. An appropriate Project Delivery System is selected based on the outcome of the aforementioned analyses, allocation of project risks, and a commodity-versus-service analysis (Figure 3.2).

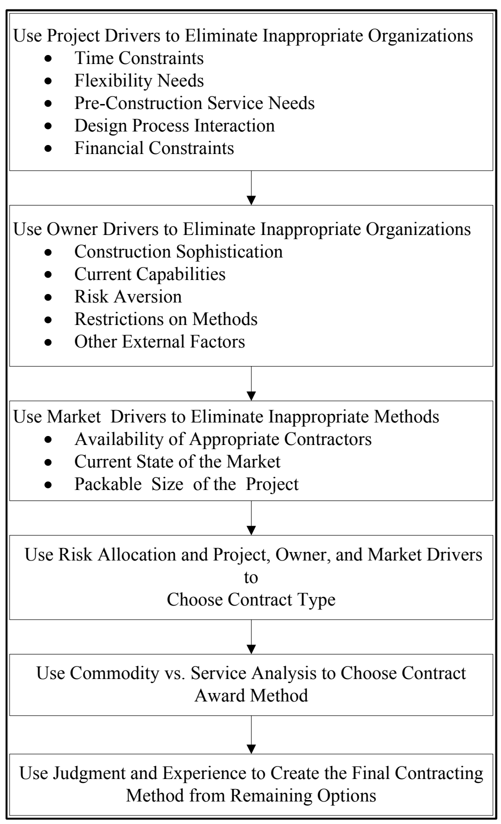


FIGURE 3.2

Project Delivery System Selection Flowchart (Adopted from Gordon 1994)

Molenaar and Songer (1998) introduced a formalized selection model for public-sector Design Build projects. The core of this model is a regression-based predictive equation built based on 122 retrospective case studies. Projects are selected based on the anticipated project success that can be achieved if Design Build Project Delivery System is used.

Alhazmi and McCaffer (2000) presented an analytical model for selecting the most appropriate Project Delivery System. This model, which is called the Project Procurement System Selection Model (PPSSM), integrates the Analytical Hierarchy Process (AHP) and Parker's judging alternative technique of value engineering into a multi-criteria, multi-screening system. A survey of public-sector owners was conducted in order to evaluate the effectiveness and efficiency of PPSSM in facilitating the selection of appropriate Project Delivery System. The flowchart shown in Figure 3.3 illustrates the model proposed by Alhazmi and McCaffer (2000).

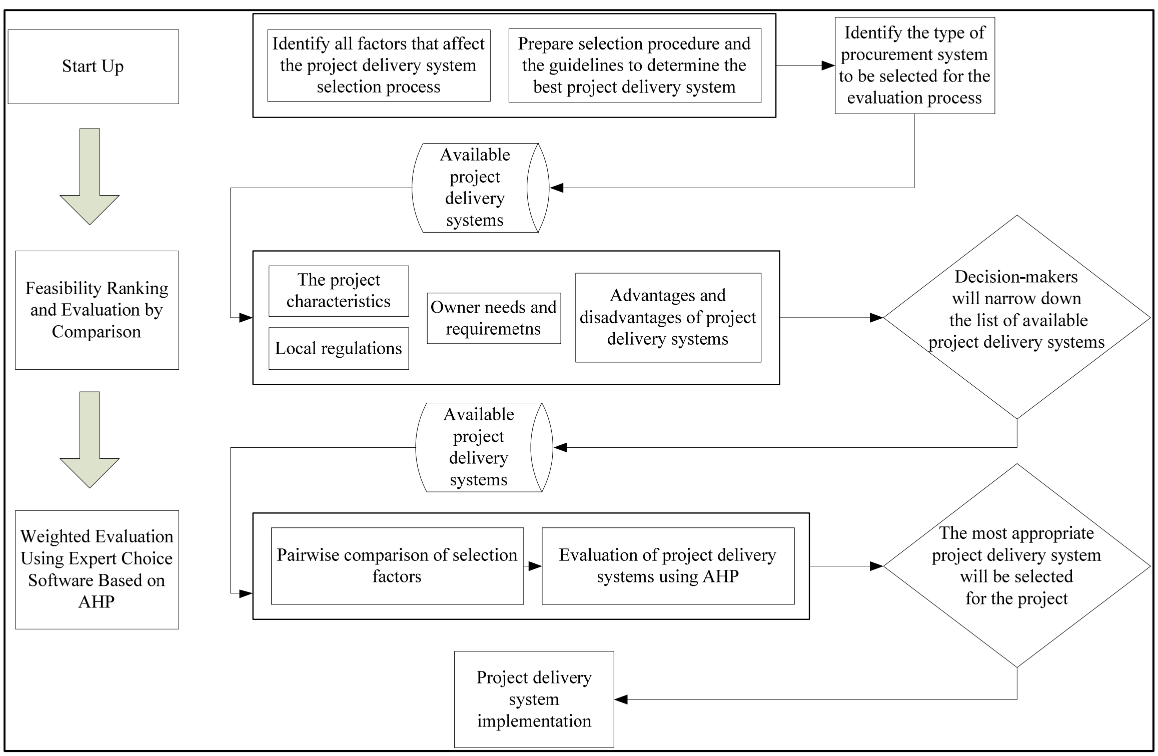


FIGURE 3.3

Project Procurement System Selection Model Developed by Alhazmi and McCaffer (2000)

As part of a research sponsored by CII, Oyetunji and Anderson (2001) developed a structured procedure to assist owners in selecting appropriate Project Delivery System for a project. This procedure focuses on owner's goals and objectives for the project as well as the environment in which the project is executed. It can be used in order to identify an appropriate Project Delivery System for any given project based on the anticipated effect of a relevant set of factors in a pairwise (PW) comparison of Project Delivery Systems. Figure 3.4 illustrates the Project Delivery System selection procedure proposed by Oyetunji and Anderson (2001).

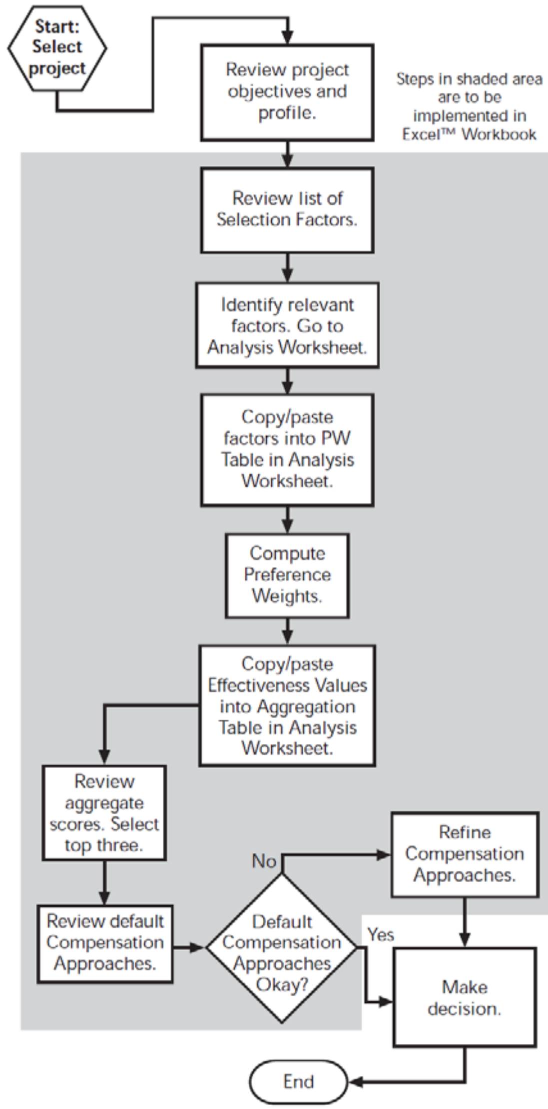


FIGURE 3.4

Project Delivery System Selection Procedure Proposed by Oyetunji and Anderson (2001)

Chan et al. (2001b) adopted a Delphi technique to develop a multi-attribute selection model. This model is based on four rounds of Delphi surveys to derive objective opinions in a rather subjective area such as the multi-attribute model for the selection of procurement method. A set of exclusive criteria for the selection of procurement method was identified following the first two rounds of the Delphi. The last two rounds of the Delphi were set to derive a statistically significant consensus on the weighting of the utility factors. A multi-attribute procurement selection model was developed based on the criteria and utility factors derived from the Delphi survey.

Mahdi and Alreshaid (2005) examined the compatibility of various Project Delivery Systems with specific types of owners and projects. They presented a multi-criteria decision-making model using the analytical hierarchy process that assists owners in selecting the proper Project Delivery System for their projects. The authors identified thirty-four factors that were categorized into seven areas, owner characteristics, project characteristics, design characteristics, regulatory constraints, contractor characteristics, risks, and claims and disputes. The decision makers can assign different weights to these seven areas when deciding the most appropriate Project Delivery System.

Loulakis (2005) presented a matrix for Project Delivery System evaluation and selection. Selection factors are analyzed and categorized under three major criteria: project goals, owner characteristics, and marketplace condition. Findings of previous research efforts on comparing different Project Delivery Systems, such as Design Bid Build and Design Build, were taken into account to rank and prioritize different selection factors in this matrix.

Warne and Beard (2005) developed a guideline to assist owners in selecting appropriate Project Delivery System for their projects. In their view, identifying project goals is the first step in the decision making process. The project goals specified in the guideline are quality, cost control, design expertise, schedule, specific product or outcome, risk, legal requirements, political direction, safety and security, and sustainability. The guideline provided recommendations on the appropriate Project Delivery System based on the project goals specified by the owner. For instance, the guideline recommended Design Build Project Delivery System for the projects where expedited delivery and early cost establishment are essential.

Oyetunji and Anderson (2006) developed a decision support tool for identifying the optimal Project Delivery System for capital industrial and general building projects. Their approach utilized a multi-criteria decision analysis approach known as Simple Multi-Attribute Rating Technique with swing weights (SMARTS) to evaluate Project Delivery System alternatives.

Mafakheri et al. (2007) presented a model for selecting an optimal Project Delivery System using the Analytical Hierarchy Process (AHP) coupled with rough set-based measures to fully rank the Project Delivery System alternatives. This model considers both benchmarking results and owner's opinion in order to relatively rank alternative Project Delivery Systems.

Touran et al. (2009a) studied different Project Delivery Systems for airport capital projects. They evaluated advantages and disadvantages of various Project Delivery Systems in terms of their compatibilities with several factors categorized under five main areas: project level, agency-level, public policy/regulatory issues, life cycle issues, and other issues. They presented a decision process that works in three tiers: analytical delivery decision approach, weighted matrix delivery decision approach, and optimal risk-based approach. In a later study, they presented a similar decision process to select appropriate Project Delivery System in transit capital projects (2009b).

Chan (2007) presented a Fuzzy Procurement Selection Model (FPSM), a mathematical ranking model for relatively ranking Project Delivery Systems. The proposed model combined the fuzzy membership function, fuzzy relationship model, and fuzzy synthesis evaluation model to form a ranking system that can incorporate differences in local practices or requirements.

Ng and Cheung (2007) emphasized the importance of selecting an appropriate Project Delivery System for an infrastructure project and presented a conceptual framework of the Virtual Project Delivery System Adviser for Infrastructure Facilities (VPDSA-IF). The selection factors used in their analysis include: project speed, cost certainty, flexibility, responsibility, complexity, quality level, risk allocation/avoidance, and price completion. Figure 3.5 presents the conceptual framework proposed by Ng and Cheung (2007) for Project Delivery System selection.

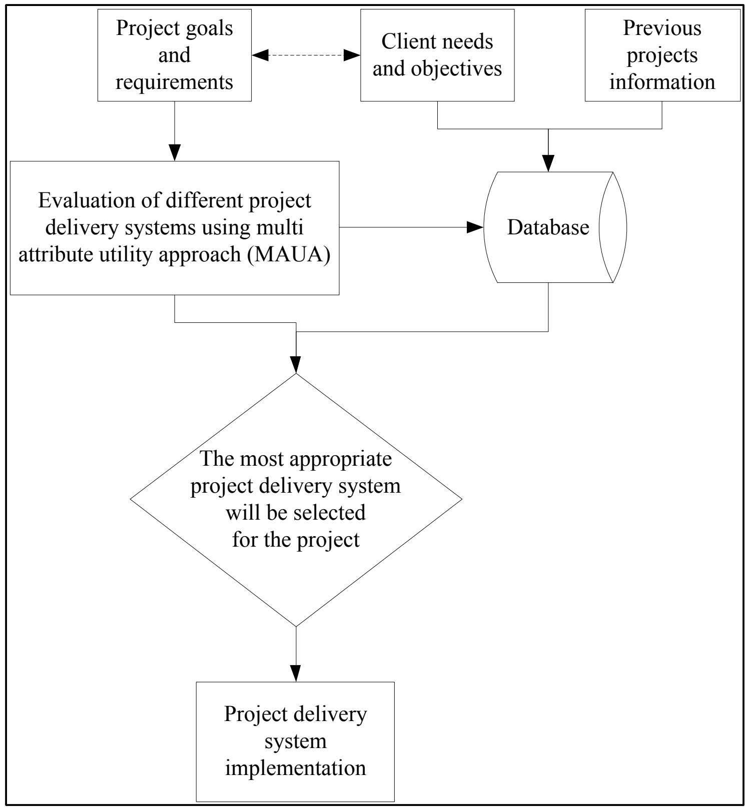


FIGURE 3.5

Multi-criteria Project Procurement System Selection Model Developed by Ng and Cheung (2007)

Ibbs and Chih (2011) conducted an extensive review of Project Delivery System selection approaches. They identified four groups of Project Delivery System selection methods, namely, guidance (i.e., decision charts and guidelines), multi-attribute analysis (i.e., multi-attribute utility theory and analytical hierarchical process), knowledge- and experience-based (i.e., case-based reasoning), and mix-method approaches. Based on this categorization, they presented the formalized Project Delivery System selection process illustrated in Figure 3.6. The "…" bullets stand for "others" in this figure.

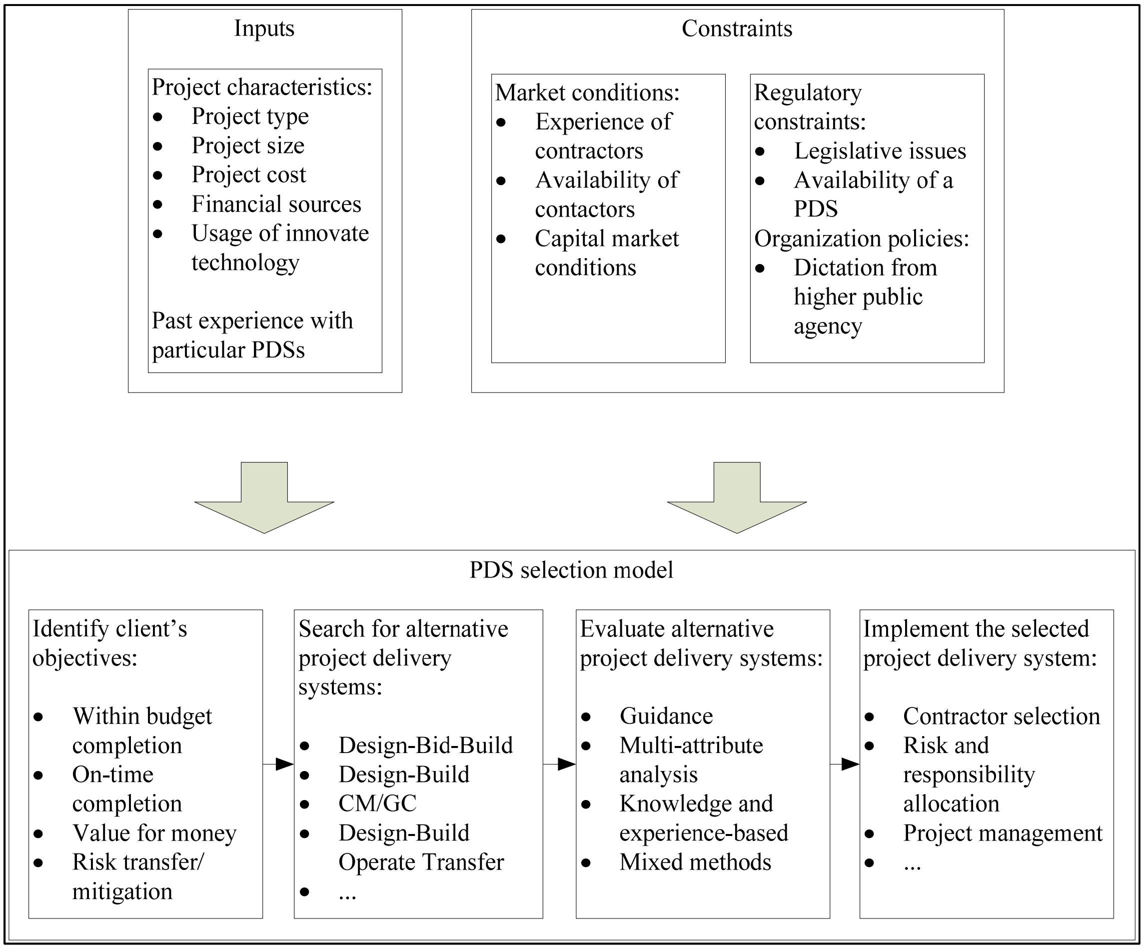


FIGURE 3.6

Conceptual Project Delivery System (PDS) Selection Process Developed by Ibbs and Chih (2011)

Love et al. (2012) developed a process that helps project stakeholders evaluate their goals and objectives to select the Project Delivery System that generates better value for money. The proposed Project Delivery System selection process utilizes qualitative and quantitative stages and is comprised of six steps as shown in Figure 3.7. The outcome of the six-step process is a recommendation that is grounded in detailed evaluation of project goals, constraints, and the characteristics of authorized Project Delivery Systems.

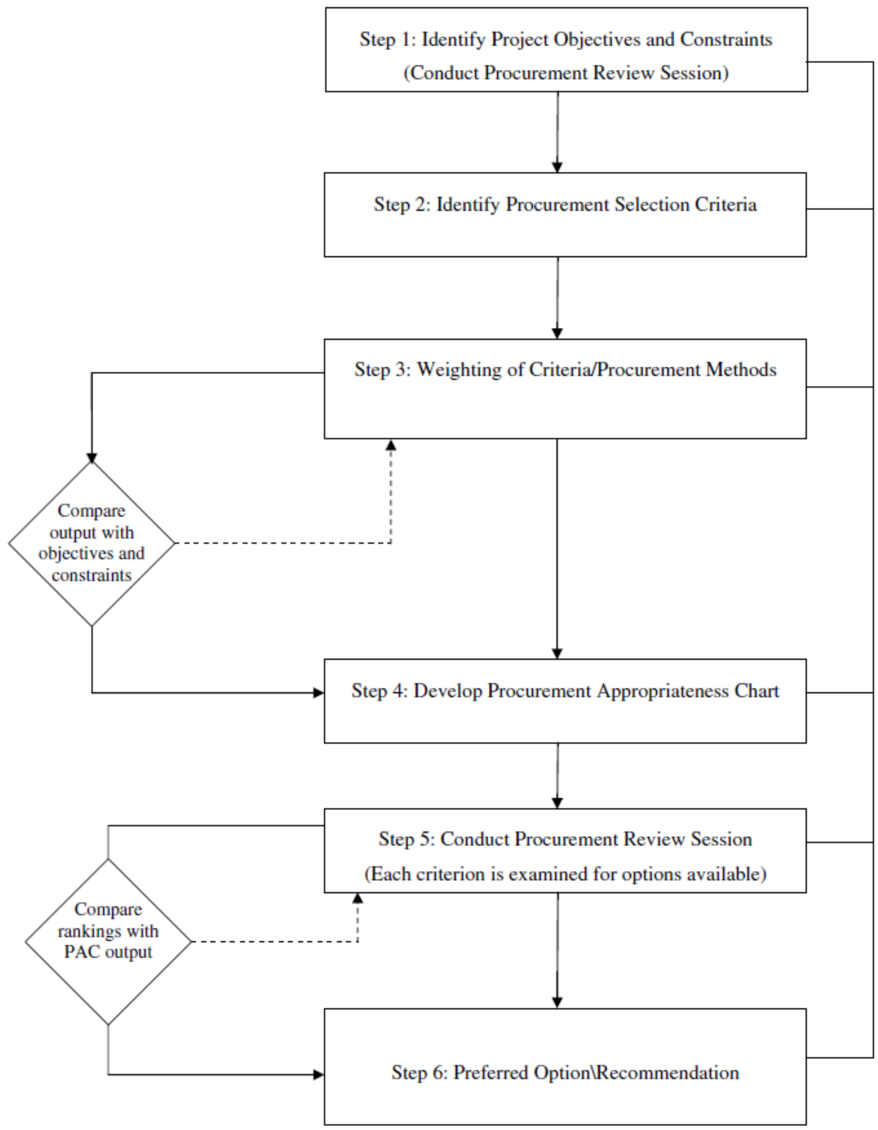


FIGURE 3.7

Overview of the Project Delivery Selection Process Proposed by Love et al. (2012)

Molenaar et al. (2012) developed a decision support tool called the Project Delivery Selection Matrix (PDSM) to assist transportation agencies in selecting an appropriate Project Delivery System. The tool uses a risk-based selection approach to select a Project Delivery System from three choices: Design Bid Build, Design Build, and CM/GC. The evaluation uses specific project attributes and characteristics and evaluates the appropriateness of each Project Delivery System based on a series of primary evaluation factors (Delivery Schedule, Project Complexity and Innovation, Level of Design Cost), an initial risk assessment, and three secondary evaluation factors (Owner's Staff Experience/Availability, Level of Oversight and Control Competition and Contractor Experience). Figure 3.8 illustrates a flowchart that describes the Project Delivery System selection process proposed by Molenaar et al. (2012).

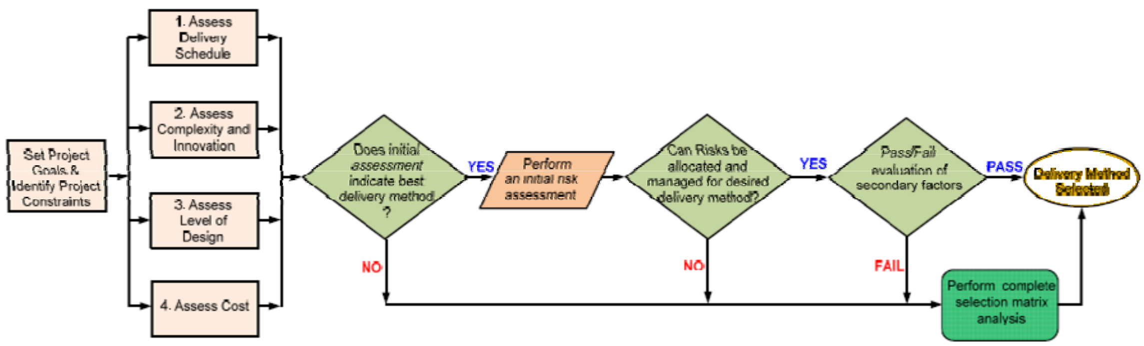


FIGURE 3.8

Flowchart Describing the Project Delivery System Selection Process Proposed by Molenaar et al. (2012)

Design Build Project Delivery Selection at Georgia Department of Transportation

Similar to several other State DOTs across the nation, the Georgia Department of Transportation (GDOT) has utilized Design Build Project Delivery System for delivering transportation projects. Georgia legislators initially set the cap for the project delivered using Design Build Project Delivery System at 15% (in dollars) of GDOT's annual construction budget. This cap was later raised by legislators to 30% with 2014 being set as the sunset date for the legislation. In March 2012, Georgia legislators approved a substantial increase in the level of using Design Build Project Delivery System for transportation projects by raising the cap for Design Build projects to 50% (in dollars) of GDOT's annual construction budget with no sunset date.

In order to increase its efficiency in delivering transportation projects, GDOT should select Design Build for a project only if it is expected to produce the best outcome for the project in terms of the project delivery schedule, project delivery cost and/or project quality. Therefore, GDOT requires a systematic approach for evaluating the suitability of the Design Build Project Delivery System for a project. Since GDOT should utilize Design Build Project Delivery System according to its unique legislative and procedural framework, it is critical that this systematic approach take into consideration GDOT's unique interests and needs.

Therefore, the research team conducted an extensive review of GDOT's project procurement guidelines and documents. The objective was to identify GDOT's expectations, goals, and specific issues related to the selection of Design Build Project Delivery System for transportation projects. It is explored that GDOT currently considers the following projects as good candidates for Design Build Project Delivery System:

- Projects that need to be accelerated for the public benefit
- Projects where up-front contractor-engineer interaction will stimulate value engineering analysis in order to reduce project cost

- Projects with complex constructability issues
- Projects using specialty or innovative designs and construction methods or techniques
- Projects directly supporting economic development
- Projects to maximize the use of available funding (i.e., Federal, Bonds, etc.)
- An emergency project where repair or design and construction need to be expedited for the public good (i.e., procurement for emergency projects may be expedited at the Chief Engineer's discretion)
- Projects involving software development or integration, and/or rapidly changing technologies

In addition to reviewing GDOT's project procurement guidelines and documents, the research team conducted detailed interviews with GDOT representatives from the Office of Innovative Program Delivery, in order to identify the factors that drive GDOT decision about selecting Design Build Project Delivery System for a project. It is found that the establishment of a single point of responsibility is at the core of considering Design Build Project Delivery System from the GDOT's standpoint. Based on the results of content analysis and structured interviews, the research team identified a set of significant factors as primary criteria for selection of Design Build Project Delivery System for a transportation project by GDOT. Table 3.2 summarizes these important factors along with respective definitions.

TABLE 3.2

Significant Design Build Selection Factors from the GDOT's Office of Innovative Program Delivery's Perspective

Selection Factor	**Definition**
Reduce Cost	Reduce the project cost as compared to other procurement methods
Expedite Delivery	Reduce the project completion time as compared to other procurement methods
Manage Technical Complexity	Address the issue of technical complexity through single contract
Facilitate Innovation	Introduce construction knowledge into design process
Maximize the Use of Available Funds	Maximize the use of available funding (e.g., Federal, Bonds, etc.) through the fast-track delivery
Manage Project Risks	Effectively manage the project risk through single contract

In addition to this detailed literature review, the research team decided to conduct structured interviews with three State DOTs (i.e., Colorado, Florida, and Virginia Departments of Transportation), in order to better understated state of practice in using Design Build Project Delivery System for transportation projects. The research team planned to identify what motivate these State DOTs to select Design Build Project Delivery System for their projects. The team researched the characteristics of transportation projects that are considered good candidates for Design Build Project Delivery System in these States. This provided the research team with an insight into the DOT's decision-making process that leads to the selection of the Design Build in lieu of other Project Delivery System for a transportation project. The findings of current Design Build practices in these State DOTs are presented in the following chapter.

CHAPTER 4 STATE OF PRACTICE OF DESIGN BUILD IN COLORADO, FLORIDA, AND VIRGINIA DEPARTMENTS OF TRANSPORTATION

Once the detailed literature review was completed, the research team conducted structured interviews with the representatives from State DOTs that are the forefront of using Design Build for transportation projects. These three State DOTs are Colorado Department of Transportation (CDOT), Florida Department of Transportation (FDOT), and Virginia Department of Transportation (VDOT). This process helped research team better understated state of practice in using Design Build Project Delivery System for transportation projects and gain further understanding of the experiences and opinions of key participants in Design Build projects. Prior to the interview with the representative from each State DOT, the research team prepared a questionnaire (shown in Appendix I) that included a series of questions concerning the state of practice of Design Build in the respective State DOTs as well as a series of questions directly related to the topic of this research project. The findings of this in-depth study are presented in this Chapter.

COLORADO DOT

1. BACKGROUND

The Colorado Department of Transportation (CDOT) started the experimental use of Design Build Project Delivery System in mid-1990's. The use of Design Build Project Delivery System is authorized in Revised Statute, Part 14, Article 1 of Title 43. This legislation authorized the CDOT to use Design Build Project Delivery System for transportation projects where the Chief Engineer determines that it is in the best interest of the public. Under this legislation, CDOT is authorized to use an adjusted score for Design Build team selection whenever appropriate.

CDOT's first Design Build project was the $1.2 Billion Colorado Transportation-Expansion (T-Rex) project. T-Rex project was started in 1999 and finished in 2006. It is the largest project that CDOT has delivered under Design Build program so far. A unique project in terms of size and scope, T-Rex was an exceptionally successful example of a Design Build Project Delivery System applied to a multi-modal (highway and light rail transit) infrastructure mega-project.

Early involvement of all the interested parties and stakeholders, including CDOT's key personnel, potential Design Build Teams, stakeholders, and the general public, was the key to getting this Design Build project completed on-time and within budget. The use of the Design Build Project Delivery System and, hence, commitment on the part of all T-REX Project participants to function as "One Team/One Voice" proved to be a critical factor in the success of the project.

T-Rex project initiated significant changes in CDOT from the project cultural and procedural perspective. This experience motivated CDOT to create a position for Innovative Project Delivery Systems in their organizational chart. The position was created in 2004. The prime responsibility assigned to this position is to provide CDOT's regional transportation offices with management and technical support regarding the use of Deign Build Project Delivery System and gathering CDOT's lessons learned and maintaining the acquired knowledge from the past projects in-house for the future use. There are plans for expanding this position as CDOT's Design Build projects grow in number.

CDOT has no cap on the dollar value of projects that are delivered using Design Build Project Delivery System. Currently, CDOT has a goal of achieving a 40% threshold of the annual total project fund. Following the approval of the Funding Advancement for Surface Transportation and Economic Recovery (FASTER) legislation, which requires CDOT to immediately renovate 118 (originally 125) deficient bridges across the State, the Department has increased its pace in utilizing Design Build Project Delivery System.

2. Selection of Appropriate Project Delivery System at CDOT

CDOT has recently started to use a formal approach to select Project Delivery System for highway project. This "risk-based" process provides CDOT staff and project team members with generic forms that can be used to determine if there is a dominant or obvious choice of Project Delivery System among the three available choices (CDOT 2011): Design Bid Build, Design Build, and Construction Manager/General Contractor (CM/GC). Using this process, Project Delivery System is selected based on specific project attributes and characteristics. Specifically, in this process, the appropriateness of each Project Delivery System is evaluated based on a series of primary evaluation factors, an initial risk assessment, and three secondary evaluation factors. The outcome of this process is a Project Delivery Decision Report that describes the decision about the Project Delivery System in details. The process consists of the following activities (CDOT 2011):

A. Describe the project and set the project goals: The process begins by collecting and organizing information on the characteristics of project. A project description form, which at least includes the items below, can be used for the purpose of defining the project characteristics:

   - Project name

- Location
- Estimated budget
- Estimated project delivery period
- Required delivery date (if applicable)
- Source(s) of project funding
- Project corridor
- Major features of work – pavement, bridge, sound barriers, etc.
- Major schedule milestones
- Major project stakeholders
- Major challenges (e.g., challenges with acquiring right of way, utilities, and/or environmental approvals, challenges during construction phase)
- Main identified sources of risk
- Safety issues
- Sustainable design and construction requirements

It should be noted that other items can be added if the evaluators believe that they may influence the Project Delivery System decision. Next, specific project goals should be identified. These project goals must be clearly understood as a foundation for the selection of appropriate Project Delivery System. These goals should remain consistent over the life of the project.

B. Assess the three primary factors that most often determine the selection of the appropriate Project Delivery System. These primary factors are: Delivery Schedule, Complexity and Innovation, and Level of Design at the time of the project delivery procurement. For each candidate Project Delivery System, the evaluators should discuss the opportunities and obstacles related to each factor, and document the discussion on these factors.

1. Delivery Schedule: Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assessment of delivery schedule is concerned with the time required to secure the funding required for the project and get the project started. Delivery schedule assessment also considers the importance of project completion schedule.

2. Complexity and Innovation: Assessment is concerned with the applicability of new designs or processes to resolve complex and technical issues.

3. Level of Design: Assessment focuses on the percentage of design completion at the time of Project Delivery System selection.

An example of the form, which can be used for the analysis opportunities and obstacles as well as the evaluation summary form, is shown in Figure 4.1. Figure 4.2 shows a sample of the opportunities and obstacles checklists that are used in conjunction with the evaluation.

C. Perform an initial risk assessment if the assessment of three primary factors indicates there is a clear choice of the Project Delivery System.

4. Initial risk assessment: Risk is an uncertain event or condition that can negatively impact the project outcome. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. CDOT uses three sets of risk assessment checklists, which are provided to assist in an initial risk assessment relative to the selection of the Project Delivery System for transportation projects:

1. Typical transportation project risks categorized in major areas including site conditions and investigations, utilities, railroads, drainage/water quality best management practices, environmental, and third party involvement
2. General project risks checklist as shown in Figure 4.3
3. Opportunities/challenges checklist (relative to Design Bid Build, Design Build and CM at Risk Project Delivery Systems)

The initial assessment of project risks is aimed at determining if the project risks can be appropriately managed under the Project Delivery System in question.

D. Perform a brief pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision. These secondary factors are as the following:

5. Cost: Assessment is focused on the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

6. Staff Experience/Availability: Assessment is concerned with the owner staff experience and availability as it relates to the Project Delivery Systems in question.

7. Level of Oversight and Control: Assessment is concerned with the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process.

8. Competition and Contractor Experience: Assessment is focused on the level of competition, experience and availability of qualified contractors in the marketplace and their capacity for delivering the project.

E. If steps B, C and D do not result in clear determination of the appropriate Project Delivery System, perform a more rigorous evaluation of all eight factors against the three potential Project Delivery Systems i.e., Design Bid Build, Design Build and CM/GC.

DESIGN-BID-BUILD	
Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete.	
Opportunities	**Obstacles**
▪	▪ ....
▪	▪ ....
▪	▪ ....

DESIGN-BUILD	
Can get project under construction (and meet funding obligations) before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the need for an accurate RFP.	
Opportunities	**Obstacles**
▪	▪ ....
▪	▪ ....
▪	▪ ....

CM/GC	
Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule, but schedule can be slowed down by CM/GC design process and Guaranteed Maximum Price (GMP)negotiations and contracting.	
Opportunities	**Obstacles**
▪	▪ ....
▪	▪ ....
▪	▪ ....

Delivery Schedule Summary

	DBB	DB	CM/GC
1. Delivery Schedule			

Key: ✚✚ Most appropriate delivery method ✚ Appropriate delivery method
— Least appropriate delivery method **X** Fatal Flaw (discontinue evaluation of this method)
NA Factor not applicable or not relevant to the selection of project delivery

Notes and Comments: ....
....
....
....

FIGURE 4.1

Example of the Forms That Can Be Used For the Analysis Opportunities and Obstacles (Top) as Well as the Evaluation Summary Form (Bottom) (Copyright of CDOT 2011)

DESIGN-BID-BUILD	
Opportunities	**Challenges**
❒ Schedule is more predictable and more manageable ❒ Milestones can be easier to define ❒ Projects can more easily be "shelved" ❒ Shortest procurement period ❒ Elements of design can be advanced prior to permitting, construction, etc. ❒ Time to communicate/discuss design with stakeholders	❒ Requires time to perform a linear design-bid-construction process ❒ Design and construction schedules can be unrealistic due to lack industry input ❒ Errors in design lead to change orders and schedule delays ❒ Low bid selection may lead to potential delays and other adverse outcomes.

DESIGN-BUILD	
Opportunities	**Challenges**
❒ Potential to accelerate schedule through parallel design-build process ❒ Shifting schedule risk to DB team ❒ Encumbers construction funds more quickly ❒ Industry input into design and schedule ❒ Fewer chances for disputes between agency and design-builders ❒ More efficient procurement of long-lead items ❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ❒ Allows innovation in resource loading and scheduling by DB team	❒ Request for proposal development and procurement can be intensive ❒ Undefined events or conditions found after procurement, but during design can impact schedule and cost ❒ Time required to define technical requirements and expectations through RFP development can be intensive ❒ Time required to gain acceptance of quality program ❒ Requires agency and stakeholder commitments to an expeditious review of design

CM/GC	
Opportunities	**Challenges**
❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ❒ More efficient procurement of long-lead items ❒ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ❒ Can provide a shorter procurement schedule than DB ❒ Team involvement for schedule optimization ❒ Continuous constructability review and VE ❒ Maintenance of Traffic improves with contractor inputs ❒ Contractor input for phasing, constructability and traffic control may reduce overall schedule	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ❒ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule

FIGURE 4.2

A Sample of the Opportunities and Obstacles Checklists (Concerned with Schedule) that Are Used in Conjunction with the Evaluation (Copyright of CDOT 2011)

Environmental Risks	**External Risks**
❒ Delay in review of environmental documentation ❒ Challenge in appropriate environmental documentation ❒ Defined and non-defined hazardous waste ❒ Environmental regulation changes ❒ Environmental impact statement (EIS) required ❒ NEPA/ 404 Merger Process required ❒ Environmental analysis on new alignments required	❒ Stakeholders request late changes ❒ Influential stakeholders request additional needs to serve their own commercial purposes ❒ Local communities pose objections ❒ Community relations ❒ Conformance with regulations/guidelines/ design criteria ❒ Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
❒ Unforeseen delays due to utility owner and third-party ❒ Encounter unexpected utilities during construction ❒ Cost sharing with utilities not as planned ❒ Utility integration with project not as planned ❒ Third-party delays during construction ❒ Coordination with other projects ❒ Coordination with other government agencies	❒ Unexpected geotechnical issues ❒ Surveys late and/or in error ❒ Hazardous waste site analysis incomplete or in error ❒ Inadequate geotechnical investigations ❒ Adverse groundwater conditions ❒ Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
❒ Railroad involvement ❒ Objections to ROW appraisal take more time and/or money ❒ Excessive relocation or demolition ❒ Acquisition ROW problems ❒ Difficult or additional condemnation ❒ Accelerating pace of development in project corridor ❒ Additional ROW purchase due to alignment change	❒ Design is incomplete/ Design exceptions ❒ Scope definition is poor or incomplete ❒ Project purpose and need are poorly defined ❒ Communication breakdown with project team ❒ Pressure to delivery project on an accelerated schedule ❒ Constructability of design issues ❒ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)
Organizational Risks	**Construction Risks**
❒ Inexperienced staff assigned ❒ Losing critical staff at crucial point of the project ❒ Functional units not available or overloaded ❒ No control over staff priorities ❒ Lack of coordination/ communication ❒ Local agency issues ❒ Internal red tape causes delay getting approvals, decisions ❒ Too many projects/ new priority project inserted into program	❒ Pressure to delivery project on an accelerated schedule. ❒ Inaccurate contract time estimates ❒ Construction QC/QA issues ❒ Unclear contract documents ❒ Problem with construction sequencing/ staging/ phasing ❒ Maintenance of Traffic/ Work Zone Traffic Control

FIGURE 4.3

General Project Risk Checklist that includes the Items to Consider when Assessing Risk

(Copyright of CDOT 2011)

3. PROCUREMENT METHODS FOR DESIGN BUILD PROJECTS

CDOT is authorized to use various procurement methods for Design Build projects. According to Section 3 - Policy 2 of Colorado Code of Regulations (CCR) 601-15, CDOT may procure design-build projects using the following methods (CDOT 2013):

- Adjusted Score procurement method (Best Value);
- Low Bid procurement method;
- Any other method the Chief Engineer determines appropriate.

Considering the Section 3 - Policy 2 of Colorado Code of Regulations (CCR) 601-15 and the FHWA regulations, CDOT decided to use four approved procurement methods for design-build projects that are described in "CDOT Design Build Manual" (CDOT 2013) as the following:

- "Two-phase procurement method: The 'Two-Phase' selection procedure consists of a Request for Qualifications (RFQ) followed by a Request for Proposal (RFP). The Award criteria options include lowest price, adjusted low-bid (price per quality point), meets criteria and low bid, weighted criteria process, fixed price and best design, and best value." CDOT has procured several Design Build projects on the Best Value basis. These projects have been generally large (over $50 million) and complex projects. CDOT has not abandoned the Low-Bid Design Build yet; however, they do not use it as much anymore.
- "Single-phase procurement method: The 'Single-Phase' selection procedure consists of a RFP only, and is issued based on the use of a pre-qualification list. The Award criteria options are the same as those listed for the Two-Phased Selection."
- "Modified design-build: The 'Modified Design-Build' selection procedure consists of a 'two-phase' or 'single-phase' selection process. In either application, the Award criteria are based on 'lowest price and technically acceptable'." In the case of Modified Design

Build, the technical aspect of the proposals submitted by the Design Build Team is evaluated on a pass/fail basis. The criteria for evaluating Design Build Teams' qualifications are generally very loose. The contract is awarded to the lowest price Design Build proposal that passes the technical evaluation. There is no need for CDOT to issue an RFQ. Interested Design Build Teams that are registered with the Department can submit their proposal. This procurement method has been historically used for projects under $10 million. Recently, CDOT has been shying away from the Low Bid (Modified) Design Build due to the negative feedback from the contractors and consultants community. Both contractors and consultants do not favor the combination of Design Build and Low Bid. Another argument against the Low Bid procurement is that the loose qualification criteria may reduce CDOT's ability to distinguish among the interested Design Build Teams. This may impact the quality of competition and lead to undesirable project outcome.

- Streamlined Design Build: On a couple of projects, CDOT has procured the Design Build Team using Streamlined Design Build. The Streamlined Design Build is a procurement method typically used for smaller and less complex Deign Build projects with Best Value award criteria instead of Low Bid. Streamlined Design Build procurement method provides the basis for paying stipend to participants. However, CDOT does not always pay stipend when procuring Streamlined Design Build (Figure 4.9)
- Streamlined Design Build is generally used for projects above $10 million.

So far, CDOT has procured more than 15 Design Build projects, in which 11 Design Build projects were awarded. Figure 4.4 illustrates the distribution of the number of Design Build project procured since 2008.

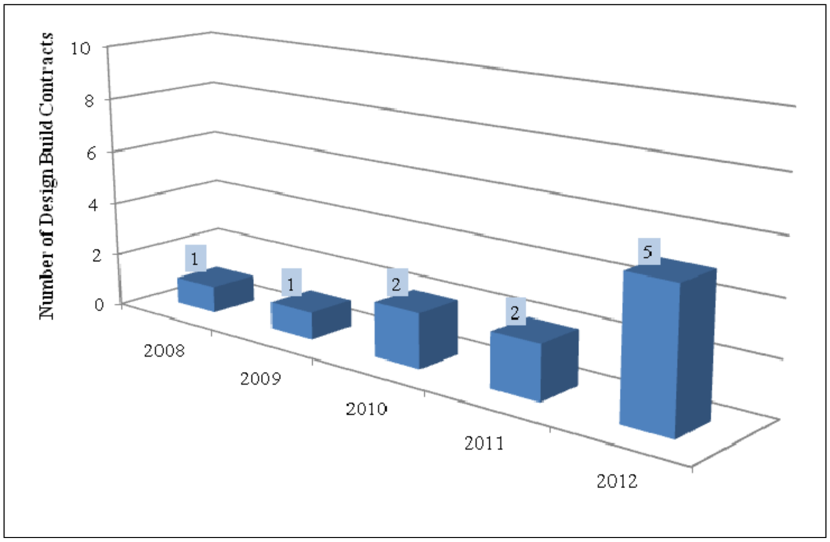


FIGURE 4.4

Number of Design Build Projects Procured Since 2008

Figure 4.5 illustrates the value of Design Build projects procured every year since 2008.

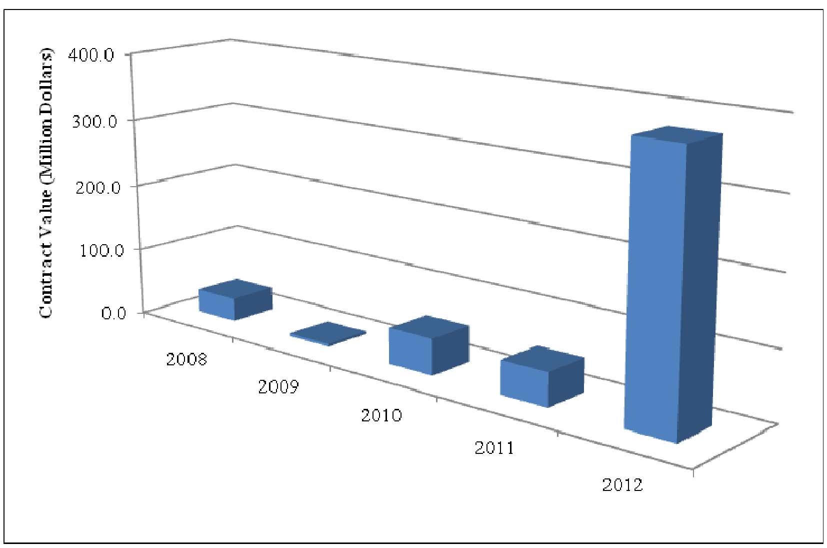


FIGURE 4.5

Contract Value ($ Million) of Design Build Projects Procured Since 2008

Figure 4.6 shows the number of Design Build projects that CDOT has procured using four authorized procurement methods described above.

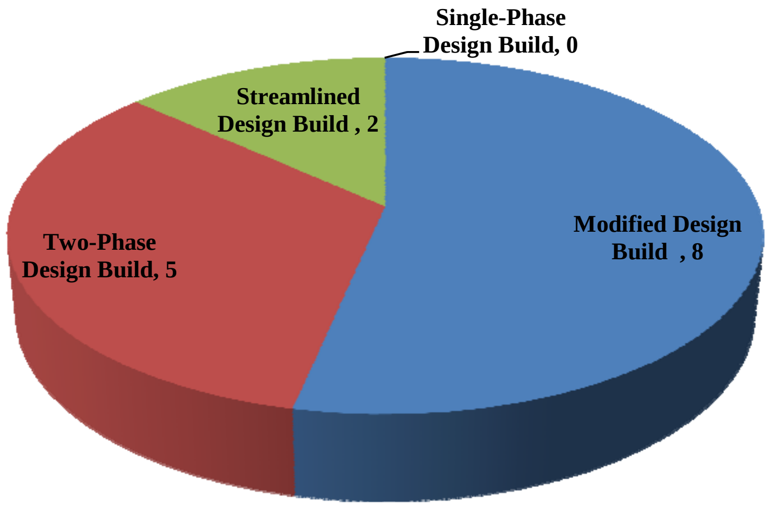


FIGURE 4.6

Types of Procurement Methods and the Frequency of Their Use

CDOT always uses shortlisting in conjunction with Two-Phase Best Value Procurement (Figure 4.7).

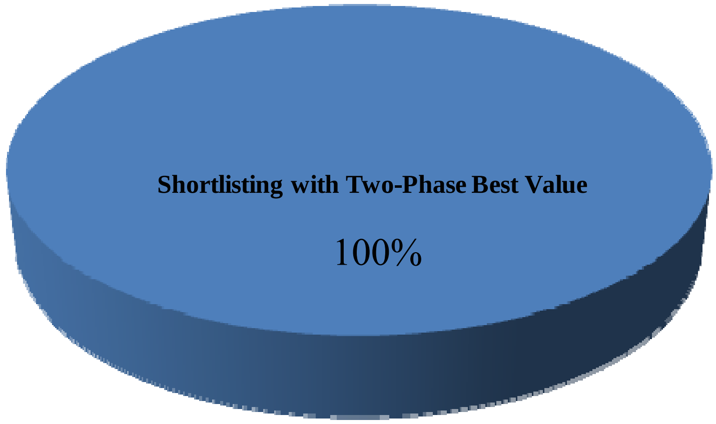


FIGURE 4.7

Shortlisting with Two-Phase Best Value

In addition, CDOT always pays stipend to non-winning shortlisted Design Build Teams (Figure 4.8).

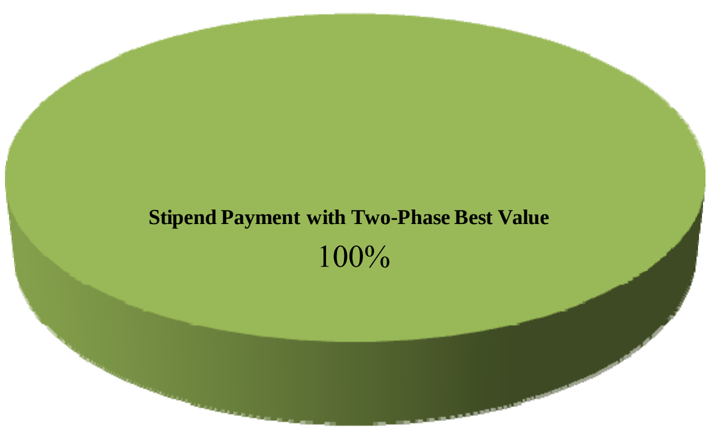


FIGURE 4.8

Stipend when Two-Phase Best Value is Used

CDOT does not always pay stipend when procuring Streamlined Design Build (Figure 4.9).

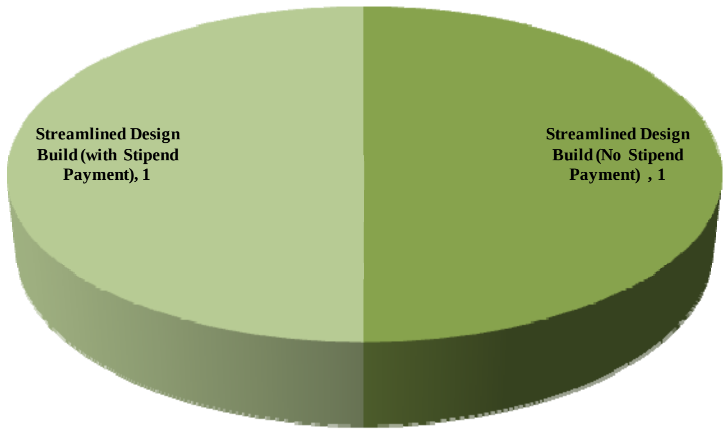


FIGURE 4.9

Stipend Payment when Streamlined Design Build is Used

3.1 Selection of Design Building Procurement Method

A Two-Phase procurement method is used for most of CDOT's Design Build projects. However, a negative response to any one of the questions below may indicate that the use of a Single-Phase procurement or Modified Design Build process would be more suitable (CDOT 2013).

- Are three or more offers anticipated?
- Will interested Design Build Teams be expected to perform substantial design work before developing price proposals?
- Will interested Design Build Teams incur a substantial expense in preparing the proposal?
- Have you identified and analyzed other contribution factors? Including:

- The extent to which you have defined the project requirements;
- The time constraints for proposal period and delivery of the project;
- The capability and experience of the potential contractors;
- The Department's capability to manage the selection process;
- Other criteria considered appropriate.

In addition, the selection of the procurement method for a Design Build project may be based on project finance options, including (CDOT 2013):

- Revenue generating projects (Tolling);
- Bonded projects;
- Public-Private-Partnership projects with funding agreements;
- Innovative Financed projects (TIFIA or Concessions).

Other considerations used in selecting the procurement methods for Design Build projects include (CDOT 2013):

- Status of right of way acquisition or potential for delays in securing parcels;
- Status of securing inter-governmental or cooperating agency agreements;
- Status of securing permits;
- Public and private utility relocation and or adjustment agreements;
- Unforeseen conditions such as hazardous materials;
- Unforeseen sub-surface or geological features;
- Constrained schedule for design, construction and completion;
- Ability to transfer, share, and manage risks;

- Ability to define the scope for both design and construction;
- Department's ability to develop, implement and support the Design Build process.

3.2. TWO-PHASE PROCUREMENT METHOD

3.2.1. REQUEST FOR QUALIFICATIONS (RFQ)

The RFQ process is the first phase of a Two-Phase procurement method and is used to solicit the Statements of Qualifications (SOQ's) from interested Design Build Teams. It is a formal and structured process which must comply with **F**ederal Regulations, State Statute, and the Colorado Code of Regulations. The RFQ shall be published at least 45 days prior to the anticipated date for award of a contract. Interested Design Build Teams are required to submit a SOQ in response to the RFQ by a specified cut-off date identified in the RFQ. The RFQ typically includes (CDOT 2013):

- A scope of work;
- A description of the elements (i.e., sections) that will be evaluated;
- The basis and factors upon which the most highly qualified Firms will be determined;
- Other requirements as determined.

Typically, the RFQ consists of eight (8) sections (CDOT 2013):

- Introduction;
- Background Information and the RFQ Process;
- Required Content of the Statement of Qualifications and Confidentiality;
- Statement of Qualification Submittal Requirements;
- Evaluation Process;
- Phase Two of the Procurement Process – the Request for Proposals;

- Protest Procedures;
- Submittal Forms.

3.2.2. Developing Evaluation Criteria

The SOQ submitted by the interested Design Build Team should address the following key points (CDOT 2013):

- The qualifications of the Design Build Team;
- The key personnel;
- Information of the Design Build Team's technical approach;
- Other information required by the RFQ.

CDOT evaluates the Design Build Teams' SOQs based on the evaluation criteria specified in the RFQ. The evaluation criteria selected for use should be aligned with CDOT's requirements for the project. They should focus on evaluating Design Build Teams' ability to perform the work. With this in mind, it is also important that CDOT avoid setting RFQ requirements that are so restrictive that few, if any, Design Build Team can meet. CDOT assigns weights to the individual criteria according to their relative importance to the successful completion of the project.

SOQ criteria focused on the Qualifications of the Firm are (CDOT 2013):

- Capabilities
    - Financial capacity
    - Resource capacity and availability
    - Staff available (Project Manager, Design Manager, Construction Superintendent, Quality Manager, etc.);
    - Specialized design capability for the key project elements;

- Specialized construction capability for the key project elements;
- QA/QC organization;

- Experience
  - Corporate experience with Design Build contracting;
  - Experience with formal partnering activities
  - Experience in similar types of work
  - Experience in the execution of fast-track projects;
  - Experience with complex construction staging, traffic control, site conditions;
  - Specialized expertise that reduces risk and assures quality of work
- Past performance on awarded contracts (completion, liquidated damages, quality, claims, fines, schedule)
- History of performance (unsubstantiated claims, fines, suits, quality, accuracy, schedule)
- Current work load on specific issues pertinent to the Design Build project;
- Project team organization;
- Bonding record or proof of bonding ability
- Understanding of local environment
- Legal and Financial disclosure.

SOQ criteria focused on the Key personnel are (CDOT 2013):

- Individual experience of team members with Design Build contracting;
  - Minimum qualification requirements for key members;
  - Key member resume;

- Experience in the execution of fast-track projects;
- History of the proposed team working together;
- Specialized design capability for the key project elements;
- Specialized construction capability for the key project elements;
- Experience with complex construction staging, traffic control, site conditions;
- Construction team member safety records;
- Specialized expertise that reduces risk and assures quality of work

SOQ criteria focused on the Information of the Design Build Team's technical approach are:

- Approach and understanding of the project;
- QC/QA approach;
- Scheduling and control systems to track and manage project

3.2.3. Evaluation of Qualifications

CDOT should start the evaluation of the deadline for SOQ submission and complete the process within 60 days. The SOQ evaluation process begins immediately after the submittal date identified in the RFQ. The evaluation process has two steps. The initial step determines responsiveness according to the requirements of the RFQ. This evaluation process is on a pass/fail basis. SOQs receiving a "pass" proceed to the next step. SOQs receiving a "fail" are rejected and returned. Design Build Teams that have failed in the initial evaluation step can protest CDOT's decision by following the procedure specified in the RFQ (CDOT 2013).

The second step of the SOQ evaluation process is a scoring or ranking step where the SOQs submitted by responsive Design Build Teams are measured and ranked against the evaluation criteria set forth in the RFQ (CDOT 2013). The evaluation process is conducted by an "Evaluation Board." The evaluation board members are individuals experienced in a broad array of areas of project delivery. There are board members that can use any of the two established standard methods for SOQ evaluation: the Numeric SOQ evaluation method where proposals are given a numeric score used for ranking and, the Adjectival SOQ evaluation method where categorizes of acceptance are described and used for rank. Regardless of the approach used, the entire evaluation board must be brought together for training in the evaluation process (CDOT 2013). In addition, the evaluation process should be completed with the entire board present. This approach provides the best opportunity for sharing the expertise and reducing the required time for outside research.

3.2.4. SHORTLISTING

CDOT may choose to "Shortlist" responsive Design Build Teams based on their SOQ scores. The maximum number of Firms to be shortlisted and invited to submit a proposal in response to the RFP shall be specified in the RFQ. The minimum number of shortlisted Design Build Teams shall be 2 firms (CDOT 2013). Federal guidelines recommend that State DOTs should shortlist 3 to 5 firms.

If CDOT decides to shortlist the responsive Design Build Teams, a formal ranking document must be developed and provided to the Chief Engineer for review and approval. Authorization to post or release ranking results, or to issue any ranking notification documents is made by the Chief Engineer. CDOT sends to all Design Build Team that have submitted their SOQs a record of shortlisted Design Build Teams (if any). The Department also publishes the list on its Design Build website.

Once the SOQ evaluation is completed, the Chief Engineer, or a designee, notifies all responsive Design Build Teams of their ranking, and invites those shortlisted to submit a proposal in accordance with the RFP. Only firms that have been shortlisted during the RFQ process are allowed to submit a proposal in response to the RFP. CDOT assumes no obligations, responsibilities and liabilities, fiscal or otherwise, to reimburse all or part of the costs incurred by the parties responding to any RFQ (CDOT 2013). All such costs shall be borne solely by each Design Build Team.

3.2.5. REQUEST FOR PROPOSALS (RFP)

The Request for Proposals (RFP) is the second phase of a two-phase procurement process and solicits proposals from short-listed firms. This process, similar to the RFQ process, must follow Federal Regulations, State Statute, and the Colorado Code of Regulations (CDOT 2013). The Department must receive approval from FHWA to release the Final RFP.

CDOT should issue the RFP as soon as possible and no later than 90 days after the completion of the RFQ evaluation and shortlisting process (CDOT 2013). To assist development and definition, the RFP process may be undertaken in two steps. Where this is desired, a “draft” RFP is issued followed by a “final” RFP. If a “draft” RFP is issued first, the date for issuing the “final” RFP shall be extended the same amount of time as that used for the draft RFP process. In the RFQ, CDOT should elaborately describe the timeline for issuance of RFP.

Colorado Code of Regulations stipulates 15 required items for inclusion in all RFP’s. They include (CDOT 2013):

- Scope of work;
- Instructions;
- Bid proposal forms;
- Provisions for contracts;
- General and special conditions;
- Basis for evaluation of proposals;
- Procedures to be followed for submitting proposals;

- Criteria for evaluation of proposals and their relative weights, and the procedures for making awards;
- Proposed terms and conditions for the Design Build contract;
- Description of the drawings, specifications, or other submittals to be submitted with the proposal, with guidance as to the form and level of completeness of the drawings, specifications, or submittals that are acceptable;
- Schedule for planned commencement and completion of the Design Build contract;
- Budget limits for the Design Build contract (if any);
- Requirements for performance bonds, payment bonds, and insurance;
- Amount of the potential Stipulated Fee (Stipend); and
- Any other information that CDOT in its discretion chooses to supply, including without limitation, surveys, soils reports, drawings or models of existing structures, environmental studies, photographs, or references to public records.

The RFP shall specify the minimum requirements to be met by Design Build Teams' proposals. The proposals must be received by CDOT by the deadline specified in the RFP, which shall not be less than 10 days after issuance of the RFP (CDOT 2013).

The proposals submitted by the Design Build Teams shall include two separate components: a Technical Proposal, and a Price Proposal. The Technical Proposal shall include all information requested in the RFP. The Price Proposal shall include a price for the completed project, and a price for each salient feature of the project if so specified in the RFP.

The Technical Proposal and Price Proposal are evaluated separately, in accordance with the evaluation factors and process set forth in the RFP (CDOT 2013). CDOT opens the Price Proposal only after the completion of Technical Proposals. CDOT should complete the proposal evaluation process and select the Design Build Team to be awarded the contract under the RFP within 180 days after the deadline for submitting the proposals. If a Best and Final Offer (BAFO) is requested, the date for selection shall be extended the same amount of time as that used for the BAFO process.

3.2.6. Pre-proposal Conference

Pre-proposal conferences are informal group meetings intended to provide all Design Build Teams with critical information regarding the project and/or procurement process. Pre-proposal conferences may be mandatory or optional as stated in the Instruction to Design Build Teams (ITP) and RFP. The draft ITP identifies the date, time, and location of the meeting, and state whether the meeting is mandatory. Typically, the pre-proposal conference is held immediately after the release of the draft RFP and draft ITP.

3.2.7. Industry Review Meetings

Industry review meetings are held with the individual Design Build Teams and not in a group setting. The meetings provide CDOT and Design Build Teams to discuss questions and issues concerning the procurement documents as well as questions related to Alternative Configuration Concepts (ACCs) and Alternative Technical Concepts (ATCs). Industry review meetings are held after release of the draft RFP and draft ITP. These draft documents shall disclose the dates, times and locations of the meetings. Depending on the characteristics of the project, CDOT may hold two to three meetings with each Design Build Team.

3.2.8. Pre-Proposal Submittals

The pre-proposal submittal is used as a precursor to One-on-One Meetings and takes place before release of the Final RFP. All Design Build Team are requested to submit their Alternative Configuration Concepts (ACCs) and Alternative Technical Concepts (ATCs) to the Department for review and consideration in preparation of the One-on-One Meetings. The draft ITP identifies an estimated date for the submittal of pre-proposal documents.

3.2.9. ONE-ON-ONE MEETINGS

CDOT uses one-on-one meetings in order to discuss with Design Build Team their submitted ACCs and ATCs. This process begins immediately after release of the Final RFP (CDOT 2013). The Final RFP and Final ITP identify an estimated schedule for release of any potential addendum to the documents based on outcomes of one-on-one meetings. The final RFP and final ITP also identify the estimated schedule for these meetings. One-on-one meetings shall be held separately with all Design Build Teams that have received RFP.

If the meetings or responses to inquiries result in material changes to the scope of work, or otherwise affect the manner or form of the response, all Design Build Teams known to be participating should be notified in writing of any such change. When such written notice is issued, Design Build Teams are given a reasonable amount of time to review the revised materials, to contemplate any potential impact on their proposals and to consider the content for inclusion in their proposals.

One-on-one Meetings are undertaken with complete confidentiality. CDOT does not disclose information on details of the competing RFP proposals (CDOT 2013). In other words, CDOT does not hand over any information about a Design Build Team's proposed construction techniques, processes, and strategies. Further, CDOT does not engage in auction techniques, during such formal discussions. "Auction techniques" include: (a) indicating to a Design Build Team a cost or price it must meet to obtain further consideration; or (b) advising a Design Build Team of its price standing relative to others; or (c) otherwise furnishing information about other Design Build Team's prices.

3.2.10. FINAL RFP

The final RFP is created by compiling the information and input gathered during all previous phases. The final RFP reflects all potential changes to the scope of work that is resulted from the industry review process following the release of draft RFP and draft ITP. Refinements in scope and price of the project do not invalidate the process (CDOT 2013). For risk management purposes, CDOT releases the final RFP after receipt of the signed NEPA Decision Document. The final RFP is accompanied by the final ITP.

3.2.11. Final ITP

The ITP fulfills the "instructions" requirement of the RFP, and details the process by which the Design Build Teams responds to the RFP. It provides an Introduction, Proposal Process, Proposal Requirements, Evaluation Criteria, Procurement Requirements, Forms, and other pertinent instructions to Design Build Teams which were shortlisted during the RFQ process. The final ITP accompanies the final RFP, and also reflects potential changes in the scope of work. The final ITP identifies the anticipated "Notice to Proceed" date and a Procurement Schedule by which participating Design Build Teams shall prepare and submit their proposal.

3.2.12. Evaluation of Proposals

For each project, CDOT establishes an RFP Technical Review Process. A defensible evaluation process requires the method and procedure to be developed, documented, and accepted by the Executive Oversight Committee, before the release of the RFP (draft and final). The nature of the elements being evaluated, and the evaluator's qualifications shall be considered when selecting members of the Proposal evaluation team.

CDOT may choose to utilize any of the two established standard methods for evaluating Design Build Teams' proposals. The Numeric Proposal Evaluation process where proposals are given a numeric score used for ranking and, the Adjectival Proposal Evaluation process where categories of acceptance are described and used for rank (CDOT 2013).

Numerical Proposal Evaluation

Key Members of Evaluation and Selection Organization under numerical proposal evaluation include:

- Executive Oversight Chairperson
- Executive Oversight Committee
- Evaluation Committee (EC) Chairperson
- Evaluation Committee (EC)
- Technical Subcommittees
- Facilitators
- Assistants

The general procedures for the numerical proposal evaluation contain following steps.

- Responsiveness Review: The responsiveness review is conducted on a pass/fail evaluation basis. The EC Chairperson or designee(s) and assistants review Design Build Teams' proposals for responsiveness based on the pass/fail criteria set in the RFP. The EC Chairperson or designee(s) also determine whether the Design Build Team properly incorporated any Alternative Configuration Concepts (ACCs) into its proposal. The Basic/Temporary Configuration Subcommittee determines responsiveness to the Basic and Temporary Configuration proposal requirements.
- Technical Proposal Evaluation:
  - The Technical Subcommittees review the Technical Proposals.
  - The Technical Subcommittees develop strengths and weaknesses findings.
  - The Technical Subcommittees determine the Technical Proposal scores.
  - The Additional Requested Elements (ARE) Subcommittee determines the ARE scores for each Proposal.

- The Technical Subcommittees present the strengths and weaknesses findings and Technical Proposal scores to the EC.

- The EC confirms the Technical Subcommittees' strengths and weaknesses findings and Technical Proposal scores or provides direction to subcommittee(s) to review findings based upon EC input.
- The EC determines the composite scores for each Proposal.
- The EC determines the Best Value recommendation.
- The EC presents to the Executive Oversight Committee the summary Proposal Evaluation Findings Report and Best Value recommendation.
  - Executive Oversight Chairperson Determination: The Executive Oversight Chairperson determines whether to request the EC review their findings, award the Contract, request BAFOs or to reject all Proposals.
  - Best Value Determination with Numerical Technical Proposal Evaluation: Award of the project shall be based on a Best Value determination defined by a Fixed Price-Best Design approach. The Fixed Price is defined as the Guaranteed Maximum Price. The Best Design is determined by the Design Build Team that achieves the highest proposal score. Selection is based upon the highest scored proposal and represents the best value to CDOT.
- In cases where two or more Design Build Teams include all AREs in their proposals at or below the Guaranteed Maximum Price, and their total scores are greater than all other Design Build Teams' scores, the Best Value determination is based upon the lowest score defined by dividing the Design Build Team's price by the proposal score.

Adjectival Proposal Evaluation

Key Members of Evaluation and Selection Organization under Adjectival Proposal Evaluation include:

- Selection Official (SO)
- Proposal Evaluation Board (PEB)
- Technical Composite Team (TCT)
- Technical Evaluation Teams (TET)
- Price Evaluation Team (PET)
- Contracts Management Group (CMG)
- Technical Advisors
- Observers

The general procedures for the Adjectival Proposal Evaluation contain following steps.

- CMG receives Proposals; reviews and distributes items for responsiveness reviews; separates Technical and Price proposals; prepares the proposals for evaluation.
- Responsiveness reviewers may request items for discussions.
- CMG/TET Leaders distribute technical proposals to Technical Evaluation Teams.
- CMG provides "blind" price proposals to PET.
- Technical Evaluation Teams may provide items for discussion to PEB Chairperson.
- PEB Chairperson decides whether or not to submit technical clarification requests to Design Build Teams.
- PET may provide items for discussion to CMG.

- CMG decides whether or not to submit price proposal clarifications to Design Build Teams.
- TET provides technical rating recommendations to the TCT.
- TCT may provide items for discussion to PEB Chairperson; reviews technical proposal ratings recommended by TET; assigns ratings for the technical factors and provides rating recommendations to PEB.
- PEB, considering TET recommendations, reviews and assigns overall rating to technical proposals.
- PET evaluates price reasonableness, develops price evaluation report, and submits to PEB.
- PEB receives price evaluation report from PET and reviews price proposals.
- PEB performs integrated assessment of price and the ratings of the technical proposals and PEB Chairperson recommends selection of the Design Build Team providing the best value to CDOT, negotiations, BAFOs or rejection of all Proposals; PEB prepares and submits to the SO a PEB report fully documenting the recommendation.
- SO presents the recommendation from the PEB Chairperson to the governing body for approval.

3.2.13. STIPEND

In case that the project solicitation is not cancelled (i.e., the project is awarded to a Design Build Team) CDOT, may pay a stipend to Design Build Teams that submit responsive proposals, but are not awarded the Design Build contract (CDOT 2013). Whether a stipend is paid, and the amount, if any, shall be identified in the RFQ and RFP.

When a stipend is specified in the RFQ and RFP, the submission of a proposal in response to the RFP shall constitute the firm's acceptance of the stipend as full payment for all technical solutions and design concepts contained in the proposal. The transfer of solutions and design concepts contained in the proposal to CDOT is irrevocable. The Design Build Teams do not have the option of refusing the stipend and not transferring ownership of all technical solutions and design concepts contained in the proposal. CDOT owns and has the unlimited right to use all or part of the technical solutions and design concepts contained in the proposal on any transportation project. No Stipend is paid to the selected Design Build Team if the award is not consummated due to failure of the selected Design Build Team to provide the items specified in the RFP.

3.2.14. Alternative Configuration Concepts or ACCs

CDOT encourages Design Build Teams to propose alternatives to the Basic Configuration, Temporary Configuration, Additional Requested Elements (AREs), and changes to the Quality Management, Geotechnical and Pavement (excluding pavement types), Earthwork, Drainage, Roadways, Structures, Maintenance of Traffic, Public Information, and Architectural Requirements that are equal or better in quality or effect (as determined by CDOT in its sole discretion). These recommendations are categorized as "Alternative Configuration Concepts" or "ACCs". Other RFP sections are not subject to the ACC process (CDOT 2013).

The Basic Configuration and Temporary Configuration are Contract requirements except to the extent that they are superseded by pre-Approved ACCs. Changes to the Basic Configuration, Temporary Configuration, AREs or portions of AREs or to the Quality Management, Geotechnical and Pavement (excluding pavement type), Earthwork, Drainage, Roadways, Structures, Maintenance of Traffic, Public Information, and Architectural Requirements is not permitted unless they have been Approved by CDOT under the ACC process. Except for incorporating Approved ACCs, the Proposal may not otherwise contain exceptions to or deviations from the requirements of the RFP (CDOT 2013).

An ACC submission must include:

- A narrative description of the ACC;
- The locations where the ACC is used on the project;
- Conceptual drawings of the ACC, if the ACC affects drawings.
- An analysis of the cost savings and any other benefits of implementing the ACC.
- An explanation of why the proposed change is equal or better in quality.

If an ACC requires governmental approvals, the Design Build Team has full responsibility for obtaining all such approvals. If any required approval is not subsequently granted with the result that the Design Build Team must change its approach to meet the original requirements of the contract document, the Design Build Team is eligible for a change order that increases the contract price or extends the completion deadlines.

CDOT reviews all submitted ACCs, and return verbal comments, as determined in CDOT's sole discretion, to each Design Build Team during the one-on-one meeting. CDOT returns written comments by a date specified and listed in the RFP. The process is absolutely confidential based on one-on-one meetings. In most cases, CDOT provides the immediate feedback to the teams in terms of approving or dismissing the proposals. In some cases, when more deliberation and discussions with the specialty areas are required, the teams receive the feedback later in writing. As long as CDOT pays stipend, the ideas and proposals offered to CDOT from both winning and losing Design Build Teams is CDOT’s idea that can be used in that specific project as well as other projects.

Comments on ACCs should be limited to one of the following statements:

- The ACC is Approved;
- The ACC is not Approved; and

- Identification of any conditions, which must be met in order to approve the ACC.

The Design Build Team may incorporate zero, one, or more approved ACCs as part of its proposal. If a Design Build Team incorporates an ACC with conditions into its proposal, the Design Build Team shall be responsible to comply with the ACC conditions if awarded the Contract. Copies of CDOT's ACC approval letters for each incorporated ACC shall be included in the proposal. Except for incorporating approved ACCs with conditions at Design Build Team's risk, the proposal may not otherwise contain exceptions to or deviations from the requirements of the RFP.

3.2.15. ALTERNATIVE TECHNICAL CONCEPTS OR ATC'S

Design Build Teams shall submit Technical Approaches to any Structures not historically used by CDOT. CDOT does not permit Design Build Teams to use technical approaches that vary from what is historically used by CDOT, unless the Design Build Team has already received CDOT's approval (CDOT 2013).

A technical approach submission must include:

- A narrative description of the technical approach.
- Conceptual drawings of the technical approach, if the technical approach affects drawings.

CDOT reviews all submitted ATCs and, in its sole discretion, return verbal feedback to each Design Build Team during the one-on-one meeting. CDOT also returns written comments by a date specified in the RFP. After the completion of industry review, CDOT should prepare and transmit official responses to ATCs. CDOT should also prepare and release an amended final RFP and final ITP to Design Build Teams.

It should be noted that CDOT does not use ACC and ATC for Low Bid Design Build projects. However, with Streamlined Design Build, there is opportunity for using ACC and ATC.

4. IDENTIFYING AND ALLOCATING RISK

There are two categories of risk in Design Build: "Contract Risk" and "Technical Risks". With Design Build Project Delivery System, the Department can use performance provisions which enable the allocation of each project risk to the party most capable to manage the risk. There is a cost to risk, regardless of which party it is assigned and allocated to. When assigning and allocating risk, consideration must be given to:

- Which party, the Department or Design Build Team, can best manage the risk?
- How much is the Department willing to pay the Design Build Team to take the risk?

The process of risk assessment, assignment, and allocation can be initiated by review of:

- The project goals; and
- The tasks required to define the project scope.

There are various risks associated with each goal and each task. The assignment and allocation of these risks affects project development process as well as its outcome. Once specific project goals and tasks are identified, the risk allocation process can be continued based on the response to two critical questions:

- What is the likelihood (high or low) of the risk occurring?
- What are the consequences (catastrophic, manageable, or negligible) of the risk?

The Department typically includes definition, assignment, and allocation of risk in the contract for items such as:

- Acceptance of work;
- Errors and Omissions;
- Sub-contracting;

- Labor disputes;
- Force Majeure;
- Professional Engineering Services and Liability for design;
- Contract changes;
- Performance;
- Claims;
- Ownership of ideas;
- Differing or changed site conditions;
- Hazardous materials;
- Cultural resources;
- Endangered species;
- Permit requirements;
- Utility relocations;
- QC/QA responsibilities;
- Incentives/disincentives;
- Liquidated damages;
- Payment methodology.

5. RIGHT-OF-WAY

As a general rule, CDOT remains in full ownership and control of all actions concerned with Right of Way (ROW) acquisition. Regardless of the size of project, CDOT generally tries to acquire as much ROW as soon as possible so that the burden and risk transferred to the Design Build Team is reduced.

Because the Department provides conceptual designs rather than final designs, the ROW acquisition process follows a specialized approach. Right of Way Plans consist of “Preliminary Parcel Impact Maps” which are developed from “County Assessor Maps” and the “Conceptual Design Roadway Plan Sheets”. These maps identify the parcel owner and the type of impact (total take, partial take, or permanent easement). The Design Build Team must hire and retain as its key personnel, experienced individuals who are familiar with CDOT policies and procedures concerning ROW acquisition. To ensure compliance and intent, the Design Build Team shall also:

- Request authorization for all “Temporary Easements”;
- Prepare and document appraisals, or “Value Findings”;
- Submit appraisals and value findings for review and approval;
- Complete a Phase 1 Environmental Assessment for easements not identified in the “NEPA Clearance Document”;
- Document all actions, meetings and negotiations undertaken for temporary easements;
- Ensure “Key Personnel” communicate with design and construction forces to maintain compliance with Temporary Easement processes and restrictions.

The Department’s conceptual design must completely fall within the ROW identified on the plans and preliminary parcel impact maps. To allow innovation and flexibility**,** horizontal and vertical tolerances should be specified in the contract. These tolerances must also be accounted for in the Department’s preliminary parcel impact maps.

ROW services are not generally included in the contract. So far, the amount of ROW acquired by CDOT for Design Build projects has always been sufficient. In case more ROW is required based on ATC or ACC submitted by the Design Build Teams, the burden for ROW services is on the Design Build Team. In that case, they have to budget for acquisition services. However, the acquisition remains under the control and direction of the Department. These risks include:

- Meetings;
- Investigations;
- Clearances;
- Permits, delays;
- Damages and all other associated actions;
- Costs and expenses necessary to acquire the impacted parcel.

6. Environmental

The conceptual design and contract supplied by CDOT provide for horizontal and vertical variance in order to provide the Design Build Team with the opportunity to develop an efficient final design. Nevertheless, the variations in the horizontal and vertical alignments in turn affect environmental mitigation measures. The mitigation measures are the responsibility of the Design Build Team to prepare, document, implement, and maintain until acceptance.

To ensure environmental compliance, the Department's environmental manager and project manager must work together in the development of the project scope and RFP, and during the administration of the contract. The Department must provide a thorough scope with clear definition and risk assignment for all environmental activities. The NEPA decision document must be complied with along with all regulatory and permitting requirements. Clear scope and definition must be provided to identify all required permits, and the party responsible for securing the permits. The risk of implementing, maintaining, and documenting permit requirements must be defined.

CDOT can issue the draft RFP before acquiring the NEPA documents and approvals. However, before issuing the final RFP, CDOT has to have the environmental documents approved. Typically, after shortlisting, CDOT issues a draft RFP so that the shortlisted teams can review it and ask for clarifications. The final RFP is issued after the draft and it can only be issued after all environmental documents are approved.

Pre-existing hazardous materials present a risk to both parties. The Department should make every effort to identify the type, location, and quantity of pre-existing hazardous materials that may be encountered. These efforts, along with the unknown, still present significant risks. The Department's approach to managing these risks is to include in the contract a "Force Account" method to compensate all related cost (for identified and unidentified locations) of pre-existing hazardous materials.

7. UTILITIES

The Department's standard utility process should be followed and provided in the scope development. This includes identification of the utility by owner, plan and profile location, requirement for relocation and/or adjustment, and all owner stipulated design and construction requirements.

A schedule or matrix for relocations or adjustment should be provided and kept up to date. It should identify the party responsible to perform the work and the schedule by which the work should be completed. The Utility Agreements or their draft, and the matrix should be included in Technical Requirements.

Dimensions of utilities are often difficult to verify. When actual dimensions vary from scoped dimensions, the amount of work required is affected. The Contract should clearly define thresholds and criteria for adjusting contract payments under these conditions.

The Department should secure all Utility Permits prior to release of the final RFP.

Section 43-1-1411(3)(a) of the Colorado Revised Statutes was created for the Design Build process, and allows the Design Build Contractor to perform utility work when the utility owner is unable or unwilling. The Design Build Contractor must use the services of a pre-approved contractor. The Department's "Utility Agreement", which is referenced in the contract, discloses the conditions for allowing this non-owner work, and the list of pre-approved contractors.

Early participation with all utility companies allows securing buy-in and resolving issues related to budgeting, scheduling, work assignments and formation of the Project Specific Utility Relocation Agreement s (PSURAs).

The RFP should emphasize that the Design Build contractor shall:

- Show all proposed utility relocation designs on the project plans (utility owner and Design Build Team);
- Field survey and locate all utilities;
- Provide location information for all utility relocations;
- Complete "as built" drawings for all utilities;
- Require a "Utility Pre-Bid Conference";
- Require scheduling, verification and documentation of all utility work completed on the project (owner and Design Build Team); and
- Require coordination meetings between the Design Build contractor and utility owner.

8. ORGANIZATION FOR DESIGN BUILD PROJECT PROCUREMENT

There are major two components in the Design Build project procurement organization: regional office and central office. Typically, the regional office plays the main administrative role on the Design Build project over the procurement process. The central office participates in the selection committee and tracks the progress for the purpose of the gathering information and disseminating it among other regions. It is the regional offices and chief engineer that make the key decisions. The chief engineer is the major player on the headquarters side that is involved with the Design Build projects. The central innovative project delivery office generally establishes the link between the regional offices so that they could share information and expertise. In this sense, the central office mostly has an educational role and helps the regional offices acquire the knowledge and expertise they may need for delivering their projects.

If a project is delivered by Modified Design Build, it is administrated by the regional offices. Nevertheless, the procurement activities (advertisement, writing contract, etc.) for these projects are done in coordination with the central office. For the large and complex projects, all of the operations are done at the regional office level in coordination with the Chief Engineer. They issue the letter of interest, develop and publish RFQs, chose the selection panel members, perform the shortlisting, post the RFP and pay the stipend out of their regional office. These are mostly done with the help of consultants.

9. PROJECT EVALUATION PRACTICE

The project teams have to submit reports of lessons learned and best practices at the mid-point of the project as well as the end-point of the project. These are the only sources of information that can be used for evaluating the success of Design Build projects. There are also best practices meeting that are held at the end of the projects that are used for discussing the issues and the strategies used for addressing these issues.

FLORIDA DOT

1. BACKGROUND

In 1995, the Florida Legislature authorized the Department to use the Design Build process (Design Build Major: Section 337.11(7), F.S.) on buildings, major bridges, and rail corridor projects. In 1996, this authority (Design Build Minor: Section 337.025, F.S.) was further expanded to include all project types as a part of the "innovative" practices package. The Department is required to comply with the annual contracting monetary cap set by the statute for innovative projects let under Section, 337.025, F.S. (FDOT 2012).

For Design Build Major, Section 337.11(7), F.S. provides: “If the head of the Department determines that it is in the best interests of the public, the Department may combine the right of way services and design and construction phases of any project into a single contract, except for a resurfacing or minor bridge project, the right of way services and design and construction phases of which may be combined under Section 337.025, F.S”. However, construction activities may not begin on any portion of such projects until title to the necessary rights-of-way and easements for the construction of that portion of the project have vested in the State or a local governmental entity and all railroad crossing and Utility Agreements have been executed. Title to rights-of-way is vested in the State when the title has been dedicated to the public or acquired by prescription” (FDOT 2012).

So far, FDOT has procured numerous Design Build projects. Figure 4.10 illustrates the distribution of the number of Design Build projects procured since 2000.

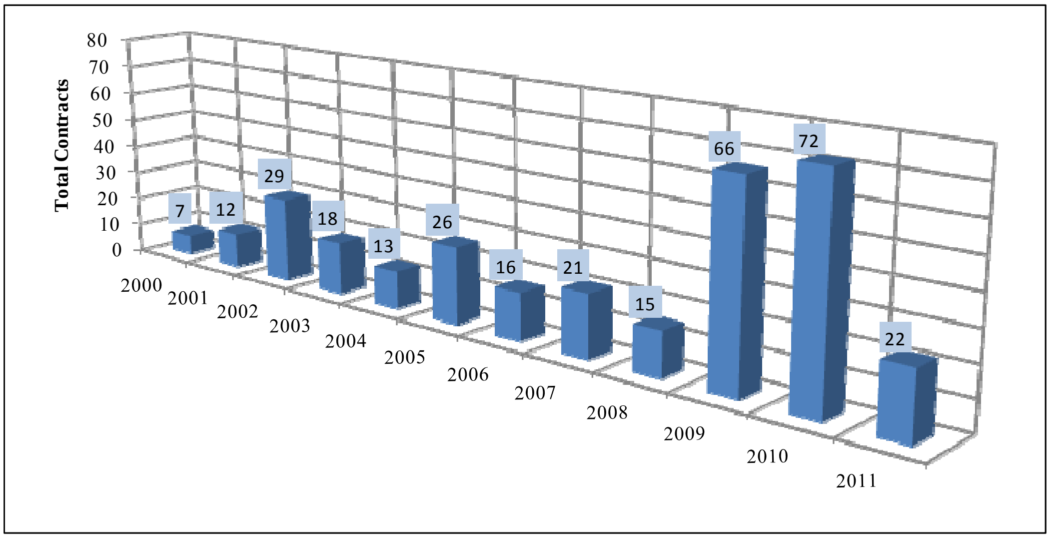


FIGURE 4.10

Number of Design Build Projects Procured Since 2000 Using Low Bid and Adjusted Score Procurement Methods

Figure 4.11 illustrates the value of Design Build projects procured every year since 2000.

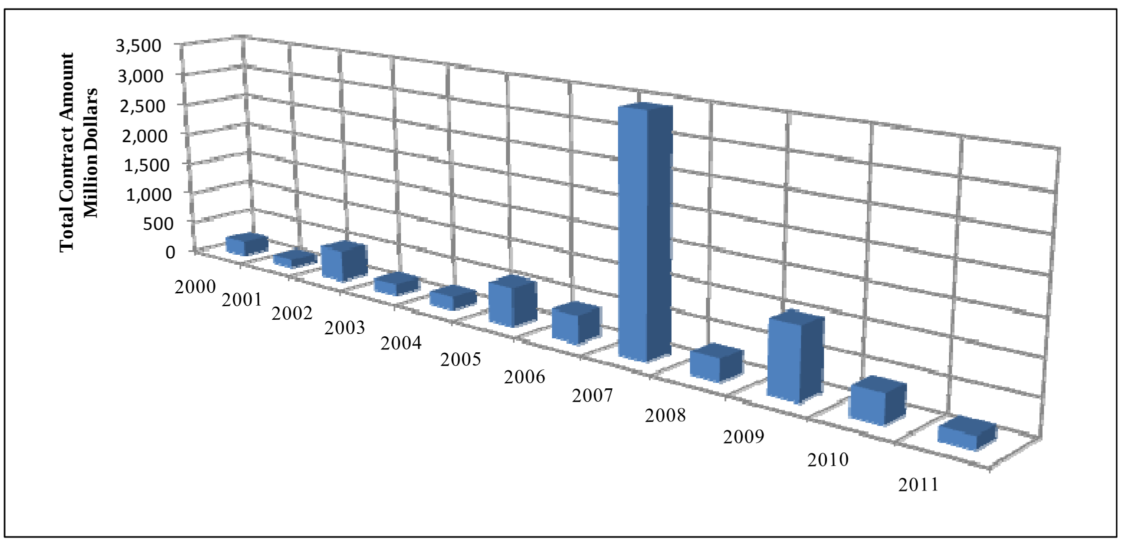


FIGURE 4.11

Contract Value ($ Million) of Design Build Projects Procured Since 2000 Using Low Bid and Adjusted Score Procurement Methods

Figure 4.12 shows the number of Design Build projects that FDOT has procured using various authorized procurement methods (i.e., Low Bid and Adjusted Score).

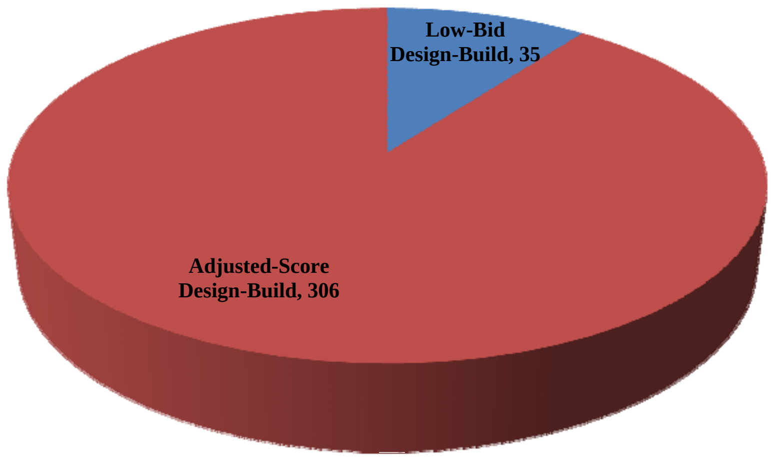


FIGURE 4.12

Types of Procurement Methods and the Frequency of Their Use

FDOT always uses shortlisting in Design Build projects procured by the Two-Phase Best Value Procurement that is based on Adjusted-Score (Figure 4.13).

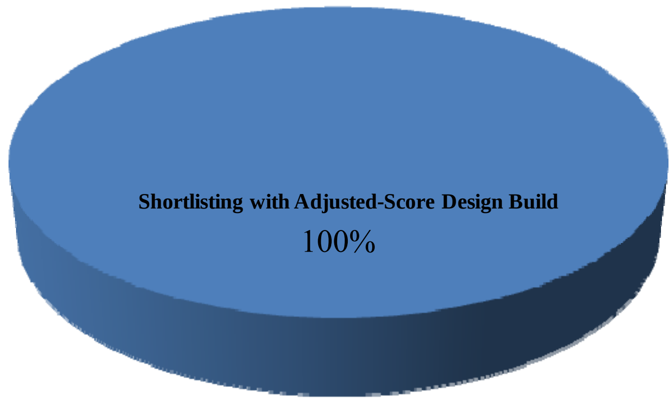


FIGURE 4.13

Shortlisting when Two-Phase Best Value is Used

In addition, FDOT always pays stipend to non-winning shortlisted Design Build Teams in Two-Phase Adjusted-Score Design Build projects (Figure 4.14).

FIGURE 4.14

Stipend when Two-Phase Best Value is Used

2. DESIGN BUILD PROCUREMENT METHOD

There are two types of Design Build projects in Florida (FDOT 2012):

- **Design Build (Major),** as authorized by Section 337.11(7), F.S., is a contracting technique, which allows the Department to combine the design and construction phases of a building (Fixed Capital Outlay (FCO) or non-FCO), a major bridge, or a rail corridor project into a single contract with an estimated cost of $10 million or more. Section 337.11(7), F.S. provides: "If the head of the Department determines it is in the best interests of the public, the Department may combine the design and construction phases of a project into a single contract, except for a resurfacing or minor bridge project, the right of way services and design and construction phases of which may be combined under Section 337.025, F.S". Such contract is referred to as a Design Build contract.
- **Design Build (Minor),** as authorized by the Innovative Contracting statute (Section 337.025, F.S.), is a contracting technique which allows road contracting projects and other types of construction projects that are not covered by Section 337.11(7), F.S. and have an estimated cost of less than $10 million. There is a statutory cap annually on all innovative contracts (statewide) currently at $120 million.
- **Design Build Finance (DBF),** Design Build Finance Project Delivery System adds in the financing mechanism into the general Design Build Project Delivery System. It is under Public Private Partnership (PPP) statute that is separated from the general DB statute. Therefore, the boilerplate documents for the Design Build and Design Build Finance are same but the enabling legislations are different. There are certain requirements in terms of the documents that they have to prepare and present including the payout plans, etc. The first project under Design Build Finance in Florida was the 400 million dollar expansion of I-75.

2.1 Approaches for Design Build Project Selection

Design Build Project Delivery System should be considered in the following types of projects (FDOT 2012):

1) Projects that demand an expedited schedule and can be completed earlier
2) Projects that require minimum Right of Way acquisition and utility relocation
3) Projects that can have a well-defined scope for all parties (Design & Construction)
4) Projects that have room for innovation in the design and/or construction effort
5) Projects with low risk of unforeseen conditions
6) Projects with low possibility for significant change during all phases of work

Examples of projects that may be good Design Build project candidates (FDOT 2012):

1) Major bridges
2) Minor bridges
3) Intelligent Transportation Systems (ITS) and computer signalized traffic
4) Intersection improvement (with known utilities)
5) Buildings-office building, rest areas, welcome stations, pedestrian overpass, etc.
6) Interstate widening
7) Rural widening
8) Fencing
9) Landscaping
10) Lighting
11) Sidewalks
12) Signing
13) Signalization
14) Guardrail

Examples of projects that may not be Design Build project candidates are listed below. Use of Design Build Project Delivery System on these type projects requires written approval by the State Construction Office (FDOT 2012):

1) Major bridge rehab/repair with significant unknowns
2) Rehab of movable bridges
3) Urban construction/reconstruction with major utility impacts, major subsoil excavation, Right of Way or other major unknowns
4) Mill and resurfacing

Resurfacing projects is can be delivered by Design Build Project Delivery System if the project satisfies the following (FDOT 2012):

1) The project should be confined to resurfacing as much as practical. There should be minimal roadway or shoulder widening that could create front slope or clear zone issues (ex. Added Turn Lane).
2) The project should not have environmental issues that require significant permitting or agency coordination.
3) The project should only have minor utility adjustments or none at all.

3. APPROACHES FOR DESIGN BUILD TEAM SELECTION

3.1. ADJUSTED SCORE DESIGN BUILD BID PROCESS (ASDB)

Adjusted Score Design Build (ASDB) means the contract award is based on the lowest adjusted score, which is determined by dividing the price proposal by the Technical Proposal score. In some cases, the price is adjusted for the Proposed Contract Time and Time Value Cost factor (FDOT 2012).

Value of Time Factor in the Technical Evaluation for ASDB: The adjusted score bid may include a bid adjustment for the value of time. This adjustment is based on the Design Build Team's proposed number of days to complete the project multiplied by a value per day established by the Department (number of days times cost/day = price proposal adjustment [increase]). This adjustment is used for selection purposes only and shall not affect the Department's liquidated damages schedule or constitute an incentive/disincentive to the contract.

The Adjusted Score Design Build (ASDB) approach may be used when overall outcomes can be clearly defined; however, a number of alternatives may exist which could provide the outcomes desired. An example of this method is a bridge project where alternative foundations, spans, and material types are acceptable.

Overall, the Adjusted Score Design Build approach is better fit for the complex projects having higher value, higher risk, and complexities with National Environmental Policy Act (NEPA), Right of Way (ROW) as well as more involvement of permitting agencies and other local agencies. The technical score plays a hefty role in deciding the contract award.

3.1.1. PRE-QUALIFICATION

Pre-qualification is needed for the Adjusted Score Design Build (ASDB) approach. Pre-qualification requirements for Design Build Advertisements for the contractor and design consultant members of the Design Build Team must be in accordance with the following (FDOT 2012):

1) Contractors submitting as a lead or prime with the Design Build Team must be qualified in all advertised construction contractor work classes. In this case, where the design consultant is not the lead of the Design Build Team, the design consultant is utilized to meet the advertised Professional Services Work Type requirements. The design consultant may utilize sub-consultants to meet the advertised Professional Services Work Type requirements.
2) Design consultants submitting as lead or prime with the Design Build Team may utilize subcontractors to meet all advertised construction contractor work class requirements.

The design consultant may utilize sub-consultants to meet the advertised Professional Services Work Type requirements.

3) When a joint venture party submits a Letter of Interest, one of the contractor members of the joint venture party must be assigned to meet the advertised construction contractor work class requirements. In this case, the Design Build Team is utilized to meet the advertised Professional Services Work Type requirements.

For Fixed Capital Outlay (FCO) building projects that are developed by Design Build Project Delivery System, the pre-qualification requirements for contractors include:

- Applicable Contractor License;
- State Corporate Charter Number, if Corporation; and
- Added requirements, if necessary for specialized needs.

3.1.2. Development of Design and Construction Criteria for Advertisement

The development of the design and construction criteria for a Design Build project shall be undertaken by individuals knowledgeable of the contracting requirements and design consultants experienced in the application of the performance criteria appropriate to meet the facility needs. It is essential to the success of the project that the Proposal Evaluators are involved in the development of the design and construction criteria. The Proposal Evaluators' early involvement is a key to smooth and timely procurement of Design Build services (FDOT 2012).

The Districts shall use the approved RFP as shown on the State Construction Office web page. An electronic copy of the RFP, with changes clearly identified, shall be submitted to the State Construction Office on all projects for review and approval prior to submittal to short listed Design Build Teams. The intent of the State Construction Office's review is to assure these documents are in general conformance with the commitments made to FHWA and the Industry and to coordinate any suggested changes with FHWA and the Industry (FDOT 2012).

If the project is subject to FHWA oversight, the RFP shall be submitted for FHWA approval prior to authorization and release of the RFP to the short-listed Design Build Teams. It is critical that FHWA be involved throughout the development of the design and construction criteria in order to expedite FHWA's final RFP approval. Prior to sending the RFP to requesting Design Build Teams, the Department must have FHWA approval of the RFP on oversight projects.

The advertisement includes, as a minimum, the name and description of the project, the District and County location of the project, the major type(s) of work required, any minor types of work that are required for the project (but not normally associated with the major work), the estimated construction cost of the project (if applicable), how and where Design Build Teams can respond, any additional technical qualifications desired, the criteria on which Letters of Interest (LOI) is evaluated for the short-listing process, the time frames for LOI and submitting bid proposals, the number of copies to be received, how respondents is selected, and tentative dates for short-list and final selection (FDOT 2012).

The districts have the functional groups responsible for the development of the RFP documents. Depending on the nature and scope of the projects, the districts receive input from different technical groups. The central office functional areas (e.g., Geotechnical, etc.) provide assistance and feedback to the districts on the issues that the district office may need some help with. The projects are let through the 8 district offices. The procurement office is charged with the advertisement preparation, answering the technical questions and receiving the letters of interest and verifying the capability of the firms to meet the prequalification and other project requirements. The proposal evaluators review the letters of interest and create a long list of everyone who has submitted a letter of interest and meet the requirements in terms of capacity and other prequalification criteria (up to 10). They then use the criteria reflected in the advertisement to develop a shortlist and make recommendations to the selection committee. They then receive the technical proposals and evaluate them independently. They can seek input from different specialty or technical areas but there are also certain rules in terms of seeking input from the functional areas that they have to abide by. When the proposal evaluators meet, the meeting has to be public. However, when they meet with the functional areas, the meetings do not have to be public. At the end of the proposal evaluation process, each evaluator has to submit a technical score based on a variety of criteria already identified upfront based on the requirements of the project. They bring their scores to the bid opening meeting. They average the technical evaluation scores for each firm and factor that along with their bid in a formula that is reflected in the RFP. The firm with lowest adjusted score is the winner. The time-frame between receiving the technical proposal and opening the bids is typically about a month long. However, it could be longer because they typically have a question and answer session with the proposers. The Design Build teams may provide clarifications on the details of their proposals (FDOT 2012).

The RFP is advertised by the district procurement offices. There are also district and contract administration offices. Due to availability of the resources at the central and district levels, FDOT does not face significant challenges in terms of managing the load.

3.1.3. Letter of Interest (LOI)

On Adjusted Score Design Build (ASDB) projects, LOI is required from interested Design Build Teams. LOI should be sent to the Contracting Unit. The Department is required to receive at least three (3) LOI in order to proceed with the RFPs. If three (3) LOI are not received, then the Department re-advertises, or alternatively review its list of pre-qualified Firms deemed to be the most highly qualified, based on qualification data on file, past performance grades, and location. The Department then contacts each of the listed Firms and conduct similar discussion concerning the project (FDOT 2012).

3.1.4. Long-List Development by Proposal Evaluators

The Proposal Evaluators shall develop the long-list from LOI received from responding Design Build Teams. The Contracting Unit evaluates the pre-qualifications of the construction contractor(s) and design consultant members of the Design Build Team, and the capacity of the construction contractors who are members of the Design Build Team. Pre-qualifications and capacity are to be assessed by the Contracting Unit (FDOT 2012). Prior to making a determination that any Design Build Team submitting a Letter of Interest is non-responsive on the basis of prequalification or capacity, the Contracting Unit shall contact the Prequalification Specialist of the State Construction Office. The appropriate Contracting Unit provides the Proposal Evaluators with a copy of all LOI, and information to be used for evaluation purposes. Based upon this information, the Proposal Evaluators identify or long-list a minimum of ten (or all qualified, if less than ten Design Build Teams submit LOI) Design Build Teams to be considered. The evaluation process for long listing should include all entities within the Design Build Team - including contractor, designer, Certified Environmental Inspector (CEI) (if appropriate), Right of Way Consultant (if applicable), as well as any major subcontractors listed in the LOI. No one developing the long-list may act as a voting member on the Selection Committee making the short-list (FDOT 2012).

The evaluation criteria, for long-listing, apply to construction contractor(s) and design consultant members of the Design Build Team, and Right of Way professionals, when applicable. The Proposal Evaluators should take into consideration the following criteria as it applies to the project. Not all criteria are always applied as they may have little value for the particular project. The Proposal Evaluators should determine and advertise in advance the criteria and its importance in the evaluation of the LOI to produce the long list. The criteria are (FDOT 2012):

1) Past Performance Grades: Contractor, Designer, and CEI (if CEI is included in contract);
2) Joint experience of the firms working together;
3) Design Build experience of the Firms;
4) Similar type of work experience;
5) The current capacity of the Firms;
6) Time delays on past projects;

7) Experience of key personnel;

8) Safety record;

9) Firm organization, resources and location;

10) Environmental record;

11) Contractor cooperation and dispute history;

12) Other content in the Letter of Interest; and

13) Other categories set forth in the advertised project.

3.1.4. SHORT-LIST DEVELOPMENT BY THE SELECTION COMMITTEE

Selection Committee is a committee that reviews the Long-List and chooses Design Build Teams that are asked to submit proposals, thus creating the Short-List. After the Proposal Evaluators evaluate the Technical Proposals and submit their findings to the Selection Committee, the Selection Committee makes a final selection (FDOT 2012).

In the District, as a minimum, the Selection Committee is comprised of the District Secretary (who serves as Chairperson), the appropriate Director, and the appropriate Office Head or committee members as appointed by the District Secretary. A representative from the Contracting Unit serves as the non-voting Recording Secretary at all meetings. Each member of the Committee may appoint an appropriate management level alternate as appropriate.

In the Central Office, the Selection Committee is comprised of the appropriate Assistant Secretary or their designee (who serves as Chairperson), the appropriate Director, and the appropriate Office Head or committee members as appointed by the Chairperson. The Manager of the Contractual Services Office is a non-voting member who serves as Recording Secretary at all meetings. Each Committee member may appoint an appropriate management level alternate as appropriate.

The Contracting Unit accesses information on design consultants through the Department's database. A short-list profile is developed on each of the Design Build Teams identified on the long-list.

The Selection Committee short-lists no less than three Design Build Teams. The Selection Committee may, at its discretion, designate alternate Design Build Teams to be contacted should any of the short-listed Design Build Teams indicate that they are unable to continue the selection process. The Selection Committee is not limited to short-listing from the list of long-listed Design Build Teams. However, when the Selection Committee elects to short-list other qualified Design Build Teams that are not on the long-list, but did submit a LOI, the selection file must be documented by the Contracting Unit as to the reasons for the selection.

The Selection Committee is directed to have more than three shortlisted firms in case one of them drops out. If there is not a clear difference between the 3rd and 4th place or even 4th and 5th, the district has to include them in the shortlist as well. It has to continue this up to the point where there is clear distinction. Currently, some modification of its shortlisting approach is undertaking. The criteria for shortlisting should be described clearly in the advertisements.

Short-list consideration factors, applied to key members of the Design Build Team, include (FDOT 2012):

1) Past Performance Grades: Contractor, Designer, and CEI (if CEI is included in contract);
2) Joint experience of the firms working together;
3) Design Build experience of the Firms;
4) Similar type of work experience;
5) The current capacity of the Firms;
6) Time delays on past projects;
7) Experience of key personnel;
8) Safety record;
9) Firm organization, resources and location;
10) Environmental record;

11) Contractor cooperation and dispute history; and

12) Other categories set forth in the advertised project.

The Selection Committee must document the justification for its short-list selection and be available to provide to competing Design Build Teams the selection criteria and basis of the Department's decision. Upon request by a competing Design Build Team, the Department may choose to meet with the Design Build Team, formally, to further clarify its selection. At the conclusion of a short-list meeting, the Contracting Unit ensures that each short-listed Design Build Team is contacted, and verifies that they desire to be considered for the project.

There is a Professional Services Selection Package – Short-list Evaluation Package, which becomes part of the permanent project file. The Contracting Unit posts the list of shortlisted Design Build Teams.

Design Build survey on the opportunities to improve describes the potential changes that are going to happen in future. Among these changes is the modification of the shortlisting process. FDOT is changing its shortlisting process temporarily (for one year). Once the trial period is over, FDOT will reevaluate the effectiveness of these changes. Among the changes are changing the limits on the shortlisted firms. FDOT allows all firms that have submitted a letter of interest to submit a proposal. However, participating firms that are not shortlisted do not receive stipend.

3.1.5. COMPENSATION TO SHORT-LISTED DESIGN BUILD TEAMS

Paying stipend is at the discretion of the districts; however, FDOT generally encourages them to pay stipend to the shortlisted firms. For Adjusted Score Design Build projects, where appropriate, the Department intends to contract directly with each shortlisted Design Build Team for preparation of a responsive written technical, oral technical, and price proposal in response to the Design/Build RFP. All districts should use the referenced Design/Build Stipend Agreement; Form No. 700-011-14 between FDOT and the Design Build Team (FDOT 2012). Where the Department intends to reimburse Design Build Teams for submitting a responsive proposal, the

Department must enter into the Design/Build Stipend Agreement, Form No. 700-011-14 (Contract TypeE9), directly with the non-selected Design Build Team immediately after short listing. All non-selected shortlisted Design Build Teams submitting a responsive proposal are ultimately compensated for their proposals. An agreement is required to document the terms and conditions of compensation. The intent is to compensate the amount that is noted in the RFP package. The amount is not intended to compensate the Design Build Teams for the total cost of preparing the bid package. The non-selected shortlisted Design Build Teams are to submit an invoice for payment of services on a Lump Sum basis after the selection/award process is complete. The invoice should include the following statement: "All work necessary to prepare technical and price proposals in response to the Department's RFP for the subject project". Compensation is intended to be on a pass/fail basis (i.e., responsive or non-responsive). If a proposal is deemed to be nonresponsive, then no compensation shall be made. Figure 4.15 shows the sample guideline for estimating proposal compensation amounts for Design Build projects.

Contract Value	Complex Urban & Rehabilitation	New Construction Projects	Compensation Range
<$5 M	0.0050 * Estimate	0.0040 * Estimate	$15 K - $25 K
$5 M - $20 M	0.0030 * Estimate	0.0025 * Estimate	$15 K - $60 K
$20 M - $50 M	0.0020 * Estimate	0.0018 * Estimate	$36 K - $100 K
$50 M - $100 M	0.0015 * Estimate	0.0012 * Estimate	$60 K - $150 K
> $100 M	0.0012 * Estimate	0.0010 * Estimate	$100 K+

FIGURE 4.15

Guidelines for Estimating Proposal Compensation Amounts for Design Build Projects

3.1.6. ALTERNATIVE TECHNICAL CONCEPTS (ATCS)

For Adjusted Score Design Build projects, where appropriate, the Department allows the Short-Listed Design Build Team to use the Alternative Technical Concept process. The Low Bid

Design Build projects are not allowed to use the ATCs. The justification is that the projects that are procured through low-bid do not offer the opportunity to innovate. Before July 2011, the contents of one-on-one meetings were not confidential (effectively they were considered as public meetings). But now, as a result of the pressure from the industry, there are statutory changes that require confidentiality of the one-on-one meeting contents. During the meetings, firms can ask FDOT questions and there are also confidential Questions and Answers (Q&A) meetings in which FDOT can ask the Design Build Teams questions. It is noteworthy that there are no limits on the number of ATCs that a Design Build team can propose. However, there are limits on the number of meetings that it can have with FDOT (2 meet per firm typically). FDOT may identify items that are off-limit, so the Design Build Teams cannot propose any ATC on those items (FDOT 2012).

Recordings of ATC meetings, information presented to the Department by the Design Build Team during an ATC meeting and ATC Proposals submitted by the Design Build Team shall be exempt from disclosure pursuant to a Public Records Request until such time as the Department has posted the intended Award notification or thirty (30) days after Price Proposal opening, whichever occurs first.

The proposed changes shall provide a solution that is equal to or better than what is required by the RFP, as determined by the Department. A concept is not an ATC if it reduces quality, performance, reliability, or scope. The RFP shall indicate ATC areas that are off limits (i.e. The Department is not open to changing pavement types, reduction in scope, etc.).

The purpose of an ATC meeting is to discuss the proposed changes, answer questions and other relevant issues. Each Design Build Team with proposed changes may request an ATC meeting to describe the proposed changes. The ATC meeting should be between representatives of the Design Build Team and District/Central Office staff as needed to provide feedback on the ATC concepts. Proposal Evaluators should attend each ATC meeting requested by each Short-Listed

Design Build Team. On FHWA Full-oversight projects, FHWA shall be invited to participate in the ATC meetings. All ATC meetings should take place prior to the ATC due date noted in the RFP.

Submittal and Review of ATCs

After the ATC meeting, the District Design Engineer (DDE), or designee, communicates with the appropriate staff (i.e., District Structures Engineer, District Construction Engineer, District Maintenance Engineer, State Structures Engineer, State Roadway Design Engineer, FHWA, as applicable) as necessary, and respond to the Design Build Team in writing within two weeks of the ATC meeting as to whether the proposed concept is acceptable, not acceptable, needs additional information or does not qualify as an ATC within two weeks of the ATC meeting. If the DDE, or designee, determines that more information is required for the review of an ATC, questions should be prepared by the DDE, or designee, to request and receive responses from the Design Build Team. The review should be completed within two weeks of the receipt of the ATC. If the review requires additional time, the Design Build Team should be notified in advance with an estimated timeframe for completion.

In case the ATC results in changes to design standards or criteria, require Design Exceptions, or require Design Variations, the changes should be approved in accordance with the Department's procedures prior to responding to the Design Build Team and a determination of any required addendum to the pending RFP document made.

The project file should clearly document all communications with any Design Build Team. ATCs are accepted by the Department at its discretion and the Department reserves the right to reject any ATC submitted. The schedule for ATC submittals and reviews needs to be coordinated with and identified in the Schedule of Events of the RFP.

Contents of ATC Submittal

All ATC submittals shall be sequentially numbered and include the following information and discussions (FDOT 2012):

1) Description: A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information, including, if appropriate, product details and a traffic operational analysis;

2) Usage: The locations where and an explanation of how the ATC would be used on the project;

3) Deviations: References to requirements of the RFP which are inconsistent with the proposed ATC, an explanation of the nature of the deviations from the requirements and a request for approval of such deviations or a determination that the ATC is consistent with the requirements of the RFP;

4) Analysis: An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the RFP should be allowed;

5) Impacts: A preliminary analysis of potential impacts on vehicular traffic (both during and after construction), environmental impacts, community impacts, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, maintenance, and operation;

6) Risks: A description of added risks to the Department or third parties associated with implementation of the ATC;

7) Quality: A description of how the ATC is equal or better in quality and performance than the requirements of the RFP; and Operations: A description of any changes in operation requirements associated with the ATC, including ease of operations;

8) Maintenance: A description of any changes in maintenance requirements associated with the ATC, including ease of maintenance;

9) Handback: A description of any changes in Handback Requirements associated with the ATC;

10) Anticipated Life: A description of any changes in the anticipated life of the item comprising the ATC;

11) Project Revenue: A preliminary analysis of potential impacts on Project Revenue;

12) Payments: A preliminary analysis of potential impacts on the Upfront Concession Payment and Annual Lease Payment. These submittal requirements are also needed for Public Private Partnership (PPP) projects.

After the ATC meetings, the Contracting Unit and the Project Manager, update the RFP criteria. They may issue an Addendum, if the ATC deviates from the RFP and is approved by the Department (FHWA must approve such change as applicable). Approved Design Exceptions or Design Variances require an update to the RFP. Proposal Evaluators should be informed of all approved or denied ATCs.

The Department reserves the right to disclose to all Design Build Teams any issues raised during the ATC meetings, except to the extent that the Department determines, in its sole discretion, such disclosure would reveal confidential or proprietary information of the ATC.

Incorporation into Proposal

The Design Build Team has the option to include any ATCs to which it received approval in its proposal and the Proposal Price must reflect any incorporated ATCs.

By submitting a Proposal, the Design Build Team agrees, if it is not selected, to disclosure of its work product to the successful Design Build Team, only after receipt of the designated stipend if applicable or after award of the contract, whichever occurs first.

3.1.7. EVALUATION OF PROPOSALS

The Proposal Evaluators evaluate each Design Build Team's Technical Proposal based on the rating criteria provided in the Request for Proposal.

Criteria to be considered may include the following but should be tailored to meet the individual needs of the project (FDOT 2012):

1. Environmental Protection/Commitments (_____ points)

Credit is given for minimizing impacts to the environment during all phases of design/construction and ensure that all environmental commitments are honored.

2. Maintainability (_____ points)

Credit is given for a design that minimizes periodic and routine maintenance. The following elements should be considered: access to provide adequate inspections and maintenance, maintenance of navigational system lighting, access to structure's lighting system, and quality of construction materials. Credit is assigned for exceeding minimum material requirements to enhance durability of structural components.

3. Design Build Team Guaranteed/Value Added (_____ points)

Credit is given for the extent of the coverage

4. Schedule (_____ points)

Credit is given for a comprehensive and logical schedule that minimizes Contract duration. Proper attention should be provided to the project's critical path elements.

5. Coordination (_____ points)

Credit is given for a coordination plan/effort that includes, as a minimum, coordination with the following groups:

- Department management team;
- Community;
- Permitting/Environmental agencies;
- Utility owners; and
- Local governments.

6. Quality Management Plan (_____ points)

Credit is given for a timely, complete, and comprehensive quality management plan, which incorporates effective peer reviews and includes all phases of the project.

7. Maintenance of Traffic (_____ points)

Credit is given for a Maintenance of Traffic (MOT) scheme that minimizes disruption of roadway traffic. This shall include, but not be limited to, minimization of lane closures, lane widths, visual obstructions, and drastic reductions in speed limits.

8. Aesthetics (_____ points)

Aesthetics is considered in the geometry, economy, and appropriateness of structure type, structure finishes, shapes, proportion, and form. Architectural treatments such as tiles, colors, emblems, etc., are not considered as primary aesthetic treatments.

9. Design and Geotechnical Services Investigation (_____ points)

Credit is given for the quality of the following elements:

- Quality and quantity of design resources;
- Design coordination and plans preparation schedule;
- Construction coordination plan minimizing design changes;
- Geotechnical investigation plan;
- Test load program; and
- Structure design.

10. Construction Methods (_____ points)

Credit is given for construction methods that minimize impacts to the traveling public and the environment, reduce costs, improve worker safety, and minimize Contract duration. Credit is given for exceeding minimum material requirements to enhance durability of structural components.

11. Design Build Team Experience (_____ points)

Credit is given for the Design Build Team's experience on similar work and the individual Design Build Team member's successful Design Build experience. The following areas are considered:

- Design Build Team leadership and areas of responsibility;
- Design Build Team internal coordination plan; and
- Design Build Team commitment to partnering and history of a quality project completed on time and within budget.

12. Landscaping (_____ points)

Credit is given for the quality of the elements presented.

The Proposal Evaluators evaluate each Design Build Team's technical proposal based on the rating criteria provided in the RFP. The rating or technical evaluation process is extremely important and should be accomplished using one of two methods:

Method 1: Each Proposal Evaluator is responsible for scoring the Design Build Team's proposals in the areas of their expertise only. In other words, a roadway design engineer would not develop scores for evaluation criteria related to bridge design, but rather only score items, such as approach roadways, Maintenance of Traffic (MOT), and environmental impacts appropriate to his/her level of expertise. A minimum of three (3) scores are required for each evaluation criterion prior to averaging the scores for the development of a final technical proposal score.

Method 2: Each Proposal Evaluator is responsible for obtaining a score for each evaluation criterion by selecting other persons to assist them in those areas where they do not possess an appropriate level of expertise. As an example, a bridge designer may call upon a roadway designer for assistance in scoring each Design- Build Firm's roadway approach details and MOT, and a permitting or environmental person for input on environmental mitigation details (FDOT 2012).

Proposal Evaluator can seek input from different specialty or technical areas but there are also certain rules in terms of seeking input from the functional areas that they have to abide by. When the Proposal Evaluators meet, the meeting has to be public. However, when they meet with the functional areas, the meetings do not have to be public. At the end of the proposal evaluation process, each evaluator has to submit a technical score based on a variety of criteria already identified upfront based on the requirements of the project. They bring their scores to the bid-opening meeting. They average the technical evaluation scores for each firm and factor that along with their bid in a formula that is reflected in the RFP. The firm with lowest adjusted score is the winner. The time frame between receiving the technical proposals and bid-opening is typically about a month long. However, it could be longer because FDOT typically has a question and answer session with the proposers. The Design Build teams may provide clarifications on the details of their proposals.

The Proposal Evaluators then submit a final technical proposal score for each Design Build Team to the Contracting Unit. During this technical review process, the Proposal Evaluators shall not meet together to discuss their thoughts on each proposal unless they do so in a public meeting. If Method 2 is used, then a fact finding meeting may be held. Since there are many different disciplines involved with a Design Build project, it is not reasonable to expect one person to be familiar with all the disciplines involved with the design and construction of a project. Therefore, Non-voting Technical Experts may be used for needed expertise.

The purpose of the fact finding meeting is to give each reviewer a better understanding of the technical merits of each proposal, not to develop a group score. There should be no discussion of scores or discussion between the proposal evaluators at this meeting. The following guidance applies to Design Build contract acquisitions and describes the process for fact finding meetings held between the Technical Review Committee (TRC) and technical advisors: meetings of two or more TRC members, including those with one or more technical experts for the purpose of fact finding, are properly noticed public meetings. Meetings of an individual Technical Review

Committee member with an individual technical advisor do not constitute public meetings.

The Contracting Unit shall notify all short-listed Design Build Teams of the date, time, and location of the public announcement of technical scores and the opening of the sealed bids. The Contracting Unit shall publicly open the sealed price proposals and divide each Design Build Team's price by the score given by the Proposal Evaluators to obtain an adjusted score. The Design Build Team whose adjusted score is lowest should be selected.

3.2. Low Bid Design Build (LBDB) Bid Process

As a general rule, the low bid approach should be used on projects where the design and construction criteria are concise, clearly defined, and innovation or alternatives are not being sought. This might include bridge projects with a specified foundation type, span lengths, and beam type. Resurfacing projects are restricted to the use of the Low Bid Design Build (LBDB) bid process. Projects, which are awarded based on the LBDB approach, do not utilize the LOI and short-listing process. Contractor who requests a proposal document is allowed to bid. Projects with right of way services included in the Design Build contract may not be bid using the low bid process unless an exception is granted by the Chief Engineer. Overall, LBDB process is better fit for the simple project with less complexities, lower value, lower risk, and lower opportunity for innovation (FDOT 2012).

Depending on the project scope, there has been best value or low bid. Florida makes the difference between the major and minor with the 10 million dollar threshold line for dividing them. Most of the minors are low-bid. Every once in a while, there are projects that are under $10 million and meet many other requirements of the minor Design Build project but have complexities that compel the FDOT to use the adjusted score approach even though it's a minor Design Build project. Design Build minor has the $120 million limit (Set by the Statute) every fiscal year. State construction office monitors the compliance with this cap. So whenever the districts decide to let a project, they have to receive the approval from the state construction office. The cap came in 1997. Industry had concerns with the use of the low bid method. The other innovative Project Delivery System, Construction Manager/General Contractor (CMGC) is also falling into this category. There were concerns about whether there is a real time constraint and need for expediting the procurement.

Even for the low-bids, the contractors have to be prequalified. Once the advertisement is out, the bidders should request for RFP. The Department checks their prequalification (Pass/Fail) and then releases the RFPs to those that have passed the prequalification requirement. For each project, there are certain areas and classes that they have to qualify in. For instance, if the project is an asphalt (pavement) project, the bidders have to be qualified in asphalt. The FDOT calls a low-bid project like this a single-phase project. GDOT calls the same process a two-phase process.

3.2.1. Development of Pre-Qualification Requirements

The Project Manager, with the assistance of a multi-disciplinary team that includes the Contracting Unit, determines the pre-qualification requirements. The Department's standard technical qualification requirements apply to each entity providing professional services. Pre-qualification is required for contractors performing specialty work.

On Low Bid Design Build projects, pre-qualification is required at the time the bid proposals are due. Pre-qualification requirements for Design Build Advertisements for the contractor and design consultant members of the Design Build Team must be in accordance with the following (FDOT 2012):

1) Contractors submitting as a lead or prime with the Design Build Team must be qualified in all advertised construction contractor work classes. In this case, where the design consultant does not lead of the Design Build Team, the design consultant is utilized to meet the advertised Professional Services Work Type requirements. The design consultant may utilize sub-consultants to meet the advertised Professional Services Work

Type requirements.

2) Design consultants submitting as lead or prime with the Design Build Team may utilize subcontractors to meet the advertised construction contractor work class requirements. The design consultant may utilize sub-consultants to meet the advertised Professional Services Work Type requirements.
3) When a joint venture party submits a Letter of Interest, one of the members of the joint venture party must be assigned to meet the advertised construction contractor work class requirements. In this case, the design consultant member of the Design Build Team is utilized to meet the advertised Professional Services Work Type requirements.

For Fixed Capital Outlay (FCO) building projects that are developed by Design Build Project Delivery System, the pre-qualification requirements for contractors include (FDOT 2012):

- Applicable Contractor License;
- State Corporate Charter Number, if Corporation; and
- Added requirements, if necessary for specialized needs.

In addition to the general requirements, the following applies to low bid resurfacing Design Build projects (FDOT 2012):

1) The Criteria Package shall include a topographic survey and pavement cross-sections, or cross-slope and profile data at a minimum.
2) The Criteria Package shall include pavement cores and traffic data in accordance with standard FDOT procedures, at a minimum. Preferably, a Pavement Design Package or the minimum pavement design criteria shall be included.
3) The scope shall specifically detail any improvements other than resurfacing of pavements. If existing structures violate clear zone, the scope shall note that the violation needs to be remedied. Otherwise, an exception/variance should be granted.
4) If signal work is included, the scope shall identify if strain poles or mast arms are

required.

5) For all Low Bid Design Build Resurfacing Projects, the Criteria Package should include survey and geotechnical information.

Pre-Bid Meeting for Low Bid Design Build

If the LBDB project is complex, a pre-bid meeting may be held in order to discuss the Design Build project and clarify any concerns. This meeting may be waived if the complexity of the project does not warrant such a meeting. Affected Utility Agency/Owners shall be invited to the pre-bid meeting.

RFP Request by Pre-Qualified Design Build Teams

Firms should request a copy of the RFP from the name and address identified in the advertisement. Design Build Teams must be pre-qualified before submitting LBDB proposals.

3.2.2. PROPOSAL EVALUATION

The Department may proceed if at least two proposals are received. Design Build Teams are be asked to develop and submit proposals based on the RFP. Proposals are segmented into two parts: Technical Proposals and Price Proposals. Technical Proposals and Price Proposals should be received by the date, time, and appropriate office, as noted in the announcement. For the adjusted score procurement process, there are sequences to the date on which the technical proposals and the price proposals are due. The technical proposals arrive generally around a month to 6 weeks prior to the price proposal. This gives the Design Build teams the ability to make adjustments in their price proposals based on the Q&A sessions they may have with FDOT as well as the adjustments that FDOT may make into the RFP. For the low-bid procurement, the price and technical proposals arrive at the same time. Technical Proposals and Price Proposals shall be submitted in separate packages (with the Price Proposal sealed) and appropriately labeled. Price Proposals shall include all standard bid package forms. The office receiving the proposals sends the technical proposals to the Proposal Evaluators (FDOT 2012).

Technical Proposals

A technical proposal shall include a detailed project schedule using Critical Path Method (CPM) (or other techniques as appropriate), preliminary design plans, preliminary specifications, technical reports, calculations, permit requirements and other data requested in response to the RFP. The package shall indicate clearly that it is the technical proposal and shall identify clearly the Design Build Team's name, project description, or any other information required (FDOT 2012).

Price Proposals

Price proposals shall include one lump sum cost for all design, construction, and construction engineering and inspection (if CEI is included) of the proposed project. The package shall indicate clearly that it is the price proposal and shall identify clearly the Design Build Team's name, project description, and any other information required.

Bid Opening for Low Bid Design Build (LBDB)

Under the LBDB process, the appropriate District or Central Office publicly opens the price proposals on the day, time, and location specified in the advertisement, and send the Proposal Evaluators the technical proposals.

The Proposal Evaluators' Review of Responsiveness of Proposals

The Contracting Unit evaluates the pre-qualifications of the construction contractor(s) and design consultant members of the Design Build Team, and the capacity of the construction contractors who are members of the Design Build Team. Pre-qualifications and capacity are to be assessed by the Contracting Unit. Prior to making a determination that any Design Build Team is non-responsive on the basis of prequalification or capacity, the Contracting Unit shall contact the Prequalification Specialist of the State Construction Office (FDOT 2012).

The Proposal Evaluators shall review the design concepts and preliminary designs of the lowest bidder in order to assess the responsiveness of the lowest bidder's technical proposal compared to the Design and Construction Criteria Package.

In the event the lowest bidder's technical proposal is found to be non-responsive, the Proposal Evaluators then review the next lowest bidder's technical proposal to determine its responsiveness. On all federally funded projects, FHWA concurrence must be obtained prior to evaluating the next lowest bidder’s technical proposal. A Bid Proposal is considered non-responsive if it does not contain all the required information and level of detail, or is non-compliant with the design and construction criteria defined in the RFP. Prior to the Department declaring the Design Build Team non-responsive, it may be appropriate for the Department to contact the Design Build Team to discuss/clarify its concerns before moving on to the next lowest bidder. However, once determined that the low bidder is nonresponsive, the process continues until the lowest bidder having a responsive proposal is found (FDOT 2012).

Value of Time Factor for Low Bid Design Build

Low Bid Design Build (LBDB) may include a bid adjustment for the value of time. This adjustment is based on the Design Build Team's proposed number of days to complete the project multiplied by a value per day established by the Department (number of days times cost/day = price proposal adjustment [increase]).

Selection Committee Awards Design Build Team with the Lowest Responsive Bid

Unless all proposals are rejected, the Selection Committee approves an award to the Design Build Team with the lowest bid that has a responsive technical proposal. The Department enters into a contract for the price proposed. In the advertisement and pertinent bid documents, the Department shall reserve the right to reject all proposals and waive minor proposal irregularities.

3.3. DESIGN BUILD HYBRID

This method stipulates a maximum price. Design Build Teams compete on project scope, qualifications, quality, innovation, schedule, and costs (not to exceed the maximum price). The Department prepares and assembles a set of contract plan sheets for the project and the plan sheets are attached to the RFP. Every proposal has a stipulated price and the competition is on price, scope, quality, innovation, and schedule. This method has the advantage of allowing the Department to determine if the required scope is realistically achievable within the limits of a tight budget. It is responsive to the efficient use of funds by committing virtually all available funding up front and using the scope, schedule, and quality of project proposals to determine the most attractive offer (FDOT 2012).

Design Build Hybrid is scored in the same fashion as other Design Build Contracts. The Department announces the maximum price for the project it has prepared and assembles a set of project Contract plan sheets for the project and the plan sheets are attached to the RFP and all proposers develop design approaches with corresponding schedules that maximize the amount of scope that can be designed and built without exceeding the maximum price. The scope may be modified or changed to meet this maximum bid price. The evaluation uses a form of weighted criteria method with point scoring to arrive at a final score for each proposal and the project is awarded to the proposal that has the lowest adjusted score. This process should be used on all projects $100 million and greater in price.

3.4. DESIGN BUILD MAXIMUM PRICE

This method stipulates a maximum price that is stated in the RFP. Any proposal that goes above it is considered as non-responsive. Design Build Teams compete on project scope, qualifications, quality, innovation, schedule, and costs (not to exceed the maximum price). Every proposal has a stipulated price and the competition is on price, scope, quality, innovation, and schedule. This method has the advantage of immediately allowing the Department to determine if the required scope is realistically achievable within the limits of a tight budget. It is responsive to the efficient use of funds by committing virtually all-available funding up front and using the scope, schedule, innovation, and quality of project proposals to determine the most attractive offer.

Design Build Maximum Price is scored in the same fashion as other Design Build Contracts. The Department announces the maximum price for the project, and all proposers develop design approaches with corresponding schedules that maximize the amount of scope that can be designed and built without exceeding the maximum price. The scope may be modified to meet this maximum bid price. The evaluation uses a form of weighted criteria method with point scoring to arrive at a final score for each proposal and the project is awarded to the proposal that has the lowest adjusted score. This process should be used on all projects $25 million and greater in price.

3.5. DESIGN BUILD WITH OPTIONS

This process provides a method to build a project to a lesser scope versus not letting the project due to the bids coming in higher than what the Department can afford. The Department plans to construct the entire project as stipulated in the Contract Documents. However, the Department intends to establish priorities for the Contract award in the event the goals of the Department cannot be achieved with the funds determined available by the Department. If funding is a limitation on a project based on bids received, the Department can exercise options established for a project. These options tailor the contract to the needs of the project. The Department assigned award priority for each option would be as follows (FDOT 2012):

- Option 1: All items of work;
- Option 2: Option 1 less items of work identified in the Contract Documents under Option 2; and
- Option 3: Option 2 less items of work identified in the Contract Documents under Option 3.

These options help the Design Build teams figure out the number of work items they are able to bid within the budget if they are not capable to bid for the whole project. Should the Department exercise its option on the Contract, the options are taken in the order as provided above. The Department intends to award the Contract to the responsible bidder with the lowest bid for the option for which the Department has determined available funding exists.

4. UTILITIES

FDOT mitigates the utility risk upfront by coordinating with the utilities based on the conceptual designs. However, much of the utility coordination is dependent on the final design proposed by the Design Build team. Therefore, FDOT shifts the responsibility for finalizing utilities to the Design Build Teams. Nevertheless, some districts still believe that they can manage the utility coordination process and they may maintain the responsibility instead of shifting it to the Design Build team. However, in majority of cases, FDOT shifts that responsibility to the Design Build teams. Therefore, the utility relocation is included in the Design Build Contracts. Nevertheless, FDOT always handles the re-imbursements. FDOT does not shift the responsibility for reimbursement part to the Design Build teams. FDOT sets up a separate phase in its work program for the utility relocation work (FDOT 2012).

The Design Build Team shall be responsible for identifying the existence, features and locations of any and all utilities within the limits of construction; for coordinating any required utility relocations or adjustments necessary for satisfactory completion of the Contract work; and for any and all work necessary to otherwise accommodate any and all utilities within limits of construction during construction and upon satisfactory completion of the work.

Upon written request, the Department makes all utility permits and utility relocation information available to the Design Build Team for inspection. However, the Department makes no representation as to the completeness or accuracy of such information and the Design Build Team relies on the completeness or accuracy of such information at its own risk.

The Department should gather initial Utility Agency/Owner (UA/O) contact information and this information should be provided as part of the RFP. The Department, in coordination with each UA/O, should perform sufficient advanced utility coordination to identify the tentative project impacts to the existing utilities, identify payment responsibilities associated with the potential utility design and relocation efforts, and identify those time-line impacts during construction that result from the tentative utility relocation impacts which are expected by the project. Each affected UA/O should provide documentation which describes the locations of existing facilities. The Department should include this information as part of the concept plans attached to the RFP.

The Department shall provide to the Design Build Teams a summary which identifies the location of existing utility facilities, information related to whether those facilities are allowed in Department Right of Way by Utility Permit and identify those facilities which are related to a compensable property interest or other right for reimbursement. All determinations related to compensable property interest or other rights to reimbursement shall be coordinated with the Department's Office of General Counsel and State Utilities Office.

When utility relocation is anticipated, a mandatory pre-proposal meeting with the Short-Listed Design Build Teams, followed by mandatory site visits with the Short-Listed Design Build Teams and the UA/Os within the project limits should be conducted. Following the mandatory pre-proposal meeting, the Department should establish meeting schedules between each affected UA/O and each Short-Listed Design Build Team. The District Utility Engineer is responsible for facilitating these meetings and facilitating meetings with UA/Os reluctant to coordinate with each Short-Listed Design Build Team. The schedule for these meetings shall be identified in the Schedule of Events portion of the RFP (FDOT 2012).

In the case that, after reasonable pre-construction coordination and investigation by the Design Build Team, one or more utilities within the limits of construction are found to be materially misallocated (either vertically or horizontally), or materially different in features, or existing when previously undisclosed, the Design Build Team may pursue recovery of actual damages against the utility involved. The Department grants the Design Build Team an assignment of rights the Department may have by permit or as a property right as to the utility. However, these are limited to only those rights necessary for the Design Build Team to pursue recovery of actual damages directly against the utility, and as limited above.

The Utility Agency/Owner is responsible for all relocation costs except when the Department's

Office of General Counsel makes a determination that prior compensable interests exist. All determinations related to compensable property interest or other rights to reimbursement shall be coordinated with the FDOT's Office of General Counsel and State Utilities Office.

5. RIGHT OF WAY

Prior to advertisement, for a Design Build project, it must be determined if the project can be built within the existing right of way. If no additional right of way is required for the project, the District Right of Way Manager must provide a right of way certification for construction stating that no additional right of way was acquired for the project or that additional right of way was acquired and all right of way activities were completed in compliance with the applicable federal and state laws and regulations. If the Department has determined that no additional right of way is required for the project, the RFP should address how additional right of way is to be acquired should a Design Build Team propose to purchase additional right of way based on an innovative approach to the project. In those situations, the RFP should clearly demonstrate that the Design Build Team is responsible for all additional cost and time related to the acquisition of this right of way, regardless of whether the right of way is acquired by the Department or the Design Build Team (FDOT 2012).

FDOT can advertise the Design Build project and distribute the draft RFP without having the titles to the ROW but they cannot to distribute the final RFP without the final titles to ROW. In terms of application for the ROW titles and approvals, FDOT does not have to rely on the Design Build Team's designs and proposals. It can rely on its own conceptual design and scope to finalize the titles. If additional right of way is required because of a winner Design Build Team's proposal, FDOT can issue amendments to those agreements especially when the firm's proposed approach has considerable advantages such as financial savings. FDOT has some language built into the contract to cover such potential changes. In such cases, the Design Build Teams carry some risks because if their proposed changes are not implementable, FDOT abandons the proposal.

If additional right of way is required for the project and the acquisition of that right of way is to be included as part of the Design Build project, the Request for Proposal and ultimately the Design Build contract shall include appropriate controls to ensure that all right of way is acquired in compliance with the applicable federal and state laws and regulations and that construction activities do not commence until all property is acquired and relocation activities are complete.

If a determination is made that additional right of way is required, the Project Manager shall consult with the District Right of Way Manager and the head of the District Office(s) responsible for right of way mapping, title searches and conveyance documents, to determine what if any of these services is included in the Design Build contract. The Design and Construction Criteria Package must clearly identify those services, the standards that are required, and the documentation that must be received by the Department which are mandatory during the right of way process.

If right of way services are included in the Design Build contract, negotiations for the acquisition of right of way may not begin until a Notice to Commence Right of Way Acquisition is issued by the Department. National Environmental Policy ACT (NEPA) approval and completion of right of way maps, title information, and legal descriptions are required before the notice to commence may be issued.

On every project requiring additional right of way, the Department must issue a Notice to Commence Construction Activities prior to the start of any construction activities on any portion of the project for which additional right of way was required. This requirement is applicable whether the right of way services are included in the Design Build contract or, alternatively, they are handled separately. The Notice to Commence Construction Activities may not be issued until such time as the right of way certification for construction is executed by the Department. Right of way may be certified on any portion of a Design Build project that is deemed to be a buildable section by the contractor (FDOT 2012).

6. ENVIRONMENTAL

Regulations for implementing the National Environmental Policy Act (NEPA) are promulgated by the Council on Environmental Quality (CEQ). These regulations provide that a Final Environmental Impact Statement (FEIS), Finding of No Significant Impact (FONSI), or a determination that a proposed action is categorically excluded, serves as the administrative record of compliance with the policy and procedures of the NEPA and other environmental statutes and executive orders.

On Federal-Aid projects, usually FHWA serves as the lead federal agency for compliance with the NEPA and the Florida Department of Transportation (FDOT) serves as the lead state agency.

When funds other than Federal funds are used to develop and construct a transportation project, a State Environmental Impact Report (SEIR) or a Non-Major State Action (NMSA) is required to comply with State Laws. NEPA compliance is required if Federal approval of an action is needed. The standard for the preparation and processing of an environmental document to comply with the NEPA is the Department's Project Development and Environment (PD&E) Manual. The process spelled out in the PD&E Manual must be followed and completed before a project can advance to the final design and construction phases. Before design and construction funds can be authorized for Federal-Aid projects, the FHWA has to approve the environmental document and issue location and design approval. For projects funded with funds other than federal funds, the District Secretary must approve the SEIR or NMSA, before the project can advance. As with regular projects, the PD&E process needs to be complete before a Design Build project can be concept acceptance (FDOT 2012).

Construction activities are regulated by environmental rules and regulations that are administered by federal, state, local, and special District governing agencies. Environmental permits are required from one or more regulatory agencies for most land alterations such as addition of impervious surfaces, construction, alteration, or abandonment of storm water management facilities, and wetlands or surface water impacts. The time at which these permits can be obtained vary with the type of project, its impacts, and the requirements of a specific permitting agency. The acquisition of permits can result in having to re-address NEPA issues during design so it is very important to have done a complete and thorough job during the PD&E phase.

The normal PD&E process starts with the distribution of an Advance Notification (AN) Package to various states, federal and local agencies. The AN package describes the project and, among other things, specifies all potential permits required on the project. In most cases, a Permit Coordination Package is developed to enhance interagency coordination early in the process of project development. This package provides conceptual information on the project and is circulated to applicable permitting agencies for comments. The preliminary coordination with jurisdictional agencies may take six (6) to twelve (12) months depending on the complexity of the project and the environmental sensitivity of the project area. The final permit application is normally started when Phase II plans are complete.

In the interest of shortening the permit application period, the following have been tried with success on previous Design Build projects (FDOT 2012):

1) Coordinate with the permitting agencies and keep them involved in the decision making during the PD&E process. Having one-on-one periodic meetings with the agencies is recommended in addition to the submission of the Preliminary Coordination Package. Obtaining "preliminary" commitments from the agencies in writing during the PD&E process helps to expedite the permit application during design.
2) Perform enough design work upfront to obtain permits during the PD&E process instead of having to apply for permits during the design phase. This would eliminate part of the permitting work from the Design Build scope of work. Prior concurrence from the permitting agencies should be obtained in writing.
3) Identify construction activities that can begin before final permits are received. This

enables the design consultant to start design in project features that do not require permits. The Contractor could start working in those areas while the design consultant is working in other design and permit application activities.

For programming PD&E projects in the Work Program, and to ensure that projects are programmed correctly, please see the Department's Work Program Instructions.

Reevaluation of Environmental Impacts

Prior to the authorization of Design Build projects under either Federal or State funding, a reevaluation of the environmental impacts shall be made. If a major design change is proposed after the authorization, then a written reevaluation must be produced as required in the PD&E Manual. The Design Build Team shall provide the information to the District Environmental Management Office to determine if the proposed design changes warrant a reevaluation. The Design Build Team is responsible for conducting any needed environmental studies and completing the documentation for the environmental reevaluation. For Federal-aid projects, FDOT shall obtain FHWA's approval of the NEPA reevaluation before the Design Build Team can proceed (FDOT 2012).

7. ORGANIZATION FOR DESIGN BUILD PROJECT PROCUREMENT

There are major two positions in the Design Build Procurement organization chart: district office and central office. The Districts have the functional groups responsible for the development and advertisement of the RFP documents. Depending on the nature and scope of the projects, the districts receive input from different technical groups. The central office functional areas (e.g., Geotechnical, etc.) provide assistance and feedback to the districts on the issues that the district offices need some help with. The Design Build projects are let through the 8 district offices. The procurement office is charged with the advertisement preparation, answering the technical questions and receiving the letters of interest and verifying the capability of the firms to meet the prequalification and other project requirements.

Due to availability of the resources at the central and district levels, FDOT does not face significant challenges in terms of managing the load.

VIRGINIA DOT

1. BACKGROUND

In 2001, the first Design Build law in Virginia was passed. The statute initially restricted the number of projects that VDOT can deliver through the Design Build Project Delivery System. The limit was 5 Design Build projects at less than $20 million value and 5 Design Build projects valued at more than $20 million. In addition, the statute established that at any time VDOT cannot have more than 5 ongoing Design Build projects. Unlike many other states, VDOT had the opportunity to start developing its Design Build program from scratch. VDOT developed a detailed guideline addressing the types of projects it is going to deliver with Design Build and the procurement processes to be used for Design Build projects. In 2006, the general assembly removed the restriction and removed the cap on the number and value of Design Build projects that VDOT can procure. The statute also provides VDOT with flexibility in using Design Build Delivery System for various types of projects. The legislation required the commissioner to go through the process of finding the public interest and justify why VDOT wants to use the Design Build instead of Design Bid Build and submit in writing the "finding of public interest" for the Design Build project. Other than that, the legislation has not put any limits on issues such as the type of procurement VDOT can use. VDOT is authorized to use whatever procurement method it deems appropriate for a proposed Design Build project.

VDOT advertised its first Design Build project in 2003. Since then, VDOT has procured more than 32 Design Build projects. Figure 4.16 illustrates the distribution of the number of Design Build projects procured since 2003.

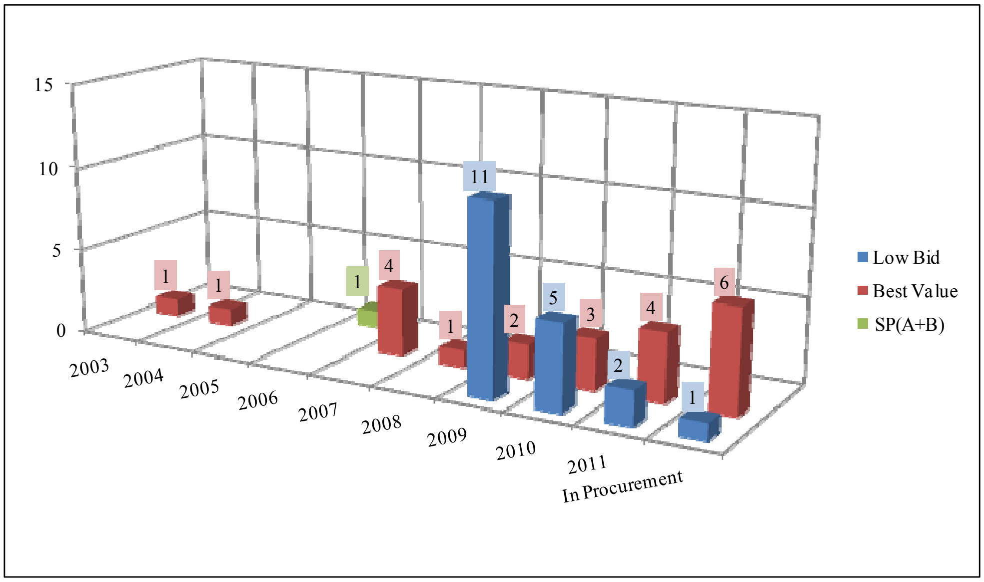


FIGURE 4.16

Number of Design Build Projects Procured Since 2003 Using Low Bid, Best Value, and A+ B Procurement Methods

Figure 4.17 illustrates the value of Design Build projects procured every year since 2003. The estimated contract values of these projects range between 0.5 and 244.4 Million dollars.

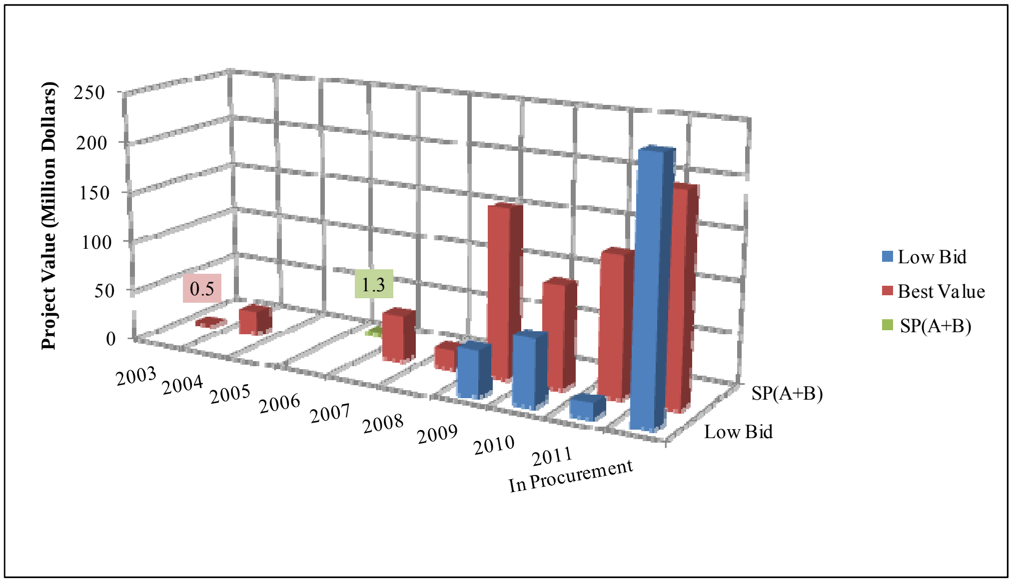


FIGURE 4.17

Contract Value ($ Million) of Design Build Projects Procured Since 2003 Using Low Bid, Best Value and A+B Procurement Methods

Figure 4.18 shows the number of Design Build projects that VDOT has procured using various authorized procurement methods.

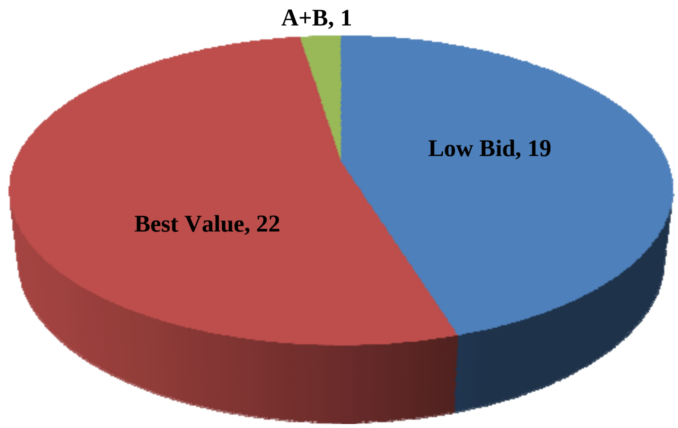


FIGURE 4.18

Types of Procurement Methods and the Frequency of Their Use

So far, when using Low Bid, VDOT has always selected the Design Build Team in a single phase (Figure 4.19). VDOT is planning on utilizing Two Phase Low Bid procurement for future projects.

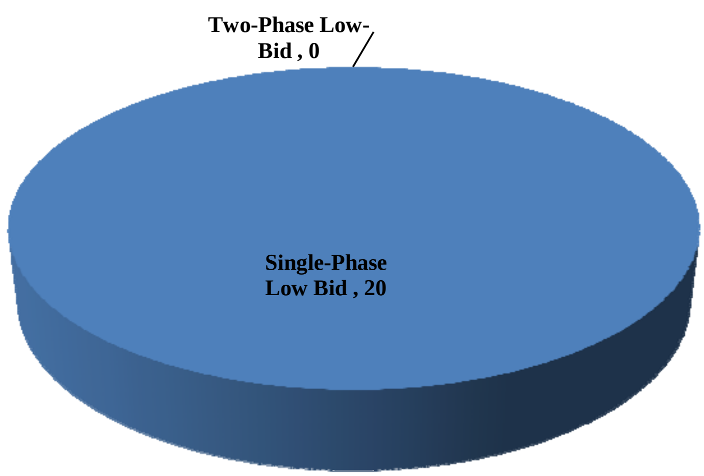


FIGURE 4.19

Variations of Low Bid Procurement Method and the Frequency of Their Use

Depending on the characteristics of projects, VDOT has used both Single-Phase and Two-Phase Best Value procurement methods for selecting Design Build Teams (Figure 4.20).

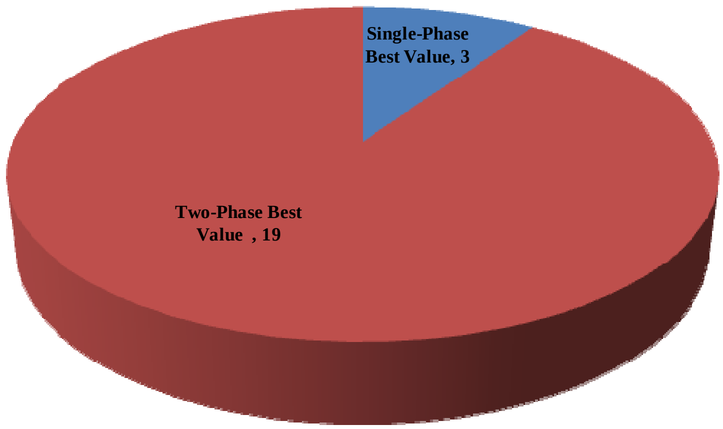


FIGURE 4.20

Variations of Best Value Procurement Method and the Frequency of Their Use

VDOT always uses shortlisting in conjunction with Two-Phase Best Value Procurement (Figure 4.21).

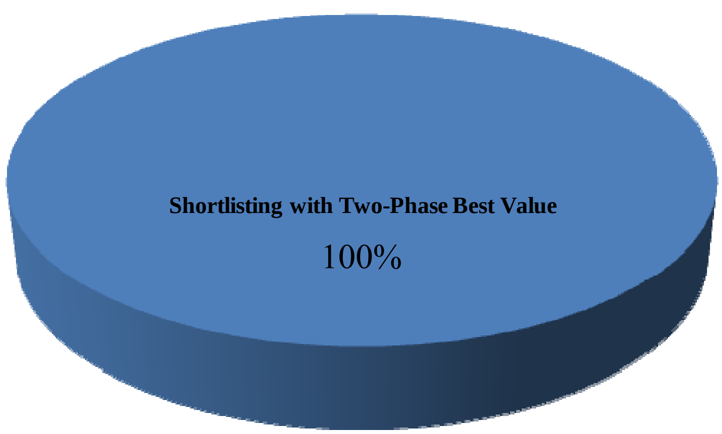


FIGURE 4.21

Shortlisting when Two-Phase Best Value is Used

In addition, VDOT always pays stipend to non-winning shortlisted Design Build Teams (Figure 4.22).

FIGURE 4.22

Stipend when Two-Phase Best Value is Used

2. Approach for Design Build Project Selection

The Innovative Project Delivery Division (IPD), in conjunction with the Districts, Planning, Programming, and the Preliminary Engineering Divisions, review each annual update of the Six-Year Plan (SYP) to identify candidate Design Build projects. The IPD Division ranks the projects based on the Objective Criteria, discussions with the pertinent district, available funding levels within the SYP, and compliance with the Law. The Director of the IPD Division assigns an IPD Division staff member as Project Manager - Innovative Project Delivery Division (PM-IPD) for the contract development and solicitation of the Design Build contract. The pertinent District Administrator assigns a District staff member as PM-D (VDOT 2011).

VDOT has very broad criteria for justifying the use of Design Build. Since they are very broad, almost any VDOT project that is fully funded is a candidate for Design Build delivery system. This is even true for the projects that for instance do not have much room for innovation; the use of Design Build for these projects can still be justified.

The following categories are types of projects that generally may be suited for Design Build contracts (VDOT 2011):

- Emergency and repair projects
- Projects directly supporting economic development/enhancement
- Projects using specialty or innovative designs and construction methods or techniques
- Projects to maximize the use of available funding (i.e. Federal, Bonds, etc.)
- Projects deemed by VDOT to have expedited scheduling requirements
- Projects that do not lend themselves to normal Design Bid Build procedures
- Intelligent Transportation System (ITS) projects involving software development or integration and/or rapidly changing technologies having one or more of the following advantages:
    - Provides increased flexibility to modify the design approach and equipment used based on changes in technology
    - Allows VDOT to place increased emphasis on contractor qualifications and their technical approach in conjunction with cost considerations
    - Provides a mechanism to "jump-start" ITS design activities in Districts that have limited technical staff able to perform much of the up-front design work
    - Permits greater input on project design from ITS vendors and systems developers

3. Approach for Design Build Team Selection

VDOT goes through a rigorous screening process at the start of every project. During this process, VDOT identifies the criteria such as scope, price, complexity, level of details already developed by VDOT, opportunity for innovation, and level of competition that can be used to clearly distinguish between the Design Build Teams. VDOT has mostly used two types of procurement methods (VDOT 2011): Single-Phase Low Bid and Two-Phase Best Value. Nevertheless, it has the flexibility of using other procurement methods such as Single-Phase Best Value and Two-Phase Low Bid if deemed appropriate.

Single-Phase Low Bid

The Single-Phase Low Bid procurement process is for simple, straightforward, non-complex projects in which there are not many criteria available to make distinction between the Design Build Teams. In these cases, VDOT uses Single-Phase Low Bid process and requires all the participating Design Build teams to go through all the required administrative criteria such as registration, bonding, etc.

VDOT requires all the Design Build Teams to provide the necessary qualifications information (key personnel, etc.) VDOT first checks the responsiveness of the Design Build Teams to the qualification requirements and then opens the price packages in a public meeting. VDOT also checks the responsiveness of the Design Build Teams in terms of their price packages.

VDOT also decides whether there is a need for shortlisting for Single-Phase Low Bid. It looks at the cost for putting a technical proposal and bid package together. If the cost of putting a proposal package is not significant (e.g., VDOT has done all the engineering work), VDOT leaves the field open (no shortlisting) and lets all interested firms participate.

In case VDOT uses shortlisting for Low Bid, the procurement process transforms into a Two-Phase Low Bid. This procurement process is going to be used for mid-size, non-complex projects that have limited room for innovations. In these cases, due to the characteristics of project, it is very hard for VDOT to make distinction between the Design Build Teams' technical proposals. VDOT's main concern is whether the Design Build Teams have the capabilities to deliver the project. The Two-Phase Low Bid process allows VDOT to go through comprehensive screening process to ensure that the Design Build Teams have the required capabilities. It also helps VDOT select the Design Build Team based on the price. Similar to the Single-Phase Low Bid, VDOT expects that the cost of preparing the proposal for a project procured using Two-Phase Low Bid procurement is very low. This is the reason why VDOT does no pay stipend for the majority of Low Bid projects).

Two-Phase Best Value Process

Large, complex projects that have many risks or projects that offer many opportunities for innovation as well as opportunities for using different design concepts are generally procured using the Two-Phase Best Value. So far, VDOT has used Two-Phase Best Value for around 14 projects. VDOT has always used shortlisting and paid stipend with the Two-Phase Best Value projects in order to encourage the participating Design Build Teams to submit high-quality technical proposals. So far, VDOT has always shortlisted three Design Build Teams. However, VDOT is considering having more than three firms (4 or 5) if the scores are close and it is challenging to make distinction among the firms (VDOT 2011).

VDOT has always used a 30-70% weight distribution between technical and price proposals. It should be noted that VDOT is not mandated by law to use this weight distribution. However, VDOT keeps using this weighting since it has always helped the Department in getting best combination of technical quality and price. VDOT's only concern regarding the use of Two Phase Best Value is that it may face challenges in ranking Design Build Teams' technical proposals when, due to the characteristics of project, they are very similar. As a result, VDOT is planning to use a Two-Phase Low Bid process whenever the conditions are favorable.

3.1. PROJECT ADVERTISEMENT

VDOT follows its standard project advertisement procedures as set forth for Design Build projects. The solicitation is published on the publicly accessible internet procurement web site designated by VDOT.

VDOT drafts each project advertisement so that it fits the unique needs of that particular project. The project advertisement typically states a general description of the project. It also includes the general requirements set forth in VDOT's standard procurement procedures, any additional technical qualifications desired, and the time frames for submitting the RFQ and RFP. VDOT may waive or alter contractor's pre-qualification requirements based on any specialized nature of the project. The time that it takes VDOT to develop the project advertisement is dependent upon the level of complexity of a Design Build project as well as the project deadlines.

3.2. SOLICITATION PROCESS

The solicitation process that VDOT uses for a Design Build project is defined by the type of selection process it plans to use. VDOT may use a Single-Phase selection process, a Two-Phase selection process, or any other appropriate type of process that is based on specific needs and merits of the project.

VDOT issues an RFQ and/or RFP, soliciting Statement of Qualifications (SOQs) and/or Design Build proposals from Design Build Teams. The Single-Phase selection process consists of an RFP only. VDOT can use the Single-Phase selection process for any projects with a relatively straightforward scope and short delivery time.

The Two-Phase selection process requires an RFQ and RFP. VDOT may use SOQ to shortlist qualified Design Build Teams. Only the shortlisted Design Build Teams are invited to submit a Proposal in response to the RFP. VDOT typically uses the Two-Phase selection process for complex or relatively larger projects. It allows VDOT to narrow down the number of Design Build Teams submitting proposals to those Design Build Teams that are highly qualified for the proposed project. When VDOT concludes that only one Design Build Team is fully qualified, or that one Design Build Team is clearly more highly qualified than the others, it may negotiate and award the Design Build contract to that Design Build Team.

3.3. RFQ EVALUATION

For each project, VDOT develops an SOQ evaluation system based on the scope and complexity of the project. VDOT publishes the SOQ evaluation and scoring criteria in the RFQ. The criteria should be consistent with the qualifications requested and may include a description of the Design Build Team's project understanding and management approach, organization structure, demonstration of applicable experience, manpower and equipment resources, experience in obtaining environmental permits, obtaining right of way, experience with other Design Build projects, approach to quality assurance and quality control, and their financial ability to do the work (VDOT 2011). The designated Proposal Evaluation Team considers whether to request oral presentations. In an oral presentation, VDOT may ask questions relative to the qualifications before scoring the submittals. The Proposal Evaluation Team reviews, evaluates the SOQs and shortlists Design Build Teams by following the shortlisting process described in the next section.

3.4. SHORTLISTING PROCESS

Once the SOQs have been received, the Proposal Evaluation Team evaluates and scores the SOQs independently. At the end of independent evaluations process, the Proposal Evaluation Team meets and discusses the SOQs. The members of the Proposal Evaluation Team have the opportunity after discussion to revise their individual scores. The Proposal Evaluation Team scores the SOQs and ranks the Design Build Teams against the published criteria. The Project Manager - Innovative Project Delivery Division (PM-IPD[1]) serves as the chair and facilitates the scoring/ranking meeting. The meeting is attended by all Proposal Evaluation Team members, the PM-IPD, and representative from the Administrative Service Division (ASD). The ASD representative is a non-voting independent person who provides oversight and ensures fairness in the scoring process. The ASD representative certifies scores once the scoring process is over and the necessary revisions have been made and documented. VDOT also invites a representative of Civil Rights Division to serve as a non-voting member of the panel and observe the evaluation. In order to advance those most highly ranked qualified Design Build Teams to the next stage (i.e., RFP), VDOT prepares a shortlist from the ranking of the SOQs. The criteria defining the number of qualified Design Build Teams to be shortlisted are stated in the RFQ. All Design Build Teams are notified of the shortlist in writing and by the posting of the shortlist on the VDOT website (VDOT 2011).

3.5. REQUEST FOR PROPOSAL (RFP)

The shortlisted Design Build Teams are provided the RFP and invited to submit a Design Build Proposal. VDOT may hold a meeting with shortlisted Design Build Teams to address issues and questions, before they are advised to proceed with the RFP.

3.5.1. TECHNICAL PROPOSALS

VDOT defines Technical Proposal requirements in the RFP. The RFP shall indicate the importance of the project schedule to the overall ranking of the Proposal. Technical Proposals submitted by Design Build Teams should address the technical elements of the design and construction of the project. In the selection

[1] PM-IPD is VDOT's designee for supervising procurement of a Design-Build contract. This individual will be responsible for contract development, solicitation, and award.

process, VDOT evaluates Design Build Teams' understanding of the project, anticipated complex problems, and their proposed solutions to those problems. Thoroughness and quality are the key factors that are considered in Design Build Teams' proposed plans for both design and construction. VDOT also evaluates the resources Design Build Teams are planning to commit to the project.

3.5.2. PRICE PROPOSALS

VDOT shall define Price Proposal requirements in the RFP. Design Build projects typically requires lump sum Proposals. VDOT makes payments based on work packages, or major items or tasks. Therefore, the Design Build Team's Price Proposal shall include the lump sum price, a breakdown for major items or tasks, and the standard contract documents. VDOT ensures that the breakdown of major items or tasks is consistent with the payout schedule. When using the earned value method, the cost breakdown corresponds to the work packages in the work breakdown structure and the schedule. VDOT may ask the Design Build Team to submit further documentation as supplement to the Design Build Proposal prior to the execution of the contract.

The Price Proposal package must identify the Design Builder's name; project description and any other information required and must be delivered in a sealed envelope separate from the Technical Proposal. VDOT opens the Price Proposal only if the Technical Proposal is determined to be responsive.

3.6. BASIS OF AWARD

VDOT should determine which basis of award is best suited for the unique requirements of each project and clearly describe it in the RFP. VDOT is authorized to choose the basis of award from several available options, such as Best Value, Low Bid, and Fixed Price. The Proposal Evaluation Team should carefully determine what basis would best serve the interests of the Commonwealth.

3.6.1. BEST VALUE

The Design Build contract is awarded to the Design Build Team whose responsive Proposal is evaluated as providing the Best Value to VDOT. VDOT determines a formula by which to establish the Best Value and publishes the formula in the RFP.

3.6.2. LOW BID

The contract is awarded to the Design Build Team whose responsive Proposal includes the lowest price. The RFP may require that Design Build Proposals must meet a minimum technical score and/or minimum qualifications in order to be deemed responsive. A Proposal shall not be considered responsive unless it meets or exceeds the published requirements.

3.6.3. FIXED PRICE

In lieu of requiring qualitative Technical Proposals and Price Proposals, VDOT may establish a fixed dollar budget for the project in the RFP, and require submission of only qualitative Technical Proposals. The fixed price is the same for all Design Build Teams, and in this approach, award is made to the Technical Proposal receiving the highest score.

3.7. RFP EVALUATION

VDOT used to provide in the RFP documents a great level of details concerning the RFP evaluation criteria. However, due to a recent lawsuit, VDOT has stopped this practice of disclosing all these information in the RFPs. In the past, VDOT would specify in great details the meaning of each score (i.e., 1, 2…) and the expected design for each score. This practice led to VDOT's inability to make distinction between an outstanding design and other average designs. Now, VDOT still follows the rubric but refrains from stating the expected design for each score (VDOT 2011). VDOT is also looking forward to having one consensus (group) score instead of individual scores since the individual scores have historically become a legal burden for the department since the individual scores can be challenged legally. The Two-Phase Best Value selection process is based on the evaluation of the Technical Proposals and Price Proposals, as stated in the RFP.

3.7.1. TECHNICAL PROPOSAL EVALUATION

At the location, time and date indicated in the RFP, the Technical Proposals are presented to VDOT's designated Proposal Evaluation Team for evaluation. The Proposal Evaluation Team should first determine whether or not the Proposals are responsive to the requirements of the RFP. Each responsive

Technical Proposal is evaluated using the rating criteria and factors identified in the RFP. These factors may include but are not limited to project design, project construction, schedule, Design Build Team's understanding of project, and problem resolution.

The Proposal Evaluation Team reviews the individual Technical Proposals and shall score them in accordance with the advertised requirements and schedule. After the individual scores have been completed, the Proposal Evaluation Team meets to discuss the Technical Proposals. The Technical Proposals and scores are discussed one at a time. After the discussion is completed, each team member is given the opportunity to adjust his/her score. Once all scores have been finalized, the discussion proceeds to the next Technical Proposal. This procedure proceeds until all Technical Proposals have been individually discussed and each score finalized. The Project Manager - Innovative Project Delivery Division (PM-IPD) chairs and facilitates the scoring/ranking meeting. The meeting is attended by all Proposal Evaluation Team members, the PM-IPD, and the ASD representative. The ASD representative, a non-voting independent person, attends the meeting to provide oversight and to ensure fairness in the scoring process. After the revisions have been made and documented, the ASD representative shall certify scores. A representative of Civil Rights Division is also invited to observe the evaluation as a non-voting member of the panel.

VDOT evaluates each Proposal (Technical and Price) from each Design Build Team, with such evaluation being based upon the numerical weighting set forth in the RFP. The Technical Proposal typically has a weighting of thirty percent (30%) and the Price Proposal has a weighting of seventy percent (70%) (VDOT 2011).

3.7.2. Price Proposal Evaluation

VDOT keeps the Price Proposals sealed and stored in a secure location until the Technical Proposals have been evaluated. VDOT scores and ranks Price Proposals as follows:

- The Design Build Team submitting the lowest Price Proposal is awarded the maximum number of points, seventy (70).

- The next-lowest Price Proposal is awarded points based on the product of: (a) the ratio of the lowest Price Proposal divided by the next-lowest Price Proposal; and (b) seventy (70) points (i.e., the points awarded for the lowest Price Proposal), with such product rounded to the nearest one hundredth of a point.
- The process continues for each of the remaining Price Proposals, with points being awarded based on the product of: (a) the ratio of the lowest Price Proposal divided by the respective Design Build Team's Price Proposal; and (b) seventy (70) points (i.e., the points awarded for the lowest Price Proposal), with such product rounded to the nearest one hundredth of a point.

3.7.3. COMBINING TECHNICAL AND PRICE PROPOSAL SCORES

The weighted technical score is added to the weighted price score to obtain a combined score for each Design Build Team's Proposals. The Proposal with the highest combined score is considered the highest-scored Design Build Team. Figure 4.23 shows a sample of combined Technical and Price Proposal score sheet.

SAMPLE FINAL RFP SCORES						
	Technical 30%		Price 70%			
Offerors	**Raw Score**	**Weighted score**	**Price**	**Raw Score**	**Weighted score**	**Combined Score**
1	71.00	21.30	$40,000,000	97.50	68.25	89.55
2	69.00	20.70	$42,000,000	92.86	65.00	85.70
3	65.00	19.50	$39,000,000	100.00	70.00	89.50

FIGURE 4.23

Sample of Combined Technical and Price Proposal Scores (Copyright of VDOT 2011)

3.8. BEST & FINAL OFFER (BAFO)

VDOT may use a BAFO in conjunction with any Basis for Award. If VDOT decides that further information and discussion is necessary after reviewing the submitted Proposals, it may establish a competitive range of the highest rated Design Build Teams deemed to be fully qualified and best suited among those submitting Proposals (or with all Design Build Teams). VDOT invites Design Build Teams in the competitive range to participate in individual discussions with the designated Proposal Evaluation Team. Following discussions, VDOT offers the Design Build Teams in the competitive range to resubmit their Proposals in the form of a BAFO. After the BAFOs are submitted, no further discussions shall be conducted with any of the Design Build Teams. VDOT evaluates and scores the BAFOs using the same criteria stated in the RFP to evaluate the initial Proposal submittal. At its sole discretion, VDOT makes the decision to award the Design Build contract based on the evaluation of the BAFO only.

3.9. Proposal Payment (Stipend)

VDOT may consider a Proposal Payment for the Design Build Teams who submit a responsive Design Build Proposal, but who are not selected for the contract award. The Proposal Payment amount, if any, is identified and the Proposal Payment Agreement Form is included in the RFP. The Proposal Payment would be paid to unsuccessful shortlisted Design Build Teams only (VDOT 2011). When a Proposal Payment is accepted, VDOT retains the right to use technical solutions, design concepts, or any other proprietary information contained in Design Build Proposals from unsuccessful Design Build Teams. However, VDOT does not have the right to use technical solutions, design concepts, or any proprietary information contained in Proposals from unsuccessful Design Build Teams when Proposal Payments are not paid.

Under no circumstances the Commonwealth, the Commissioner, or VDOT are liable for Proposal development costs incurred by Design Build Team unless otherwise noted in the RFP. Similarly, in case the Design Build procurement process is terminated prior to the Proposal submission date, the Commonwealth, the Commissioner or VDOT are not be responsible for Proposal development costs incurred by the Design Build Teams.

4. Right-of-way Acquisition, Utilities Coordination, and NEPA Approval

VDOT does not let the project out before acquiring the NEPA document. Although the Department assumes the responsibility of acquiring the NEPA documents, it shifts the responsibilities of applying for the necessary permits to the Design Build Team. In addition, although VDOT can perform the ROW acquisition activities, it does not typically assume the responsibility for providing ROW acquisition services. This responsibility is shifted to the Design Build teams. The same happens with utility relocation. VDOT facilitates the initial meeting with the utility owners. However, the responsibility to finalize the utility coordination process and implement it is with the Design Build teams. The Design Build teams should include these services in their price proposals. It should be noted that, VDOT is the party that writes the checks but all the coordination and agreements are made by the Design Build Teams.

5. Organization for Design Build Project Procurement

VDOT has a six-year improvement program (2012-2018) that outlines planned spending for transportation projects proposed for construction development or study for the next six years that is currently under review by the districts. The districts determine the projects that they believe are good candidates for Design Build Project Delivery System. They compile a list of candidate projects and send it to the Alternative Project Delivery office. They also work with design group at the central office to identify that the projects are good candidates for Design Build from the design perspective.

The office of Alternative Project Delivery system looks at a some key features of the proposed projects including the status of the relevant NEPA documents, the risks associated with the project, the third party involvement (utility, Right of Way, Hazmat, etc.), public support, and railroad agreement. The office then asks for the schedule of various activities and the district's plans for meeting the schedule milestones. This is used in the RFP documents. Once the process is completed, the office of Innovative Project Delivery looks at the time at which the project can be advertised based on the ongoing projects in the office. This office is also responsible for pre-award activities, procurement, and awarding the projects. Nevertheless, the district office is involved in these activities through its various functional teams. Once the project is awarded, the project is handed to the district field office for contract administration. There is a scope validation period (90-120 days) during which the central office is still involved in the process. Following this period, the district office is fully responsible for contract administration.

In general, there is a lot of administrative burden on the office of Alternative Project Delivery since it is involved in majority of the stages of the procurement process for every project.

6. Next Generation Design Build Contracting

Enhancing the Best Value evaluation and the challenge of Design Build teams' responding to the RFQs and RFPs is a critical issue for VDOT. These make it hard for the department to make distinction between the Design Build Teams. A potential solution is the use of performance based RFPs in which there are only performance specifications and no requirements. Therefore, the next-generation of Design Build contracts can be the performance-based Design Build contracting.

SUMMARY

The detailed interviews with Florida, Virginia, and Colorado Sate DOTs, led to the realization that these 3 State DOTs generally have a uniform understanding of Design Build Project Delivery System and its respective strengths and weaknesses. These DOTs can be considered as mature organizations with respect to Design Build Project Delivery System. Florida has the longest Design Build history with a lot of experience, several employees, and a large number of completed Design Build projects. Colorado and Virginia have relatively younger Design Build programs with fewer personnel. One thing in common among these State DOTs is the supporting legal and statutory environment in these States. State legislatures have positive attitudes towards Design Build Project Delivery System for transportation projects. They allow the State DOTs to have considerable flexibility in terms of selecting among various forms of Design Build Project Delivery System and respective procurement methods for transportation projects. The supporting political environment and the Department's institutional alignments have really helped these State DOTs to expand their Design Build programs.

Statistics collected from CDOT, FDOT and VDOT indicate rising growth in number of Design Build projects. For all three State DOTs, the share of Design Build projects of the total annual construction fund has been constantly growing. All three State DOTs noted that they have plans for expanding their Design Build programs and increasing the number of Design Build projects (both in number and dollar worth measured as the share of their annual total project funds to their Design Build projects). For instance, CDOT currently has the goal of spending 40% of its annual total project fund through Design Build projects. In Virginia, the original statute authorizing VDOT to use Design Build, puts a restriction on the number of projects that VDOT can deliver through Design Build (5 Design Build projects at no more than $20 million value, 5 Design Build projects valued at more than $20 million and no more than 5 of Design Build projects are enforced at the same time). The State legislation removed the restriction in 2006 and let VDOT go with Design Build projects unlimited. VDOT has used this opportunity to constantly increase the number and value of Design Build projects.

Among the most prominent drivers for using Design Build Project Delivery System by these three State DOTs are: expediting project delivery, encouraging innovation, reducing project costs, and enhancing quality. One or a combination of these criteria has been used by these State DOTs in selection of Design Build Project Delivery System for a transportation project. For instance, projects that do not have much room for innovation can still be candidates for Design Build if the State DOT seeks opportunities to expedite the delivery and vice versa. This flexibility in selecting Design Build Project Delivery System has helped these State DOTs to use Design Build for delivering various types of transportation projects.

The research team explored that Design Build Project Delivery System is not appropriate for every transportation project. It is noted by the officials in these three State DOTs that considering the State DOT's specific cost, time and quality goals for a project, the traditional Design Bid Build can still be the most appropriate Project Delivery System for many projects. For instance, these State DOTs typically do not use Design Build for projects that do not involve much design work or are not too technically challenging (e.g., resurfacing an existing roadway) since they would derive little benefit from integrating the work of the designer and the contractor. The officials in these State DOTs expressed their preference towards using a systematic and transparent selection method for selecting Design Build for a transportation project. These officials believed that State DOTs benefits from an effective and transparent evaluation process that explicitly shows how using Design Build Project Delivery System can produce the best outcome for the project. State DOTs participated in this review emphasized the value of a systematic and transparent approach that can help them determine whether Design Build is the appropriate Project Delivery System for a proposed project.

The research team found out that efficient and effective risk allocation is critical in the success of Design Build projects for these three State DOTs. In a Design Build project, the Design Build Team becomes responsible for many of the activities that currently are the responsibility of the State DOT. For instance, FDOT and VDOT typically shift the responsibility of ROW acquisition and utility coordination services to Design Build Teams. The Design Build Team should accept the responsibility and risk associated with these services and the State DOT relinquishes its control over these activities. On the other hand, there have been instances that these State DOTs decided to assume the responsibility for specific activities as they felt that the DOT is the most qualified party to assume the associated risk. For instance, CDOT typically remains in full ownership and control of all actions concerned with ROW acquisition. CDOT tries to acquire as much ROW as soon as possible so that the burden and risk transferred to the Design Build Team is reduced. Nevertheless, this may have negative impact on project delivery schedule or limit the Department's ability to take advantage of the Design Build Team's knowledge and expertise related to ROW acquisition services. Thus, all three State DOTs emphasized on the great need for explicit risk identification and clear risk assignment between parties in Design Build contracts. It is found out that these State DOTs assess whether the identified project risks can be effectively managed if the Design Build Project Delivery System is selected for the project. This helps State DOTs in developing an optimized risk management plan for the Design Build project. All three State DOTs expressed the great need for the development of appropriate matrices for risk allocation.

The detailed interviews of officials in these three State DOTs revealed that the successful implementation of a Design Build project highly depends on the procurement method used for Design Build Team selection. It is found out that these State DOTs have the flexibility to use a variety of procurement methods including Single Phase Low Bid, Two Phase Low Bid, and Two Phase Best Value. In conjunction with these procurement methods and based on the specific needs of a given project, these State DOTs have used methods such as Adjusted Score, Weighted Criteria, and Meets Technical Criteria – Low Bid as the basis for awarding Design Build contracts. These State DOTs consider the major project goals and specific project characteristics for selecting the proper procurement method for the Design Build project. These State DOTs have struggled to balance between the price and technical considerations in the Design Build procurement process. The major challenge for these State DOTs has been the length and complexity of procurement process. Typically, Two Phase Best Value is a lengthy and complex procurement method that these State DOTs use for complicated projects, which are worth special attention. On the other hand, these State DOTs apply one-phase or two-phase low bid procurement method for smaller and simpler Design Build projects. However, none of these State DOTs have explicit guidelines for selecting the proper procurement method for a Design Build project.

Official in these three State DOTs evaluate each Design Build project separately and decide what procurement method (based on price or based on the combination of price and technical factors) should be selected for the project. It is indicated that sometimes the procurement phase for Design Build projects in these DOTs became a lengthy and complicated process that consumed considerable time and resources. Also, in rare occasions, the procurement process exposed these State DOTs to unwanted public scrutiny and industry protests. For instance, VDOT was subjected to a lawsuit initiated by the loosing Design Build Team. VDOT made a subtle mistake in the midst of implementing the lengthy Two Phase Best Value procurement process, which provided the ground for the lawsuit. This lawsuit was a learning point for VDOT. As a result, VDOT changed the Design Build Team evaluation process from individual assessment to the consensus-based evaluation. Also, VDOT attempts to use Low Bid procurement method whenever possible as a proper substitute for the Best Value Selection.

In general, these State DOTs are currently working to optimize the procurement process, in order to facilitate and expedite Design Build Project Delivery. The major challenge is to choose the most appropriate procurement method that meets the Department's requirements for the project and fulfills specific project goals. For instance, it was noted that these State DOTs typically used the price as the basis of awarding the Design Build contract whenever the price is the only key factor, which differentiates competing Design Build Teams. Also, these State DOTs expressed that consideration of many technical factors in the procurement process may complicate the procurement process, waste the State DOT's time and resources, and lead to public scrutiny and industry protests. However, officials in these State DOTs believed that the Best Value Selection (i.e., the combination of price and technical factors) is beneficial and albeit crucial for unique and complicated projects. In these cases, State DOTs used shortlisting to create a pool of highly qualified Design Build Teams based on their qualifications, and then awarded the Design Build contract based on a Best Value Selection approach. Officials in these State DOTs expressed that the Design Build industry in their respective States has considerable interest towards the shortlisting since it enhances the quality of competition and increases the chance of winning. Shortlisting is also an effective way for these State DOTs to manage their resources and time during the procurement phase of Design Build projects and hence, expedite the project delivery. These State DOTs facilitate the Best Value Selection through the use of few critical technical factors for proposal evaluation. More Pass/Fail criteria are intended to be used, in order to expedite shortlisting and proposal evaluation.

The research team found out that the flexibility in choosing among various procurement methods has really helped these State DOTs to fully benefit from the possible advantages of Design Build Project Delivery System. This flexibility allows these State DOTs to consider specific project goals and choose the procurement method that best matches the Department's objective in expediting project delivery. All State DOTs are actively working to improve their procurement processes for evaluating and selecting the Design Build Teams. The common goal for these State DOTs is to streamline procurement processes by creating a balance between innovation and technicality as offered by Best Value procurement with the efficiencies and transparency that can be gained through Low Bid procurement. The research team observed a common desire among these State DOTs to increase the use of Pass/Fail criteria for evaluating Design Build proposals.

It was found out during the interviews that these State DOTs have initiated efforts to develop standard contract templates for Design Build projects. Design Build projects are essentially different from Design Bid Build projects and therefore, Design Build projects require different contract templates for procurement. This is an important deviation from the current practice of modifying existing Design Bid Build contracts that is commonly followed by other State DOTs. State DOTs generally have standard contracts that have long been used for Design Bid Build projects of various sizes and values. These are construction contract templates that are not necessarily appropriate for Design Build projects in which the Design Build Team is contractually responsible for both design and construction phases. As part of the next generation Design Build, new documents should be developed to allow for the proper control of Design Build procurement and contract administration processes.

Standard Design Build contract documents should at least contain four different sections. Section 1 is the Instructions for Proposers. It contains details on submittal requirements, procurement procedures, prequalification areas, selection criteria, scoring criteria, evaluation process, and other considerations that are specific to the procurement of a given project. Section 2 essentially becomes the Design Build contract once the procurement phase is over. It consists of commercial terms, general conditions, and other details that establish the scope of the Design Build contract. Section 3 contains the technical requirements associated with the project, including drawings and design criteria. Special technical provisions of the Design Build project are explicitly described in Section 3. The project-specific technical information will form the basis for Design Build Teams' technical and price proposals. Consequently, the accuracy of this information is critical, as the risks of any errors or conflicts will likely be borne by the state DOT. Section 4 refers to standard design specifications and guidelines developed by local, state, and federal authorities that Design Build Teams should strictly follow. This Section identifies all required reference documents for design and construction that proposers must comply with. Section 4 serves at the programmatic level for design specifications of all Design Build projects.

Using standardized Design Build documents can help the Department in streamlining the Design Build procurement process. A template for all Sections can be drafted, in order to expedite contracting process. For the most parts, Sections 1 Instruction for Proposers and Section 4 References Information are not changed from a Design Build project to another Design Build project. Hence, a cut-and-paste approach can be used from one project to another, with just some parts of these Sections would be subject to changes, e.g., project-specific details and schedule for the procurement.

The officials in these State DOTs expressed great interest in the development of a systematic approach to select the most appropriate procurement method for Design Build projects. Like most State DOTS, these three State DOTs have a limited number of full-time employees in their Design Build programs and should rely on consultants or part-time staff for administering and coordinating Design Build projects. Therefore, it is critical to make the procurement process as efficient and effective as possible through the use of standard contracts (RFQs and RFPs) and whenever possible and appropriate, the use of less-complex procurement methods, such as low bid. Considering the limited resources available to Design Build programs in these State DOTs, the research team explored that the efficient Design Build organization is critical for coping with rising Design Build demands in these State DOTs. Therefore, these State DOTs expressed the great interest in developing proper risk allocation matrices and systematic procurement procedures along with standard Design Build contract template, in order to significantly save on time and limited resources available to their Design Build programs. At the same time, these three State DOTs seek any opportunities to expand their resources to strengthen their Design Build programs. Meanwhile, these DOTs rely on consultants and part-time staff for administration, coordination, and management of their Design Build projects. Overall, these State DOTs have good working relationships with the Design Build consulting communities in their States.

Overall, the state of Design Build programs is considered strong in Florida, Colorado, and Virginia DOTs. These State DOTs have strong plans to expand their programs. Although the practice of Design Build Project Delivery System is different among these State DOTs, for instance, in terms of proposal evaluation methods (e.g., adjectival rating versus scoring), the research team found out that all three State DOTs are actively seeking innovative ways to enhance, improve, and optimize their Design Build practices. The common goal is to achieve greater efficiency in delivering Design Build projects and expedite Project Delivery. The detailed interviews of these three State DOTs helped the research team understand that a systematic, transparent, and consistent approach towards the application of Design Build Project Delivery System is critical in the success of Design Build programs in these State DOTs. Proper selection of projects for Design Build Project Delivery System, development of appropriate risk allocation matrices, and a suitable selection approach for procurement methods are important subjects that facilitate the growth of Design Build programs in State DOTs with younger history of Design Build.

CHAPTER 5 A SYSTEMATIC APPROACH TO EVALUATE THE APPROPRIATENESS OF DESIGN BUILD PROJECT DELIVERY SYSTEM FOR A TRANSPORTATION PROJECT

The results of extensive academic/professional literature review, the scan of Design Build Project Delivery System in State DOTs across the nation, and the structured interviews of selected State DOTs assisted the research team to propose a systematic approach to evaluate the appropriateness of Design Build for a transportation project. This approach was developed in collaboration with GDOT Office of Innovative Program Delivery. Over the next three chapters, this systematic approach is presented that can be used to:

1. Evaluate the appropriateness of Design Build Project Delivery System for a transportation project;
2. Develop initial risk identification, assessment and allocation matrices for transportation Design Build projects; and
3. Evaluate the appropriateness of procurement methods for transportation Design Build projects

The process is shown in the form of a flow chart below.

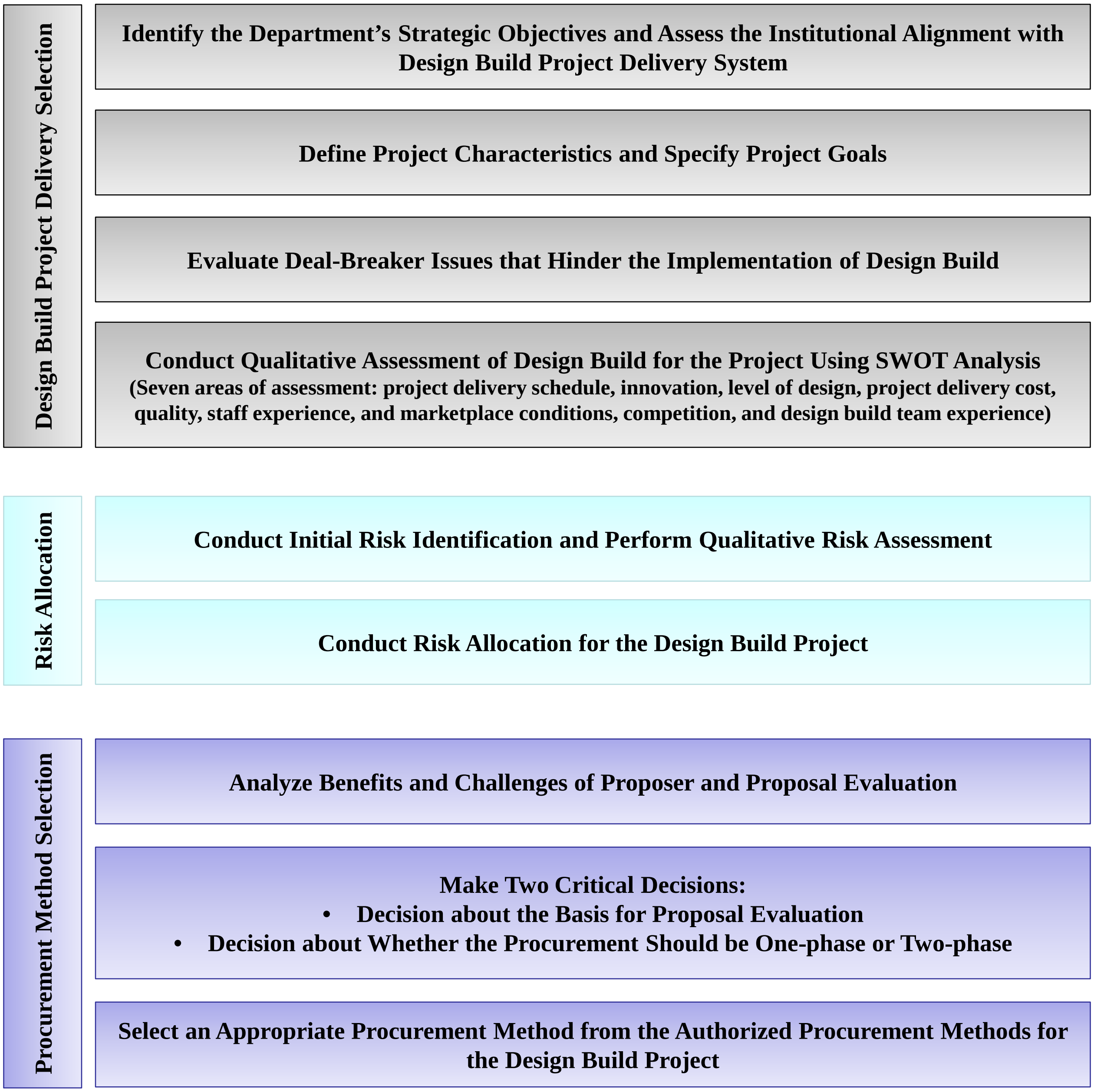


FIGURE 5.1

An overview of the Proposed Systematic Approach

Identify the Department's Strategic Objectives and Assess the Institutional Alignment with Design Build Project Delivery System

The first module of the systematic approach, presented in Figure 5.2, can be used to evaluate the appropriateness of Design Build Project Delivery System for a transportation project. The evaluation process begins with understanding and identifying the strategic goals of the Department as a foundation for selection of the appropriate Project Delivery System. The critical issue is whether using Design Build Project Delivery System is aligned with the Department's strategic goals for project delivery. The following list can be used as a basis to outline the Department's most important strategic goals related to Innovative Project Delivery Systems. It includes the institutional goals recommended in the FHWA Every Day Counts (EDC) initiative:

- Reduce Project Delivery Time
- Introduce Innovation
    - Facilitate and expedite the implementation of new technologies (e.g., Accelerated Bridge and Pavement Construction, Diverging Diamond Interchange)
- Align Project Goals (Quality, Schedule, Congestion Mitigation, etc.) with Contract Requirements
- Improve Risk Allocation
- Improve Constructability
- Improve Cost Reliability
- Reduce Owner Resources
- Lower Negative Impact on Public

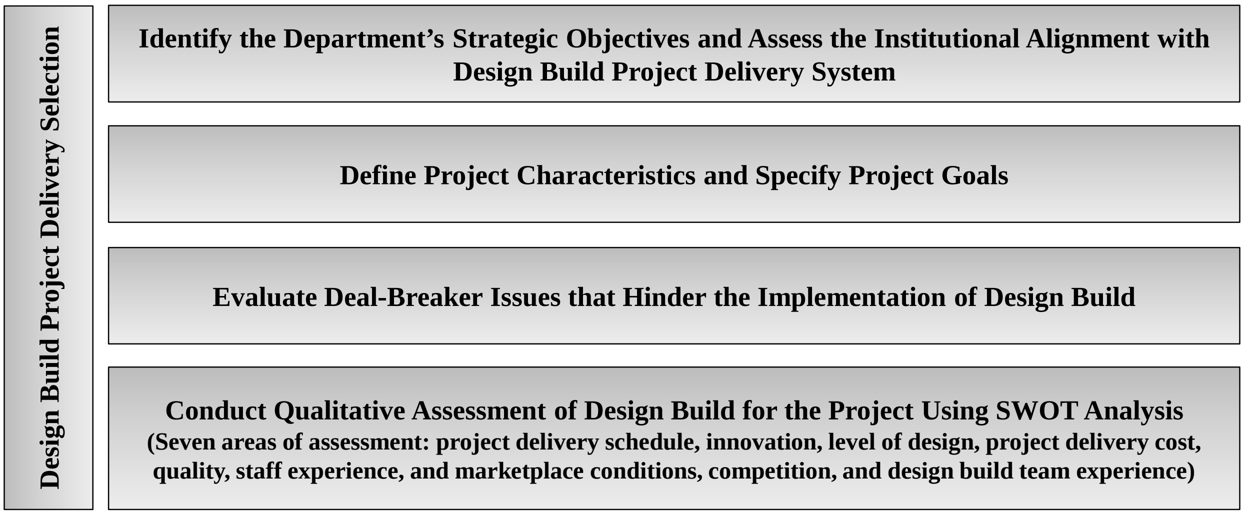


FIGURE 5.2

Module 1 of the Proposed Systematic Approach

DEFINE PROJECT CHARACTERISTICS

The following items (if applicable) can be used to create a brief description of the project. Other items can be added if they influence the decision on selection of the Project Delivery System.

- Project Name
- Project Location
- Project Corridor
- Estimated Budget
- Estimated Duration
- Required Delivery Date
- Sources of Project Funding
- Major Features of Work: pavement, bridge, sound barriers, traffic control system, etc.
    - Are these features tightly interrelated and/or closely located?
- Schedule Milestones
- Project Stakeholders
- Major Challenges
    - Unique or unusual site conditions
    - Environmental Approvals
    - Right of Way
    - Utilities
    - During Construction Phase
        - Construction staging
- Main Sources of Risk
- Safety Issues
- Traffic Management Issues
    - Traffic detours

    - Closure periods

- Sustainable Design and Construction Requirements

SPECIFY PROJECT GOALS

Specific project goals must be clearly understood and identified as a foundation for the selection of appropriate Project Delivery System. Generic project goals are summarized below. This list can be used as a basis to outline the most relevant project-specific goals.

GENERIC PROJECT GOALS

Project Delivery Schedule

- Reduce the procurement time
- Shorten the Project Delivery time
- Establish a more-realistic project schedule
- Complete the project on schedule
- Accelerate start of the project revenue
- Accelerate opening of the project to the public
- Maximize the use of available funding
- Minimize the impact on the public with the use of expedited construction process

Project Delivery Cost

- Establish project cost
- Minimize project cost
- Minimize project cost growth
- Reduce procurement cost

Innovation

- Promote innovation
- Obtain services/expertise beyond in-house capabilities

Quality, Safety and Functionality

- Enhance quality
- Enhance constructability
- Enhance the control and oversight over the design quality

- Maximize the life cycle performance of the project
- Maximize capacity and mobility improvements
- Obtain the maximum project scope with the fixed budget
- Maximize safety of workers and traveling public during construction
- Minimize inconvenience to the traveling public during construction
- Minimize the impact on environment

DEAL-BREAKER ISSUES

If the answer to any of the questions below is “No,” the project cannot be considered for Design Build Project Delivery System.

Legal & Statutory Requirements: Considering the project characteristics (type and size), does the current regulation allow the Department to use Design Build Project Delivery System to develop this project?

Agency Resources and Experience: Considering Department's available human resources and the Department’s access to Design Build consultants, can this project be delivered using Design Build Project Delivery System?

Project Funded: Considering the Department's funding resources, can this project receive funding in foreseeable future, in order to be delivered using Design Build Project Delivery System?

Note: *Sometimes, the Department may want to include a project in its Design Build watch-list although the funding for the project is still not secured.*

Leadership Support: Does the Department's leadership support the utilization of Design Build Project Delivery System for this project considering issues such as public endorsement?

Design Build Marketplace Conditions: Considering Design Build expertise available in the State and the Department’s potential access to qualified Design Build Teams outside the State, can this project be delivered using Design Build Project Delivery System?

SWOT ANALYSIS

SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis can be used by the Department to determine the appropriateness of Design Build Project Delivery system for a transportation project with respect to specific factors. SWOT analysis addresses the following issues:

Strengths: Characteristics of the Design Build Project Delivery System that give it an advantage with respect to the issue under consideration;

Weaknesses (or Limitations): Characteristics of the Design Build Project Delivery System that create disadvantages with respect to the issue under consideration;

Opportunities: Chances to improve performance (e.g. achieve the Department's project goals; greater benefits; higher efficiencies) if it decides to go with Design Build Project Delivery System;

Threats: Elements that could result in for the Department if it decides to go with Design Build Project Delivery System.

The following factors are considered in this SWOT analysis:

a) Project Delivery Schedule
b) Innovation
c) Level of Design
d) Project Delivery Cost
e) Quality
f) Staff Experience
g) Marketplace Conditions, Competition and Design Build Team Experience

A generic SWOT analysis template for Design Build Project Delivery System is presented below. A scoring system has been developed, in order to facilitate an objective and clear evaluation of the suitability of Design Build Project Delivery System for Office of Innovative Program Delivery of Georgia Department of Transportation. In this scoring system, Strengths and Weakness are scored on a 1-10 scale with Strengths receiving a positive score and Weaknesses a negative score. Opportunities and Threats are scored on a 1-5 scale with Opportunities receiving a positive score and Threats a negative score.

The appropriateness of Design Build Project Delivery System is evaluated independently for each of the seven areas. The proposed assessment method is based on both qualitative and quantitative evaluation processes. The qualitative assessment is based on SWOT analysis for each area. A template of main strengths, weaknesses, opportunities, and threats is presented for each area. This template provides a beginning point for the assessment. If appropriate, the decision maker can refine the language in these templates and further add other assessment statements to them.

The quantitative assessment is based on a simple rating system that assigns a score to each SWOT area. This score can take any value between +20 (meaning that the dynamics of the Design Build Project Delivery System best addresses the concerns of the Department in the SWOT area) and -10 (meaning that the dynamics of the Design Build Project Delivery System least addresses the concerns of the Department in the SWOT area). We normalize the score of each SWOT area to facilitate its interpretation and its application in the quantification of the total score (i.e., the raw score is linearly transformed from the range of -10 to 20 into the range of 0 to 100). Finally, we present a weighting system to combine the normalized scores of the seven SWOT areas into a total score that represents the total appropriateness of Design Build Project Delivery System for the project. Weights are selected by the decision maker to determine the relative significance of each SWOT area in the overall process of the assessment of Design Build Project Delivery System. The overall score of this quantitative assessment is a value between 0 and 100. The following table shows how appropriate Design Build Project Delivery System is for the project considering different ranges of the overall score of the proposed evaluation process.

Appropriateness of Design Build Project Delivery System for the Project	Range of the Overall Score
Excellent Design Build candidate; Design Build risks have been properly assigned and mitigated	80-100
Good Design Build candidate; Some mitigation measures should be considered to ensure successful delivery	60-80
Mediocre Design Build candidate; Design Build Project Delivery System is risky or another Project Delivery System may be more suitable	50-60
Poor Design Build candidate; Another Project Delivery System may be more suitable	40-50

Not suitable for Design Build Project Delivery System	Below 40

The entire SWOT analysis is automated in a Java Applet tool that is specifically developed for GDOT. This tool is currently used in the Office of Innovative Program Delivery for the assessment of Design Build Project Delivery System for GDOT transportation projects.

a) Project Delivery Schedule is the overall project schedule from planning through design, construction and opening to the public

<table>
<tr><th colspan="2">Design Build Project Delivery System</th></tr>
<tr><th>Strengths</th><th>Weaknesses</th></tr>
<tr><td>o The single point of responsibility (i.e., one contract) reduces the procurement time
o Project delivery can be shortened due to concurrent design and construction processes
o The contractor’s input into the design process helps the Design Build team establish a more realistic project schedule
o The project schedule is contractually established in Design Build proposals before detailed design plans are completed
o The collaboration and coordination between the designer and the contractor helps the Design Build team secure a project schedule before detailed design completion
o It reduces the chances of project delays caused by the disputes between the Department and Design Build teams</td><td>o The Request for Proposal (RFP) development process can become lengthy due to the time required to define technical requirements and expectations
o Establishing Quality Assurance Programs for design and construction that are understood and accepted by all stakeholders is time-consuming
o The Department and other stakeholders need to understand and commit to an expeditious review of design</td></tr>
<tr><td>Strengths Score: 0-10</td><td>Weaknesses Score: (0-10)</td></tr>
<tr><th>Opportunities</th><th>Threats</th></tr>
<tr><td>o It enables the Department to maximize the use of available funds
o It enables the Department to issue RFQ and RFP, award the contract and issue notice to proceed with preliminary design (i.e., let the project) prior to the conclusion of the NEPA process
o It enables the Department to allow the Design Build team to proceed with final design and construction for any projects, or portions thereof, for which the NEPA process has been completed
o It enables the Department to shift the schedule risk to the Design Build team
o It enables the Department to fast-track projects that are behind the schedule in the Plan Development Process (PDP)
o It enables the contractor to work closely with the designer to procure long-lead items early in the design process
o It enables the contractor to start working on early construction activities, such as construction mobilization, before the detailed design completion
o It enables the contractor to deliver the project in multiple phases using the phased design</td><td>o Undefined events or conditions found after procurement, but during design, can impact schedule
o By awarding the contract prior the completion of NEPA process, the Department assumes the risk of project delay and/or contract termination
o The Design Build team’s internal conflicts can adversely impact the project delivery schedule
o Defining the project scope with clear definitions, requirements and expectations may delay project procurement
o Development of a comprehensive risk management plan (risk identification, assessment, allocation and mitigation) may delay project procurement</td></tr>
</table>

o It enables the contractor to start construction prior to final Right of Way (ROW), utilities and railroads agreements o If authorized, the Department can utilize an A-plus-B(i.e., Cost plus Schedule) contracting method to include the project delivery schedule in selection of the Design Build team o It enables the use of expedited construction process in order to minimize the impact on the public o The Department may use the Design Build team's expertise in Right of Way acquisition and Utilities Coordination services to expedite project delivery	
Opportunities Score: 0-5	*Threats Score: (0-5)*
Score of Project Delivery Schedule	*From -10 to +20*
Normalized Score of Project Delivery Schedule	*From 0 to 100*

b) Innovation is the application of [new] methods, techniques and technologies in order to overcome project complexities, expedite the project delivery, reduce project costs, and/or enhance quality

<table>
<tr><th colspan="2">Design Build Project Delivery System</th></tr>
<tr><th>Strengths</th><th>Weaknesses</th></tr>
<tr><td>
o The collaboration and coordination between the designer and the contractor helps the Design Build team identify and optimize innovative designs and construction methods or techniques
o The single point of responsibility and early team integration enable the Design Build team to smoothly and effectively implement innovative solutions
o Constructability reviews and Value Engineering (VE) can be done simultaneous to the design process
</td><td>
o It requires desired solutions to complex projects to be well-defined through technical requirements and expectations, which are typically difficult to do
o Defining and evaluating qualitative aspects of design (e.g., aesthetics) can be challenging
o Cost and time constraints may inhibit innovation
o For simple and less complex projects, the prospects for innovation are limited
</td></tr>
<tr><td>Strengths Score: 0-10</td><td>Weaknesses Score: (0-10)</td></tr>
<tr><th>Opportunities</th><th>Threats</th></tr>
<tr><td>
o It enables the Department to effectively deliver complex projects such as projects with a number of primary features tightly interrelated and/or closely located, projects with construction staging issues and projects with unique or unusual conditions
o It enables the Department to enhance innovation through the release of draft RFPs and receipt of comments and requests for clarification
o It enables the Department to enhance innovation through the confidential pre-approved Alternative Technical Concepts (ATCs)
o If authorized, Best Value procurement can help the Department enhance innovation through competitive pricing of innovative designs and construction methods or techniques
o It enables the Department to benefit from both cost-saving and quality-improving innovative solutions
o By accepting ATCs, the Department shifts the risks of failure of innovative solutions to the Design Build team
o It enables the use of innovative design and construction methods or techniques, in order to minimize the negative impact on the public
o It enables the Department to capitalize on the Design Build team's access to unconventional mechanisms for the public outreach and engaging the people and other stakeholders in the project
</td><td>
o Innovation can be limited if the contractor does not allow the designer to have a legitimate seat at the table with the owner (i.e., the contractor relegates the designer to a back office design role only)
o Some innovative solutions may not be implementable within the time and budget limits of the project
o Prescriptive NEPA documents may limit the Department's flexibility for accepting innovative design solutions
o Extraordinary time and cost requirements for reevaluating NEPA document may inhibit the acceptance of ATCs
o The Design Build team may enhance innovation only from the cost standpoint and not necessarily from the quality standpoint
o Quality Assurance Programs and Quality Control Systems for innovative designs and construction methods or techniques are difficult to specify in RFPs
o There is a risk that innovative solutions do not perform as anticipated and therefore, delay the project delivery
o The use of Low Bid procurement method may inhibit innovation
o Innovation may be limited to the capability and comfort zone of the Design Build team selected for the project
</td></tr>
<tr><td>Opportunities Score: 0-5</td><td>Threats Score: (0-5)</td></tr>
<tr><td colspan="2">Score of Innovation | From -10 to +20</td></tr>
</table>

Normalized Score of Innovation	*From 0 to 100*

c) Level of Design is the percentage of design completion at the time of the project delivery procurement

Design Build Project Delivery System	
Strengths	**Weaknesses**
o It does not require complete design plans before awarding the project to the Design Build team o The detailed design specifications are not required, in order to communicate the design to potential Design Build teams (e.g., 10%-30% complete design is often satisfactory to procure the project) o Contractor involvement during the design process enhances constructability (i.e., the collaboration and coordination between the designer and the contractor enhances the opportunity to improve the constructability) o The Design Build team accepts the liability for design errors/omissions o The continuous execution of design and construction enhances the control and oversight over the final product	o The definitions, requirements and expectations (including the project scope and performance expectations) will become the basis for the contract and , thus, should be clearly stated in the RFP o As the percentage of design completion increases, the opportunity to benefit from the advantages of Design Build becomes limited o It is imperative to establish Quality Assurance Programs for design and construction that are understood and accepted by all stakeholders
Strengths Score: 0-10	*Weaknesses Score: (0-10)*
Opportunities	**Threats**
o It enables the Department to transfer design risks to the Design Build team o Flexibility in the project scope and incomplete design plans allow the Design Build team to develop innovative designs o It eases the acquirement of NEPA document approval through the flexible project scope o It enables the Department to advance the design only to the level necessary for defining the contract requirements and allocating the risks o Not fully-developed design plans permit the utilization of ATCs proposed by the Design Build team o The continuous execution of design and construction enhances the control and oversight over the project o The collaboration and coordination between the designer and the contractor enhances the opportunity to reduce the number of change orders o The collaboration and coordination between the designer and the contractor reduces the possibility of errors/omissions	o The Department's requirements and expectations may not be met if they are not adequately defined in the RFP o By relinquishing the control over design details, the Department may not be able to achieve some of its quality objectives o It can reduce the design standardization across the Department's projects o There is a risk that the design plans are defective and therefore, delay the project delivery

<table>
<tr><td>

If the Department proceeds to award the Design Build contract prior to the conclusion of NEPA process, then the Department may permit:

Undertaking design and construction activities for the purpose of defining the project alternatives and completing the NEPA alternative analysis and review process
Supporting agency coordination, public involvement, permit applications, or development of mitigation plans
Developing the design of the preferred alternative to a higher level of details

</td><td colspan="2"></td></tr>
<tr><td>Opportunities Score: 0-5</td><td colspan="2">Threats Score: (0-5)</td></tr>
<tr><td colspan="2">Score of Level of Design</td><td>From -10 to +20</td></tr>
<tr><td colspan="2">Normalized Score of Level of Design</td><td>From 0 to 100</td></tr>
</table>

d) Project Delivery Cost is the Department's overall cost of delivering the project from planning through design, construction and opening to the public

Design Build Project Delivery System		
Strengths	**Weaknesses**	
o The collaboration between the designer and the contractor helps the Design Build team identify and optimize cost-efficient solutions to project goals o The project cost is contractually established in Design Build proposals before detailed design plans are completed o The collaboration between the designer and the contractor involvement in early design and constructability reviews moderate the cost o The single point of responsibility and early team integration create the potential for lower average cost growth o The single point of responsibility (i.e., one contract) reduces the Department's procurement cost	o It is difficult to accurately estimate the lump sum cost when detailed design plans are not complete o The Design Build team may use high contingency when detailed design plans are not 100% complete o If design is too far advanced, there is limited potential for cost savings o If authorized, Best Value procurement may not necessarily lead to selection of the bidder with the lowest price o The project delivery cost increases when stipends are paid to shortlisted Design Build teams	
Strengths Score: 0-10	*Weaknesses Score: (0-10)*	
Opportunities	**Threats**	
o It enables the Department to use a fixed budget-variable scope procurement method to deliver projects o It enables the Department to utilize confidential pre-approved Alternative Technical Concepts (ATCs) as cost-efficient solutions to meet project goals o The single point of responsibility (i.e., one contract) enables the Department to reduce the contract administration costs o If authorized, the Department can utilize an appropriate variation of Best Value as the basis of award to incorporate non-price factors, such as time and technical quality in proposal evaluation	o Poor risk allocation can result in high contingencies o The Design Build team's internal conflicts can adversely impact the project delivery cost o Increased proposal cost may limit the number of Design Build teams participating in the bidding process o The limited number of qualified Design Build teams in the marketplace can limit the potential for receiving price-competitive proposals o The use of Low Bid procurement method may result in cost growth during project construction o Cost savings from innovative design and construction methods or techniques may not be transferred to the Department o Not selecting the lowest bidder without properly communicating assessment criteria and proposal evaluation process may result in negative outcomes, such as bid protest, public outcry and industry resistance	
Opportunities Score: 0-5	*Threats Score: (0-5)*	
	Score of Project Delivery Cost	*From -10 to +20*
	Normalized Score of Project Delivery Cost	*From 0 to 100*

e) Quality is the ability of the delivered project to meet and exceed the Department's requirements and performance expectations

<table>
<tr><th colspan="3">Design Build Project Delivery System</th></tr>
<tr><th>Strengths</th><th colspan="2">Weaknesses</th></tr>
<tr><td>

It provides the Department with the capability to go beyond its normal level of quality in transportation projects
It reduces construction engineering and inspection costs to the Department since these quality control activities and risks are transferred to the Design Build team
Quality Control System is enhanced through the continuous involvement of designer throughout the project
While Quality Control is the Design Build team's responsibility, Quality acceptance remains the Department's responsibility

</td><td colspan="2">

It requires developing extensive systems for design acceptance/approval and construction acceptance (verification)
It requires establishing, understanding and accepting a Design Quality Assurance Program and a Construction Quality Assurance Program by all stakeholders
It strikes at the foundation of the traditional Quality Assurance/Quality Control roles through the combination of engineering and construction

</td></tr>
<tr><td>Strengths Score: 0-10</td><td colspan="2">Weaknesses Score: (0-10)</td></tr>
<tr><th>Opportunities</th><th colspan="2">Threats</th></tr>
<tr><td>

It provides an opportunity for the Department to maintain the same or higher level of quality while reducing the overall project cost and duration
It provides an opportunity for the Department to evaluate Quality Control Systems for design and construction, which are described by Design Build Teams in their proposals

</td><td colspan="2">

Contractor may drive designer to reduce cost at risk to quality
The Design Build team may enhance innovation only from the cost standpoint and not necessarily from the quality standpoint
Quality Assurance Programs and Quality Control Systems for design and construction are difficult to define in RFPs
Quality Assurance will become problematic if the Design Build team is assigned the responsibility to perform any acceptance and verification function
By relinquishing the control over design details, the Department may not be able to achieve its quality objectives
Checks and balances in design and construction Quality Assurance Programs may not be performed adequately

</td></tr>
<tr><td>Opportunities Score: 0-5</td><td colspan="2">Threats Score: (0-5)</td></tr>
<tr><td colspan="2">Score of Quality</td><td>From -10 to +20</td></tr>
<tr><td colspan="2">Normalized Score of Quality</td><td>From 0 to 100</td></tr>
</table>

f) Staff Experience is concerned with the Department's ability to provide necessary human resources and technical expertise as it relates to delivery of the project

Design Build Project Delivery System	
Strengths	**Weaknesses**
o The single point of responsibility (i.e., one contract) reduces the Department's administrative burden on the Department staff	o It requires the commitment of Department management and technical resources and expertise at critical points in the process (i.e., RFP development, design review, etc.) o It requires the concurrent commitment of design and construction resources to administrate the procurement and oversee the implementation of project o It may require changing roles of the current Department staff o It may require additional training of the current Department staff o It may require additional consultant support o It may require additional staff with Design Build oversight experience o It may require experienced staff for risk management (identification, assessment, allocation and mitigation)
Strengths Score: 0-10	*Weaknesses Score: (0-10)*
Opportunities	**Threats**
o Using Design Build provides the Department staff with the opportunity to learn a new process o It enables the Department to collaborate with the Design Build industry to deliver projects, which require specialty skills for design or construction that may not be available inside the Department	o It requires the Department's willingness to accept the required cultural shift for Design Build Project Delivery System o The Department may have to dedicate considerable staff resources during the procurement phase o If the current Department staff has limited experiences in similar projects, there will be challenges to administrate the procurement and oversee the implementation of project
Opportunities Score: 0-5	*Threats Score: (0-5)*
Score of Staff Experience	*From -10 to +20*
Normalized Score of Staff Experience	*From 0 to 100*

g) Marketplace Conditions, Competition and Design Build Team Experience is concerned with the market potential to provide highly-qualified Design Build teams for delivery of the project

<table>
<tr><th colspan="3">Design Build Project Delivery System</th></tr>
<tr><th>Strengths</th><th colspan="2">Weaknesses</th></tr>
<tr><td>o Teaming of the designer and the contractor can result in added technical value</td><td colspan="2">o In turbulent market conditions, early commitment to a price may increase the costs for the Department
o The need for Design Build qualifications may limit competition
o It may be difficult for the Department to find the Design Build teams with adequate experience with similar projects
o The Department heavily relies on the selected Design Build team's experience and expertise</td></tr>
<tr><td>Strengths Score: 0-10</td><td colspan="2">Weaknesses Score: (0-10)</td></tr>
<tr><th>Opportunities</th><th colspan="2">Threats</th></tr>
<tr><td>o If authorized, Best Value procurement enables the Department balance qualifications and cost in Design Build procurement</td><td colspan="2">o Conflicts may arise if the owner and the Design Build team have different levels of understating about the Design Build Project Delivery System
o The Design Build Team may face internal conflict due to the gap between the designer and the contractor experience
o The limited number of qualified Design Build teams in the marketplace can limit the potential for receiving price-competitive proposals
o The use of the Low Bid selection method does not necessarily lead to the selection of the best Design Build team</td></tr>
<tr><td>Opportunities Score: 0-5</td><td colspan="2">Threats Score: (0-5)</td></tr>
<tr><td colspan="2">Score of Marketplace Conditions</td><td>From -10 to +20</td></tr>
<tr><td colspan="2">Normalized Score of Marketplace Conditions</td><td>From 0 to 100</td></tr>
</table>

We will describe the calculation process through a simple example. Suppose that the results of the evaluation process are summarized in the table below. The normalized scores of the seven SWOT areas and the relative weights of these areas are shown in the table. The weighted average of these normalized scores is calculated using this information. This weighted average is the overall score that represents how appropriate Design Build Project Delivery System is for this project.

SWOT Area (Relative Weight in Percentage)	**Normalized Score of SWOT Area**
Project Delivery Schedule (20%)	40
Innovation (20%)	70
Level of Design (20%)	50
Project Delivery Cost (20%)	40
Quality (0%)	50
Staff Experience (10%)	70
Marketplace Conditions, Competition and Design Build Team Experience (10%)	50
Overall Score	*52*

The overall score is 52 that falls this project as a mediocre candidate for Design Build Project Delivery System as highlighted in the following table.

Appropriateness of Design Build Project Delivery System for the Project	**Range of the Overall Score**
Excellent Design Build candidate; Design Build risks have been properly assigned and mitigated	80-100
Good Design Build candidate; Some mitigation measures should be considered to ensure successful delivery	60-80
Mediocre Design Build candidate; Design Build Project Delivery System is risky or another Project Delivery System may be more suitable	***50-60***
Poor Design Build candidate; Another Project Delivery System may be more suitable	40-50
Not suitable for Design Build Project Delivery System	Below 40

CHAPTER 6 A SYSTEMATIC APPROACH TO DEVELOP INITIAL RISK IDENTIFICATION, ASSESSMENT AND ALLOCATION MATRICES FOR TRANSPORTATION DESIGN BUILD PROJECTS

When deciding about the appropriateness of Design Build Project Delivery System for a transportation project, the Department should also carefully review the potential project risks and identify appropriate allocation and mitigation measures that should be adopted, in order to facilitate the smooth implementation of Design Build Project Delivery System. The second module of the systematic approach, presented in Figure 6.1, can be used to develop initial risk identification, assessment and allocation matrices for transportation Design Build projects. Risk can be defined as the probability of occurring of an event during a specific period of time that causes the project outcomes to deviate from the expected values (Mandri-Perrott 2010). Risk stems from the exposure to the consequences of uncertainty. Uncertainty is the state of shortage of adequate information about the subject matter. A risk occurs when the consequence of an activity or decision is uncertain in terms of probability, impact or time (Boothroyd and Emmett 1996).

Risk management is the act or practice of dealing with risk (Kerzner 2009). Risk management involves a group of processes integrated within the context of a project that are aimed at assessing and measuring possible project risks as well as elaborating the strategies necessary for increasing the probability and impact of positive events and decrease the probability and impact of negative events in the projects. The core concepts of risk management are similar in different standards and guides developed around the globe. We summarize several processes recommended for risk management as the following:

The Joint Standards Australia/Standards New Zealand Committee (2004) developed the Australian/New Zealand Standard AS/NZS 4360:2004 and defined risk management as the systematic application of management policies, procedures, and practices throughout project development. The approach to project risk management in the AS/NZS 4360:2004 is consistent with the project risk management approach in

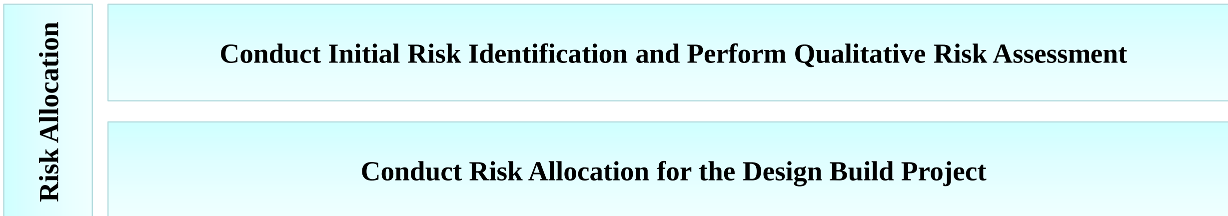


FIGURE 6.1

Module 2 of the Proposed Systematic Approach

the British standards institute (2000). Principles of a proper risk management model are described in this standard as the following:

- *Communicate and consult*: communicate and consult with internal and external stakeholders as appropriate at each stage of the management process (risk management should be considered as a whole).
- *Establish the context*: establish both external and internal contexts in which the process of risk management will take place (Criteria against which risk will be evaluated should be established and the structure of the analysis should be defined).
- *Identify risks*: identify where, when, why, and how events could prevent, degrade, delay or enhance the achievement of the objectives.
- *Analyze risks*: identify and evaluate existing controls. Determine consequences and likelihood and hence the level of risk (this analysis should consider the range of potential consequences and how these could occur).
- *Evaluate risks*: compare estimated levels of risk against the pre-established criteria and consider the balance between potential benefits and adverse outcomes (this enables decisions to be made about the extent and nature of treatments required and priorities to implement the treatments).

- *Treat risks*: develop and implement specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs.
- *Monitor and review*: monitor the effectiveness of all steps of the risk management process for continuous improvement.

The Risk Management Standard was developed through a collaborative effort among the major risk management organizations in the United Kingdom, the Institute of Risk Management (IRM), the Association of Insurance and Risk Managers (AIRMIC), and the National Forum for Risk Management in the Public Sector (ALARM). Risk analysis, risk evaluation, risk reporting and communication, risk treatment, and risk monitoring are identified as the main steps of risk management process in this standard (IRM et al. 2002).

Similarly, the Canadian Standards Association (2002) developed the Canadian Standard CAN/CSA-Q850-97 to aid decision makers in identifying, analyzing, evaluating, and controlling all types of risks. This decision making process consists of six steps developed based on a standardized management or systems analysis approach as the following:

- *Initiation*
    - Define problem or opportunity and associated risk issues
    - Identify risk management team
    - Assign responsibility, authority and resources
- *Preliminary analysis*
    - Identify hazards using risk scenarios
    - Review causes, triggers, and consequences of previous failures
- *Risk estimation*
    - Apply repeatable and transparent methodology for estimating frequency and consequence of risk scenarios
- *Risk evaluation*

    - Compare estimated risk against stakeholder acceptance criteria
    - Prioritize requirements for risk reduction
- *Risk Control*
    - Identify feasible risk control options (stabilization, protection, and warning), including estimated costs and residual risks
    - Assess stakeholder acceptance of residual risk
- *Action/Monitoring*
    - Implement chosen risk control strategies
    - Re-assess residual risks
    - Establish a monitoring process

The Association for Project Management (2004), a registered charity in the United Kingdom which aims at developing and promoting the professional disciplines of project management, developed the Project Risk Analysis and Management (PRAM) process that describes the five phases of risk management process as the following:

- *Initiate*: set scope, objectives, and context for the risk management process
- *Identify*: enable the project risk events identification, in a comprehensive, practical and cost effective way
- *Assess*: increase the understanding of each identified risk event to a level where appropriate and effective decisions can be taken
- *Plan responses*: plan the proper responses to cope with risk
- *Implement responses*: ensure that planned responses are implemented and strategic plans are changed to reflect the early risk management (ensure that those responsible for specific responses do what is required)

Molenaar et al (2005) and the "AASHTO Guide for Design-Build Procurement" (2008) noted that many of the risks, which were traditionally managed by agencies, can become the responsibility of the Design

Build Team. Hence, appropriate identification and allocation of project risks is critical for Design Build contracts. Both studies define risk identification and allocation and recommend a number of techniques and methods that can be used in risk analysis of Design Build projects as the following:

- *Risk Identification*: The iterative process of identifying and categorizing risks that requires continuous updating as the new information becomes available. Several methods can be used in risk identification as the following:
  - *Project examination*: The review of project characteristics, stakeholders, physical surroundings, and community.
  - *Document examination*: The study of available design, historic data, test data, project management plans, and lessons learned databases.
  - *Personal experience and insight*: As supplements to project and document examination, techniques, such as brainstorming among the design-build team members and interviewing subject matter experts are useful for proper risk identification.
- *Risk Allocation*: The process of assigning the risks to the party who is best able to manage them. Several principles are recommended for appropriate risk allocation as the following:
  - *Allocation of risks to achieve project goals*: Allocation of project risks should be in alignment with project goals, to encourage contract parties to monitor the risk and apply preventative measures.
  - *Balancing the burden of risk*: Allocation of project risks to the contract parties should be balanced to avoid transferring uncontrollable risk to the Design Build Team.
  - *Allocation to the party with the highest degree of control*: Project risks should be allocated to the party with the highest degree of control to avid high risk premiums.
  - *Allocation to the party who is less vulnerable*: The project risk should be allocated to the party who can bear the costs and consequences of the risk.

The FHWA Report for risk assessment and allocation for highway construction management identifies several steps in the process of risk management as the following (FHWA 2006b):

- *Identification*: The objective of risk identification is to identify and categorize risk that could affect the project and document these risks.
- *Assessment*: Risk assessment is the process of quantifying the risk events documented in the preceding identification stage.
- *Analysis*: A key purpose of quantitative risk analysis is to combine the effects of the various identified and assessed risk events into an overall project risk estimate.
- *Mitigation and Planning*: The objective of risk mitigation and planning is to explore risk response strategies for the high-risk items identified in the qualitative and quantitative risk analysis.
- *Allocation*: The objective of risk allocation is to define the roles and responsibilities for risks. The contract is the vehicle for risk allocation.
- *Tracking and Updating*: The objectives of risk monitoring and updating are: (1) systematically track the identified risks; (2) identify any new risks; (3) effectively manage the contingency reserve; and (4) capture lessons learned for future risk assessment and allocation efforts.

In the NCHRP Report 658, Molenaar et al. (2010b) presented a systematic process to apply risk analysis tools and management practices to control project cost growth. This study describes the process of project risk management as the following:

- *Risk Identification*: Process of determining which risks might affect the project and documenting their characteristics.
- *Risk Assessment/Analysis*: Qualitative or quantitative analysis that assesses impact and probability of a risk.
- *Risk mitigation and Planning*: Analysis of risk response options (acceptance, avoidance, mitigation, or transference) and deciding how to approach and plan risk management activities for a project.
- *Risk Allocation*: Assignment of responsibility for a risk to a party – typically through a contract. It is recommended to allocate risks to the party that is best able to manage them.

- *Risk monitoring and control*: Capturing, analysis, and report of project performance, usually as compared to the risk management plan.

Moreover, this guidebook developed a risk management framework to demonstrate the relationship between project phases and the aforementioned risk management steps.

The Strategic Highway Research Program 2 (SHRP 2) "Guide for the Process of Managing Risk on Rapid Renewal Contracts" describes the process of project risk management as the following (Golder Associates et al. 2011):

- *Structuring*: Define the "base" project scenario against which risk and opportunity can subsequently be identified, assessed, and eventually managed.
- *Risk Identification*: Identify a comprehensive and non-overlapping set of risks and opportunities.
- *Risk Assessment*: Assess the "severity" of each of the risks and opportunities in the risk register, and then prioritize them on that basis.
- *Risk Analysis*: Analytically combine the base and risk factors to determine the project performance measures associated with each risk.
- *Risk Management Planning*: Identify and evaluate possible ways to proactively reduce risks, focusing on those that are most severe.
- *Risk Management Implementation*: Implement the risk management plan as the project proceeds, including monitoring the status of risk reduction activities, budget and milestones at regular intervals or at major milestones or changes.

The Project Management Institute (PMI) (2012) describes the process of project risk management as the following:

- *Plan risk management*: Decide how to approach and plan the risk management activities for a project.

- *Identify project risks*: Determine which risks might affect the project and documenting their characteristics.
- *Perform qualitative risk analysis*: Perform a qualitative analysis of risks and conditions to prioritize their effects on project objectives.
- *Perform quantitative risk analysis*: Measure the probability and consequences of risks and estimating their implications for project objectives.
- *Plan risk responses*: Develop procedures and techniques to enhance opportunities and reduce threats to the project's objectives.
- *Monitor and control risks*: Implement risk response plan, track identified risks, monitor residual risks, identify new risks, execute risk reduction plans, and evaluate the process effectiveness throughout the project life cycle.

RISK MANAGEMENT AND PROJECT DELIVERY SYSTEM SELECTION IN TRANSPORTATION PROJECTS

In general, transportation projects have complex risk structures. For transportation projects, the Department's appetite for risk as well as its capability and experience in managing the types of risks inherent in a given project have a direct effect on the selection of Project Delivery System. The structure of project risks changes depending on the Project Delivery System. Various Project Delivery Systems provide different approaches to allocating risk responsibilities. This results in differences among Project Delivery Systems in terms of risk management strategies. For instance, in a Design Build transportation project, the transportation agencies, designers, and constructors accept different responsibilities compared to Design Bid Build projects. Due to changes in roles and responsibilities of project participants, the project risk structure and, consequently, the processes of risk management process in Design Build project are different compared to those in Design Bid Build projects. Appropriate choice of Project Delivery System can provide effective means for managing project risks specifically through transferring and sharing project risks (Tweeds 1996). Therefore, prior to finalizing the decision on Project Delivery

System, the Department should consider risk transferring and/or sharing, in order to lower the cost and time required to design and construct the project while maintaining or improving the project quality.

We will provide a high-level framework for initial risk allocation for Design Build projects. The major goal is to ensure whether critical project risks are identified, assessed, and allocated using the Design Build Project Delivery System. The proposed systematic approach focuses on risk identification, qualitative risk assessment, and risk allocation and provides an initial template for the high-level risk assessment that can be used by the project manager to identify and assess project risks, and assign the identified risk to the party that can best handle it. These risk templates can help the Department determine whether the project risks can be effectively managed if the Design Build Project Delivery System is selected for the project.

RISK IDENTIFICATION

The objective of risk identification is to determine where, when, why and how events could prevent, degrade, delay, or enhance the achievement of the objectives (PMI 2012; Joint Standards Australia/Standards New Zealand Committee 2004). This helps decision makers pinpoint risks before they become problems and incorporate this information into the entire process of project management (Dorofee et al. 1996). Understanding project risks enables project teams to make better decisions regarding the process of project development and delivery. Risk identification is an iterative process since new risk may evolve or become known as the project progresses during its life cycle. Therefore, risk identification should occur through all phases of project development including planning, design, and construction (Montana DOT 2012; PMI 2012).

Risk identification should be approached in a systematic way to ensure that all significant activities in the context of a project have been identified and all the risks associated with these activities are adequately characterized. The identified risks should be categorized and demonstrated in a structured format. Dorofee et al. (1996) noted that risk identification involves two activities:

1) *Capture a statement of risk*: record conditions that cause concern for a potential loss to the project; and
2) *Capture the context of a risk*: record additional information regarding the circumstances, events, and interrelationships within the project that may affect the risk.

The Joint Standards Australia/Standards New Zealand Committee (2004) prescribed the use of a variety of approaches to identify risks including checklists, judgments based on experience and records, flow charts, brainstorming, systems analysis, scenario analysis, and systems engineering techniques.

The Canadian Standards Association (2002) summarized risk identification process in terms of the following three subtasks:

- Structured and comprehensive consideration of known sources of risk or initiating events usually identified by reviewing past accidents and losses.
- Brainstorming by a team that understands all aspects of the system under consideration led by a team leader (This includes following the structured list of hazards to identify how a hazard might lead to a risk).
- A preliminary assignment of frequency and consequence to the risk scenarios (Risk scenario is defined as a sequence of events with an associated frequency and consequence. This sequence of events includes the risk that generates the potential loss and the potential consequences this risk may generate. The assignment is useful in assisting the decision maker in selecting those scenarios to be analyzed further in risk estimation and those risk scenarios to be set aside. These risk scenarios may be identified using a variety of means, including failure modes and effects analysis (FMEA), fault-tree analysis, event-tree analysis, hazard and operational studies (HAZOP), and professional judgment of internal and external experts).

The SHRP2 Report No. R09 by Golder Associates Inc et al. (2011) provided several recommendations to facilitate risk identification as the following:

- Risk identification is just the identification. To mitigate bias, it does not involve discussion of severity, screening, or prioritization.
- Risk identification should be comprehensive. Be careful not to miss or exclude risks or opportunities.
- Seek out both risks and opportunities.
- Risks and opportunities should be defined relative to the "base".
- Risks and opportunities should be identified at an appropriate level of detail.
- Risks should be characterized and documented adequately (e.g., in a risk register), in order to provide enough basis for understanding the issue and subsequent assessment.
- Risks change as the base project evolves, as conditions change, and new information becomes available.

Typically, the outcome of risk identification process is a project risk register. Risk register classifies and documents the project risks and their characteristics. It provides a structure that ensures the comprehensive and systematic identification of project risks to a consistent level of detail. The risk register is subsequently amended by qualitative or quantitative risk analysis, risk response, and risk monitoring processes. A Risk Breakdown Structure (RBS), which is an organized hierarchical representation of the identified project risks arranged by several risk categories, can also be developed during the risk identification process (Project Management Institute (PMI) 2012). For instance, Jaafari (2001) summarized risks into several categories including market, political, technical, financing, environmental, cost estimation, schedule, operating, organizational, integration, and force majeure risks. Hillson (2002, 2003) utilized the concept of the RBS and developed generic risk breakdown structures for different project types in various industries. Later, Hillson et al. (2006) developed a new method for risk identification – denoted as Risk Breakdown Matrix (RBM) – that maps Risk Breakdown Structure (RBS) into Work Breakdown Structure (WBS) to establish links between risk components and work packages in construction projects.

Institute of Risk Management (IRM) et al. (2002) classified the project risks as strategic, operational, financial, knowledge management, and compliance. The Joint Standards Australia/Standards New Zealand Committee (2004) categorized project risks into eight groups based on their source: (1) commercial and legal relationships; (2) economic circumstances; (3) human behavior; (4) natural events; (5) political circumstances; (6) technology and technical issues; (7) managing activities and controls; and (8) individual activities. The Federation of Canadian Municipalities and National Research Council (2006) classified project risks into five categories: (a) naturally occurring; (b) physical deterioration; (c) non-performance; (d) external impacts; and (e) aggression (vandalism and terrorism).

Caltrans Project Risk Management Handbook (2007) used the concept of RBS and classified risks in eight categories: (1) environmental; (2) design; (3) right of way; (4) design engineering services; (5) construction; (6) external; (7) organizational; and (8) project management (Caltrans 2007). Washington State DOT project risk management guidance (2010) developed an RBS based on the following categories: environmental and hydraulics, structures and geotechnical, design, right of way, utilities, railroad, partnerships and stakeholders, management/funding, contracting/procurement and construction. Montana DOT risk management guidelines (2012) developed an RBS consisting of eight categories: (a) right of way; (b) environmental; (c) engineering/construction; (d) traffic; (e) stakeholders; (f) unforeseen events; (g) market conditions; and (h) utilities. Florida DOT risk management guidelines (2013) categorized project risks in fifteen risk areas: (1) utility involvement; (2) project schedule; (3) interfaces; (4) experience/capability; (5) right of way involvement; (6) environmental impacts/contamination; (7) regulatory involvement; (8) contractor issues; (9) resource availability; (10) project funding; (11) political visibility; (12) public involvement; (13) safety; (14) construction complexity; and (15) weather sensitivity.

Risk Assessment and Allocation Matrices

Once the identified project risks are classified, a high-level risk assessment and allocation can be conducted in order to develop an understanding of each project risk. The objective of risk assessment and allocation is to find an appropriate and cost-effective risk treatment strategy to mitigate and manage each risk item. Initial risk assessment and allocation provides an input to decisions on whether the project risks can be effectively managed if the Design Build Project Delivery System is selected for the project. The results of risk assessment and risk allocation plans can be the basis of establishing proper risk clauses in Design Build contracts.

Two important aspects of risk are evaluated in risk assessment: (a) the likelihood of the risk occurring; and (b) the severity of the respective consequence(s). There are two general risk assessment methods, qualitative and quantitative. While qualitative risk assessment helps the project management team to evaluate the project risks on their worst-case effects and their relative likelihood of occurrence, quantitative risk assessment is best for estimating the numerical and statistical nature of the risk exposure (FHWA 2006b). Qualitative risk assessment ranks the identified risks according to their potential effects and likelihood. Risk heat maps are typically used as a proper qualitative method to assess the identified risks. Heat maps are graphical risk assessment diagrams (two-dimensioned matrices) that organize major project risks into three categories based on the combined effects of their frequency and severity: high risk, moderate risk, and low risk. Caltrans project risk management handbook (2012) provided standard definition of risk probability and impact rating. For example, 5 to 10 percent increase in cost is a moderate impact while 10 to 20 percent is considered high impact.

IRM et al. (2002) prescribed quantitative, semi-quantitative, or qualitative assessment of project risks in terms of the probability of occurrence and their possible consequence. Similarly, the Joint Standards Australia/Standards New Zealand Committee (2004) noted that risk assessment can be qualitative, semi-quantitative, quantitative, or a combination of these methods, depending on the circumstances and characteristics of the project. This standard also described five levels of impact (insignificant, minor, moderate, major and catastrophic) and five levels of likelihood (rare, unlikely, possible, likely and almost certain). The combination of the impact and likelihood levels defines the level of risk as extreme, high, moderate or low.

The Canadian Standards Association (2002) proposed the use of qualitative and quantitative risk assessment methods based on the project characteristics. This standard considers four severity levels and five likelihood levels for risk items. The FHWA Report for risk assessment and allocation for highway construction management (2006b) recommended using two general risk assessment methods, qualitative and quantitative, depending on the project characteristics and the goal of risk assessment. While qualitative risk assessment helps the project management team to evaluate the project risks on their worst-case effects and their relative likelihood of occurrence, quantitative risk assessment is best for estimating the numerical and statistical nature of the risk exposure. The US Army Corps of Engineers (2009) describes a detailed guide to conduct quantitative risk analysis for construction and civil infrastructure system projects. Two Oracle Crystal Ball models were developed as risk analysis templates for cost and schedule risk analysis.

PMI (2012) recommends using qualitative and quantitative risk assessment but indicates that qualitative risk assessment is a cost-effective and rapid means of establishing risk response plans. Qualitative risk assessment lays out the foundation for quantitative risk assessment (if required). Washington State DOT (2010) evaluates the identified risks both qualitatively and quantitatively by using a comprehensive risk management and planning spreadsheet. These risk management spreadsheets represent risk response strategies, risk owners, and risk monitor and control tasks. Montana DOT (2012) utilizes a comprehensive documentation process to allocate the risks and identify the person(s) responsible for successful implementation of the response action. A report for probabilistic risk management in design and construction projects by Construction Industry Institute (2012) developed a framework for risk management consisting of three levels of risk identification, deterministic analysis, and probabilistic analysis. The framework consists of three excel-based risk register templates with detailed instructions on how to identify risks and opportunities, to perform deterministic analysis, and to generate the three-point estimate used in probabilistic cost and schedule models. Molenaar et al. (2012) provided three sets of risk assessment checklists to assist Colorado DOT in the selection of the Project Delivery System for transportation projects: (a) Typical CDOT transportation project risks including site conditions and investigations, utilities, railroads, drainage/water quality best management practices, environmental, and third party involvement; (b) General project risk checklist; and (c) risk opportunities/challenges checklist. Risk assessment typically follows by risk response planning that is the process of developing options and determining actions to enhance opportunities and reduce threats to the project objectives. Developing proper risk allocation means is one of the most common approaches to describe risk response planning. Principle of contractual risk allocation in construction projects is extensively discussed by Barnes (1983). A proper risk allocation algorithm was presented in Barnes' research. The application of principles of risk allocation would lead to more direct realization of objective for owners and contractors and would significantly reduce conflicts in project management organizations. Chapman and Ward (2003) recommended two issues that should be considered for appropriate risk allocation as the following:

1) Scope the contracting strategy to concentrate on issues, such as what are the objectives of the contracting strategy or which parties are being considered, and what aspects of uncertainty and associated risk require allocation.
2) Plan/re-plan the contract that correctly reflects risk allocation and includes selecting a contract approach, contract terms, and contract timing.

The FHWA Report for risk assessment and allocation (2006b) provides several general recommendations that should be considered for effective risk response planning as the following:

- Allocate the risks in alignment with specific project goals
- Allocate the risks to the party best able to manage the risks
- Accept risks when appropriate to accomplish the project goals

The results of extensive academic/professional literature review in risk management assisted us, the research team of this GDOT research project, to propose an initial, high-level risk identification, assessment, and allocation system. The major objectives of this initial risk analysis are:

1) Identify and study major project risks within a transparent framework
2) Assess each project risk using a simple qualitative approach
3) Allocate each identified project risk to a proper party to manage it
4) Determine possible challenges to manage project risks in Design Build contracts

Ultimately, our goal for the initial risk analysis is to ensure that all project risks can be handled using Design Build Project Delivery System. Several risk templates are presented to provide an initial framework for risk assessment and risk allocation. These risk allocation matrices were developed in collaboration with GDOT Office of Innovative Program Delivery. These matrices are prepared as an initial framework to identify and mitigate risks in the Design Build project. The color-coded risk-level helps evaluators establish and clearly communicate the level of risk to the decision makers. The evaluators can also identify the party that is in the best position to assume and mitigate the level of risk. Each risk is allocated to either the Design Build Team or the owner or shared by these two parties under pre-agreed conditions. Any significant issue related to managing risk in the Design Build contract can be specified in these allocation matrices as comments.

Further, a Java Applet tool is developed to facilitate this process of initial risk assessment and risk allocation. The project evaluator can use this Java tool to determine the level of each risk and decide the risk will be allocated to which party. Color-coded risks are used as a visual tool to enhance the process of initial risk assessment for Design Build projects. Comments boxes are used to identify whether each risk factor can be managed using Design Build Project Delivery System. Risk allocation matrices will be the basis to outline proper clauses for Design Build contracts.

Scope Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Define scope				
	Define project				
	Establish performance requirement				
	Manage/Communicate changes in Scope				
	Incorporate flexibility in project scope				

High Risk Moderate Risk Low Risk

Environmental Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Define initial project environmental impacts				
	Receive FHWA prior concurrence				
	Select and manage the independent consultants who prepare the NEPA document				
	Define parameters for impacts				
	Conduct environmental investigation				
	Prepare environmental permits				
	Manage/implement environmental mitigation process				
	Ensure environmental compliance				
	Mitigate known hazardous waste				
	Mitigate unknown/non-defined hazardous waste				
	Obtain environmental approvals - construction related				
	Conduct environmental analysis on new alignments				
	Mitigate wetlands / stream / habitat issues				
	Mitigate permanent noise issues				
	Address archaeological, cultural, historical discoveries				
	Ensure environmental justice				
	Address community impact/social equity and Controversial issues				
	Maintain the ownership and control of NEPA process				

High Risk Moderate Risk Low Risk

Design Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Conduct preliminary surveys/ develop base map				
	Conduct Geotech investigation - initial borings based on preliminary design				
	Conduct Geotech investigation - initial borings based on proposal				
	Establish/define initial subsurface conditions				
	Perform initial project geotechnical analysis based on preliminary design				
	Develop proposal specific geotechnical analysis/report				
	Ensure plan conformance with regulations/guidelines/RFP				
	Ensure plan accuracy				
	Establish design criteria				
	Ensure conformance to design criteria				
	Perform design review				
	Conduct design QC				
	Conduct design QA				
	Provide owner with review time				
	Communicate changes in design criteria				
	Manage hazardous waste site/contaminated materials				
	Conform with changes in design criteria				
	Establish liability of design				
	Establish ownership of ideas/intellectual property				
	Set level of service (LOS) requirements based on project needs and establish measurement criteria				

High Risk Moderate Risk Low Risk

Right of Way Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Establish ROW Limits				
	Hold access Hearings/Findings and order				
	Acquire ROW Plan Approval				
	Conduct ROW plan appraisals/reviews				
	Establish Just Compensation				
	Acquire ROW				
	Acquire Construction Easements				
	Acquire Permanent Easements				
	Begin Condemnation Proceedings				
	Complete Relocation				
	Take Possession				
	Issue Certification				
	Review objections to ROW appraisal				
	Mitigate hazardous waste (on acquired ROW)				

High Risk Moderate Risk Low Risk

Local Agency, Utility, Railroad (RR), and Other Stakeholders Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Identify initial utility impacts from preliminary design				
	Establish initial Utility Locations / Conditions				
	Define required utility relocations from preliminary design				
	Relocate utilities (prior to contract)				
	Relocate utilities under agreement (during contract)				
	Modify agreement with private utility based on final design				
	Modify agreement with public utility based on final design				
	Mitigate Damage to Utilities under Construction				
	Verify utility locations/conditions				
	Coordinate with utility relocation efforts during contract				
	Address utility owner/third party caused/related delays				
	Prevent delays caused by utility/third party involvement issues				
	Prevent utility/third party delays resulting from proposal/modified design				
	Identify RR impacts based on preliminary design				
	Obtain initial RR agreement based on preliminary design				
	Coordinate with RR under agreement				
	Obtain third party agreements (federal, local, private, etc.)				
	Coordinate with third parties under agreement				
	Coordinate/collect third party betterments				
	Coordinate with other projects				
	Coordinate with adjacent property owners				
	Identify initial local agency impacts				
	Obtain initial local agency permits				
	Establish initial local agency requirements				
	Establish final/actual local agency impacts				
	Obtain modifications to existing local agency permits				
	Obtain third party agreements (federal, local, private, etc.)				
	Acquire interagency agreements				

High Risk Moderate Risk Low Risk

Contracting and Procurement Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Address issues related to the intellectual property in the RFP (e.g., when the Department intends to incorporate the ideas of non-winning Design Build teams)				
	Address issues related to delays, modifications, withdrawals or additions that result from multi-level federal, state and local participation (governmental risk)				
	Address issues related to contract language (warranties, bonding, etc.)				
	Prevent delays in ad/bid/award process (addenda, protests, etc.)				
	Ensure competitive procurement				
	Avoid delays in procurement of specialty materials or equipment				
	Procure long lead equipment or items as soon as possible				
	Ensure contractor's compliance with performance expectations				
	Ensure the clarity of procurement documents				
	Establish bonding requirements				

High Risk Moderate Risk Low Risk

Construction

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Address traffic control and staging issues				
	Acquire construction permits				
	Ensure safety / conduct safety QA				
	Comply with work windows (fish, etc.)				
	Address change orders / claims				
	Plan/coordinate construction staging issues				
	Ensure construction quality/workmanship				
	Comply with project schedule				
	Conduct estimation				
	Determine construction unit costs/quantities				
	Control/ensure materials quality				
	Maintain materials documentation				
	Ensure material availability				
	Develop/comply with initial performance requirements of QA plan				
	Develop/comply final construction/materials QC/QA plan				
	Conduct construction/materials QA				
	Conduct construction QC				
	Conduct construction QA/procedural compliance auditing				
	Meeting stipulated performance standards (Post-construction risk)				
	Conduct construction Inspection Authorization (IA) testing/inspection				
	Perform construction staking				
	Carry out erosion control				
	Perform spill prevention				
	Prevent accidents within work zone / liability				
	Avoid third party damages				
	Perform operations and maintenance during construction				
	Perform maintenance under construction - new features				
	Perform maintenance under construction - existing features				
	Manage traffic in construction zones				
	Prevent damage to utilities under construction				
	Avoid false work/rework				
	Develop shop drawings				
	Mitigate equipment failure/breakdown				
	Manage community relations				
	Ensure performance of defined mitigation measures				
	Provide warranty				
	Coordinate street/ramp closures				
	Develop construction staging plans				
	Comply with Disadvantaged Business Enterprise (DBE) requirements				

Risk Level	**Description**	Owner	Shared	Design Build Team	Comments
	Assume long term ownership/final responsibility				
	Establish/define operations' risk pool & secure insurance				
	Ensure payments				

High Risk   Moderate Risk   Low Risk

Force Majeure / Acts of God

Risk Level	**Description**	Owner	Shared	Design Build Team	Comments
	Handle strikes/labor disputes - on site labor				
	Mitigate the consequences of tornado/earthquake				
	Mitigate the consequences of epidemic, rebellion, war, riot, sabotage				
	Handle the consequences of archaeological, paleontological discovery				
	Mitigate the consequences of suspension of any environmental approval				
	Handle lawsuits against project				
	Mitigate the consequences of storm/flooding				
	Prevent fire or other physical damages				

High Risk   Moderate Risk   Low Risk

Financial & Economic Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Secure availability of funding / cash flow restrictions				
	Overcome labor disruptions				
	Mitigate uncertainty in escalation rate of labor, materials, and equipment				
	Mitigate changes in market (premium for specific materials, labor, etc.)				
	Assume financing costs				
	Address controversies resulted from the financial impact of project				

High Risk Moderate Risk Low Risk

Management & Policy Issues

Risk Level	Description	Owner	Shared	Design Build Team	Comments
	Guarantee leadership support in case of leadership change				
	Assume the costs/consequences of political/policy changes				
	Address the impact of regulatory/statutes changes				

High Risk   Moderate Risk   Low Risk

CHAPTER 7 A SYSTEMATIC APPROACH TO EVALUATE THE APPROPRIATENESS OF PROCUREMENT METHODS FOR TRANSPORTATION DESIGN BUILD PROJECTS

If the previous steps indicate that Design Build is a proper Project Delivery System for the project, then the Department should perform a rigorous evaluation of procurement methods and choose the most appropriate procurement method for the project. The third module of the systematic approach, presented in Figure 7.1, can be used to evaluate the appropriateness of procurement methods for transportation Design Build projects. This evaluation should assist the Department in making two critical decisions regarding the procurement method for the project: (1) Decision about what should be the basis for proposal evaluation; and (2) Decision about whether the procurement should be one-phase (RFP only) or two-phase (RFQ and RFP).

FIGURE 7.1

Module 3 of the Proposed Systematic Approach

1. PROPOSAL EVALUATION (BASIS OF AWARD)

The Department's first major decision regarding the procurement method is about the basis of proposal evaluation. The FHWA and State Design Build regulations require transportation agencies to evaluate price in Design Build procurements where construction is a significant component of the scope of work. However, in addition to the price, non-price factors can be used as the basis for awarding Design Build contracts. For instance, considering the project-specific goals, the Department may decide to evaluate the aesthetics aspect of proposed designs, design concepts, schedules, project management plans, traffic management plans, third-party impacts, quality assurance and quality control plans, and/or any other relevant factors. In fact, several transportation agencies have decided to award Design Build contracts on the basis of price and other non-price (i.e., technical) considerations. Whether the Department should consider non-price factors is driven by the Department's goals for the Design Build project (Gransberg and Senadheera 1999). The Department needs to systematically assess whether it is beneficial to consider non-price factors besides the bid price for the evaluation of Design Build proposals.

If the Department decides that non-price factors should be evaluated, it may consider providing the opportunity for Design Build teams to obtain pre-approval for using Alternative Technical Concepts (ATCs). The proposal evaluation may involve one-on-one communications with Design Build teams following the advertisement of RFPs. This allows Design Build teams to confidentially discuss with the Department the technical concepts of their proposals including the potential ATCs. However, when using this process, the Department should establish procedures to ensure that any information disclosed to one Design Build team is disclosed to all of them, and otherwise take precautions to avoid protest situations. The Department should also ensure that the proprietary details of the Design Build teams' proposals remain confidential. Upon the Department's discretion, the proposal evaluation process may be followed by post-proposal discussions. This allows the Department to advise the Design Build team regarding areas of proposal that require improvement. These discussions/negotiations may be followed by subsequent proposals – Best and Final Offers (BAFO) – if the Department determines that continuation of procurement is aligned with its project-specific goals.

Below we present two matrices that summarize major benefits and challenges related to two approaches to the evaluation of Design Build proposals: 1) Selection based on price consideration only; and 2) Selection based on price and technical considerations. These matrices can be used as assessment templates. The Department can (and should) examine how each benefit and challenge item is relevant to specific goals of the Design Build project. The Department can modify these benefit and challenge items considering the project-specific needs. A numerical system is supplied to help the Department calculate the appropriateness scores of these two proposal evaluation approaches for the Design Build project.

Selection Based on Price Consideration Only	
Benefits	**Challenges**
o It promotes competition and a fair playing field on the basis of price o Price-based selection is a structured and justified methodology that may result in budget savings for the Department o Price-based selection is easy-to-understand for contractors o Price-based selection is most suitable for Design Build projects where the design is too far advanced o Price-based selection is most suitable for noncomplex Design Build projects where the opportunity to innovate is limited	o The Design Build team's approach in the technical proposal is not critically examined in the selection process, which may result in schedule and technical issues o It may encourage contractors to implement cost-cutting measures instead of quality enhancing measures o It may result in considerable cost growth as the Design Build team may have incentive to request change orders o The most-qualified Design Build team that can deliver the highest quality project may not be awarded o The Design Build team's technical capabilities are not directly considered in selecting the winning Design Build team o It may be difficult for the Department to foster innovation by allowing the submission of Alternative Technical Concepts (ATCs)

Selection Based on Price and Technical Considerations	
Benefits	**Challenges**
o It provides the Department with a flexible method for detailed evaluation of the Design Build team's proposed technical approach with respect to project-specific goals (e.g., cost, schedule, innovation, quality, safety and durability) o It is most compatible with complex transportation projects where the Department should evaluate several technical aspects of the project besides the cost o It provides the Department with the opportunity to foster innovation by allowing the submission of Alternative Technical Concepts (ATCs)	o It can be effectively used when the Department's expectation and requirements can be clearly defined o Including considerations other than price in the procurement requires a project-specific evaluation process for the Design Build team's qualifications, price proposal and technical proposal o It requires the Department to assemble a project-specific evaluation team for Design Build proposals o Developing the evaluation plan and implementing the evaluation process may increase the project procurement cost o Developing the evaluation plan and implementing the evaluation process may extend the project procurement time o The evaluation team should include specific technical expertise, in order to review different aspects of the proposed design o It requires an experienced facilitator to manage the proposal evaluation process and lead the evaluation team o It may be difficult for the technical evaluation team to arrive at a consensus about a Design Build proposal o The technical proposal evaluation team should have training and experience in objective proposal evaluation o The Department should elaborately describe its expectations o The Department should elaborately describe its approach to objective evaluation of technical proposals in RFPs o It may be difficult for Design Build teams to understand the Department's expectations and technical requirements o It may be difficult for Design Build teams to understand the Department's approach for technical proposal evaluation o Proposal preparation may be costly and time consuming for Design Build teams o The cost and difficulties of preparing proposals may reduce the participation of Design Build teams o It may require the Department to include stipends, in order to encourage the submission of high-quality Design Build proposals o It requires the Department to purchase the intellectual property of ideas from the Design Build teams that submitted ATCs

2. PROPOSER EVALUATION

The second decision that the Department should make is about the evaluation of Design Build teams' qualifications. Several transportation agencies use a two-phase selection process for the procurement of Design Build contracts. The first step involves the determination of qualifications and possibly shortlisting (if authorized in the State legislations). Qualifications of Design Build teams are evaluated based on their submitted Statements of Qualifications (SOQs) responding to advertised Request for Qualifications (RFQs) or equivalent documents. Several criteria may be used by the Department to evaluate qualifications of Design Build teams including: Design Build teams' past performances, key personnel's technical expertise, financial capacity, resource capacity and availability, understanding of the project and local market, specialized design and construction capabilities for key project elements, etc. The Department may use a combination of pass/fail and numerical or adjectival scoring methods for evaluating Design Build teams' qualifications. In the RFQ, the Department should explicitly describe the SOQ evaluation procedure including the evaluation criteria and scoring methods.

Often, the two-phase selection process involves shortlisting most qualified Design Build teams. The intent of shortlisting is to reduce industry costs in preparing Design Build proposals and encourage qualified Design Build teams to participate by increasing their odds of winning. Shortlisting reduces the Department's cost of reviewing Design Build proposals. Typically, three to five Design Build teams with the highest qualifications scores will be shortlisted and notified to proceed to the second phase.

The second phase starts with the issuance of Request for Proposals (RFPs) or Invitation for Bids (IFBs). The qualified (or shortlisted) Design Build teams submit technical and price proposals in response to RFPs. The Department evaluates Design Build proposals and awards Design Build contracts based on price consideration only or a price and technical consideration as described in the previous section of this Chapter (Proposal Evaluation). The Department may use a combination of pass/fail and numerical or adjectival scoring methods for evaluating Design Build teams' proposals. In the RFP, the Department should elaborately describe the proposal evaluation procedure including the evaluation criteria and scoring methods.

However, several transportation agencies have decided to strictly use a single-phase selection process for awarding Design Build contracts. For some agencies, the use of single-phase selection was mandated by the State legislation for transportation projects. The single-phase selection process typically takes less procurement time compared to the two-phase selection process. It is often used for non-complex projects that can be delivered by many Design Build teams. Interested Design Build teams submit both their technical and price proposals to respond to the RFP. The Department evaluates Design Build proposals and awards Design Build contracts based on price consideration only or a price and technical consideration as described in the previous section of this Chapter (Proposal Evaluation).

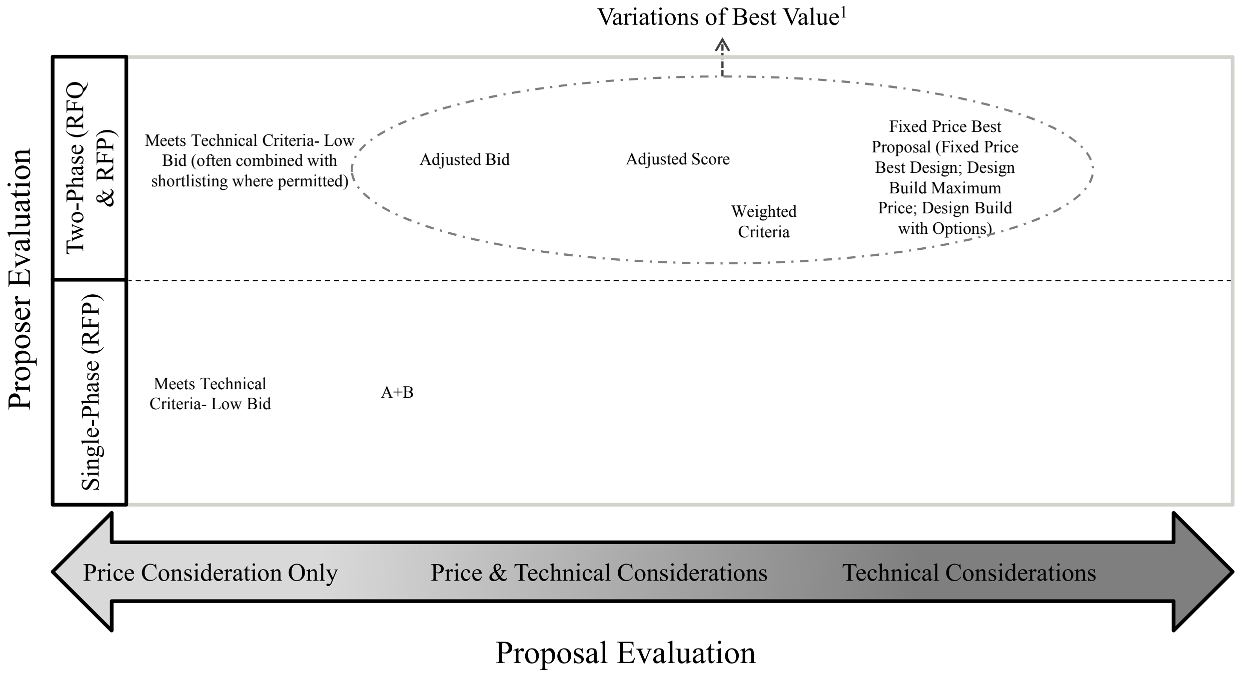
Single-Phase Selection	
Benefits	**Challenges**
o It provides the Department with the opportunity to attract a large pool of Design Build teams by allowing all interested teams to respond to RFPs o It allows the Department to expedite the selection process o The Department's cost of proposal review is typically low o It is most suitable for noncomplex Design Build projects where there are many Design Build teams that can deliver projects	o It may reduce the Department's ability for the in-depth evaluation of Design Build teams' qualifications o A large number of participants may limit the Department's ability for detailed evaluation of technical proposals o A large number of participants may discourage some Design Build teams to participate due to low odds of winning

Two-Phase Selection	
Benefits	**Challenges**
o It allows the Department to use shortlisting in order to encourage highly qualified Design Build teams to participate (the odds of winning is greater when shortlisting is practiced) o Shortlisting based on qualifications evaluation may reduce the Department's proposal review time o The two-phase procedure reduces the industry's overall cost of preparing Design Build proposals o It is most suitable for complex Design Build projects where a few qualified Design Build teams can deliver projects	o It requires the Department to assemble a project-specific team for evaluating Design Build teams' qualifications and possibly shortlisting most qualified teams o A large number of respondents to RFQs may limit the Department's ability for detailed qualification assessment o A large number of respondents to RFQs may increase the qualification assessment time o It requires the Department to establish a set of objective criteria for evaluating (and possibly shortlisting) Design Build teams o The additional cost of developing the qualifications evaluation plan and implementing the evaluation process add to the procurement cost of the project o It requires an experienced facilitator to manage the qualifications evaluation process and lead the evaluation team o It may be difficult for the qualifications evaluation team to arrive at a consensus about the qualifications of Design Build team o The qualifications evaluation team should have training and experience in objective evaluation of Design Build teams' qualifications o In the RFQ, the Department should elaborately describe its approach to objective evaluation of Design Build team qualifications

The outcomes of the assessment of proposal evaluation and proposer evaluation approaches should help the Department select the appropriate procurement method for the project from a number of available procurement methods. Existing procurement methods can be distinguished based on their emphasis on price versus technical proposals as the basis of awarding Design Build contracts. Also, these methods put different levels of stress on proposer and proposal evaluation. Below, procurement methods commonly used by State DOTs for Design Build transportation projects are summarized.

COMMONLY-USED PROCUREMENT METHODS IN U.S. TRANSPORTATION PROJECTS

Figure 7.1 below depicts how procurement methods commonly used by State DOTs for transportation Design Build projects can be categorized considering two important assessment decisions made by the Department: (1) The basis for proposal evaluation and contract award; and (2) The number of phases through which the project is procured (i.e., single-phase (RFP only) or two-phase (RFQ and RFP)).



[1]Note about the single-phase Best Value: VDOT has used it on two Design Build projects (small bridge replacement)

FIGURE 7.2

Categorization of Procurement Methods Based on (1) the Basis for Proposal Evaluation and Contract Award; and (2) The Number of Phases through which the Project is Procured

MEETS TECHNICAL CRITERIA - LOW BID

The award decision in the Meets Technical Criteria - Low Bid selection (sometimes called Fully Responsive - Lowest Price) is based on price. Typically, technical proposals are evaluated before any price proposals are reviewed. The price proposal is opened only if the technical proposal is found to be responsive by meeting the minimum technical requirements established in the RFP. Typically, the technical proposal review is done on a pass/fail basis. However, the Department may choose a numerical or adjectival ratings system for evaluating technical proposals. In this case, the minimum score required for the proposal to be considered responsive should be identified in the advertised RFP. These ratings are merely used as a way to determine whether a Design Build team meets the Department's minimum technical requirements. They are not used as the basis for awarding Design Build contracts. For those

Design Build teams that successfully pass technical reviews, the award will be exclusively based on price proposals. The contract is awarded to the Design Build team offering the lowest price.

Meets Technical Criteria - Low Bid selection is generally preferred on (small) projects where scopes are clearly defined and opportunities for innovative design and construction methods and techniques are limited. Examples are highway projects with specified pavement type and geometric design, and minimal ancillary work items. Depending on project-specific goals, the Department may choose to implement the Meets Technical Criteria - Low Bid approach in a single phase (RFP) or in two phases (RFQ and RFP).For instance, the Virginia Department of Transportation (VDOT) has procured several Design Build projects using both single-phase and two-phase Meets Technical Criteria - Low Bid selection method. Examples are Meadowville Road/I-295 Interchange and Route 29 Bridge replacement projects. The notional example below describes the process of Meets Technical Criteria - Low Bid approach.

Suppose that the Department has received five proposals from teams A, B, C, D, and E as shown in Table 7.1. The Department decided to use a technical scoring system to assess whether Design Build teams meet technical criteria. Design Build teams must receive the minimum technical score of 80, in order to be considered responsive to the advertised RFP. Technical scores for these Design Build proposals are summarized in the Table 7.1 below along with Design Build teams' bid prices. It can be seen that except Design Build team E all other 4 teams meet minimum technical criteria needed by the Department for the project. Although Design Build team E has the lowest bid price ($2,600,000), Design Build team D is awarded the project at the lump sum amount of $2,700,000. The difference in technical scores of 4 responsive Design Build teams (A, B, C, and D) is not a factor for awarding the contract.

TABLE 7.1

Design Build Teams' Technical Scores and Bid Prices in the Meets Technical Criteria - Low Bid Selection

Team	Technical Score	Bid Price ($)
A	95	3,000,000
B	90	2,900,000
C	90	2,800,000
D	**80**	**2,700,000**
~~*E*~~	~~*70*~~	~~*2,600,000*~~

VARIATIONS OF BEST VALUE

The Department may determine that, in addition to the price, the consideration of non-price factors would be beneficial and, in fact, necessary for procurement of Design Build projects. In these cases, a variation of the Best Value procurement is used by the Department. Best Value is a procurement method that considers a combination of bid price and technical (i.e., non-price) factors for evaluation of Design Build proposals. The basis of awarding the Design Build contract is not just the bid price. Other considerations are also taken into account in Best Value, in order to enhance the overall value of the Design Build project for the Department and minimize the negative impact of the project on the public.

The Department should develop a set of evaluation criteria that are used to evaluate Design Build teams' proposals. These evaluation criteria must be aligned with the project-specific goals that the Department has set for the project. Each proposal is independently assessed based on these evaluation criteria. The Department may use a combination of pass/fail and numerical or adjectival scoring methods for evaluating Design Build proposals. In the RFP, the Department should elaborately describe the proposal evaluation procedure including the evaluation criteria and scoring methods.

The implementation of Best Value procurement method is not without practical challenges. Prior to starting the procurement process, the Department should determine the compatibility of Best Value procurement method with the relevant State and Federal contracting regulations. Adjustments in the selection approach may be necessary if certain State and/or Federal regulations limit the utilization of Best Value procurement method. The Department should dedicate enough time for RFP development, approval, and advertising. The Department should also determine who needs to review and approve the RFP and involve those parties early in the process.

Prescriptive specifications of technical criteria may inhibit innovation. The Department should avoid prescribing design solutions as they may hinder proposing innovative design solutions by Design Build teams. The Department should specify how innovative design and construction methods and technologies that are different from the standard specifications will be approved.

The Department should keep the selection criteria as objective as possible so that it can determine and, if needed, defend which Design Build team presents the Best Value to the Department and the public. Otherwise, there is a possibility that the procurement process becomes a beauty contest where there is not adequate evidence to demonstrate that the selection process has been based on careful consideration of objective technical factors. The Department should also avoid setting technical proposal evaluation criteria that are difficult to interpret by the proposal evaluators. Otherwise, proposal evaluators may face difficulties in objectively scoring the Design Build teams' technical proposals based on the technical criteria set in the RFP. Design Build teams may also face challenges in understanding the Department's performance expectations and developing their proposals accordingly.

The Department's evaluators may score each Design Build technical proposal individually or collectively. It is recommended that the Department uses a consensus scoring approach rather than individual scores. Regardless, arriving at a consensus about each Design Build team's technical proposal and assigning the corresponding technical score can become challenging. To avoid challenges and ensure a smooth procurement process, the Department can use experienced individuals (staff members or consultants) with detailed knowledge of the project as facilitators who will be involved in the entire procurement process from the start to finish.

Typically, Best Value is conducted in two phases: RFQ and RFP. However, single-phase Best Value was utilized by a few State DOTs, such as Virginia, for small projects like bridge replacement projects. There are several variations of Best Value that are used in the procurement of U.S. transportation projects as follows:

- A+B
- Adjusted Bid
- Adjusted Score
- Weighted Criteria
- Fixed Cost – Best Proposal

Below, we describe each Best Value variation.

1. A+B

One of the least complicated variations of Best Value is A+B. The Design Build team's proposed schedule for completing the project is the only non-price consideration in this approach. The worth of time (B) is calculated as the product of total project duration (in days) and the equivalent daily value of the completed project (in dollars), which is established upfront in the RFP. The worth of time is calculated for each Design Build proposal considering the proposed number of days to complete the project. The calculated worth of time is added to the Design Build team's proposed price. The basis of award is the lowest total cost (A+B).This calculated A+B is used only for the selection purpose. It does not affect the Department's liquidated damages schedule or any applicable special provisions for incentives/disincentives.

In many occasions, delays in the delivery of much needed transportation projects have significant cost impacts to the public. Examples of projects are: deconstruction of existing bridges on busy interstate highways and replacement and major improvement of critical bridges. Hence, the Department, that seeks to expedite the project delivery, may be willing to award the Design Build contract to the team that can deliver the project faster even if the Design Build team's price is not the lowest. In these cases, the A+B approach can be applied, in order to award the contract to the Design Build team that promises to minimize the total cost of impact to the public. This approach has been used by several State DOTs. For instance, the Virginia Department of Transportation (VDOT) procured the Route 609 Design Build project using the A+B selection approach. Similarly, the Iowa Department of Transportation used A+B selection process in procuring the $12.5 million 24th Street Bridge replacement project in Council Bluffs, Iowa. The notional example below describes the process of A+B approach.

Suppose that the Department has received three proposals from teams I, II and III as shown in Table 7.2. The Department decided to set the daily road user cost at $12,000. Design Build teams must submit proposals which include a proposed schedule that establishes the number of working days required to complete the project. Design Build teams' proposed project schedules (i.e., number of days to complete the project) along with their bid prices (A) are summarized in the Table 7.2. For each Design Build team, the Department calculates the worth of time (B) as the product of daily road user cost and proposed project duration. The calculated value is added to the Design Build team's bid price to derive the A+B value. The Design Build Team with the lowest A+B value - team III in this case - is awarded the contract. Although Design Build team I has the lowest bid price ($4,300,000), Design Build team III is awarded the project at the lump sum amount of $4,450,000.

TABLE 7.2

Design Build Teams' Proposed Schedule, Bid Prices, and A+B Values

Team	**Bid Price ($) (A)**	**Number of Days to Complete the Project**	**Road User Cost ($)**	**Worth of Time ($) (B)**	**A+B**
I	*4,300,000*	*130*	*12,000*	*1,560,000*	*5,860,000*
II	4,900,000	110	12,000	1,320,000	6,220,000
III	**4,450,000**	**115**	**12,000**	**1,380,000**	**5,830,000**

2. Adjusted Bid

The Adjusted Bid approach adjusts the bid price considering the non-price factors and uses the adjusted bid as the basis of awarding Design Build contracts. It applies a numerical scoring system or a system that uses adjectival ratings, which are later converted to numbers. Selection of the Adjusted Bid approach as an award algorithm indicates that price is not the only factor considered to award the contract. Each Design Build proposal is scored (or rated) in several non-price (technical) categories, such as schedule, maintainability, management of traffic and quality management plan. These scores are integrated into a single proposal's technical score, which is typically a value from 0-1 or 0-100. The details of scoring (rating) system must be fully described in RFQs and RFPs.

The procurement process starts with evaluating and scoring technical proposals. Price proposals are opened after technical proposals are scored. The proposed price is adjusted in some manner by the technical score, typically through the division of price by the technical score. The Design Build team with the lowest adjusted bid will be awarded the project. The Adjusted Bid is just the basis of awarding the project. The contract price, however, is the amount stated in the price proposal. This approach has been used by several State DOTs. For instance, the Maine Department of Transportation used the Adjusted Bid selection process for procuring the Bath/Woolwich Bridge Project. The Florida Department of Transportation (FDOT) regularly uses the Adjusted Bid selection process for procuring Design Build projects. The notional example below describes the process of Adjusted Bid approach.

Suppose that the Department has received five proposals from teams A, B, C, D, and E as shown in Table 7.3. The Department decided to use a technical scoring system to evaluate technical aspects of Design Build teams' proposals. Each technical proposal is evaluated and scored on a scale of 0 to 1. Technical scores for these Design Build proposals are summarized in the Table 7.3 along with Design Build teams' bid prices. For each Design Build team, the bid price is divided by the technical score. The resulting value is the Adjusted Bid, also known as Price per Quality Point, which is used as the basis for awarding the contract. The Department awards the contract to the Design Build team with the lowest Adjusted Bid, Design Build team C (bid price: $2,800,000), although Design Build team E has submitted the lowest bid price (bid price: $2,600,000). The lump sum contract is awarded to Design Build team C at $2,800,000.

TABLE 7.3

Design Build Teams' Technical Scores, Bid Prices, and Adjusted Bids

Team	**Technical Score**	**Bid Price ($)**	**Adjusted Bid ($)**
A	0.95	3,000,000	3,157,894
B	0.90	2,900,000	3,222,222
C	**0.90**	**2,800,000**	**3,111,111**
D	0.80	2,700,000	3,375,000
E	*0.70*	*2,600,000*	*3,714,285*

3. ADJUSTED SCORE

The Adjusted Score approach uses a combination of technical score and bid price as the basis of awarding Design Build contracts. This approach requires the use of a numerical scoring system. Alternatively, the Department may use a system that applies adjectival ratings, which are later converted to numbers. The proposal evaluation process starts with reviewing and scoring technical proposals. Typically, each Design Build proposal is scored (or rated) in several non-price (technical) categories, such as schedule, maintainability, management of traffic and quality management plan. These scores are integrated into a single proposal's technical score, which is typically a value from 0-100. The details of scoring (rating) system must be fully described in RFQs and RFPs.

Price proposals are opened once technical reviews are completed. An Adjusted Score is calculated based on the Design Build team's technical score, proposed price, and engineer's estimate. The Department determines an appropriate formula to calculate the adjusted score for each Design Build proposal. The Department should publish this formula along with other details of the selection process in the RFP. Usually, the adjusted score is calculated as the product of technical score and total estimated project price divided by the proposal price:

$$\textit{Adjusted Score} = (\textit{Engineer's Estimate} \times \textit{Technical Score}) / \textit{Proposal Price}$$

The total estimated project price is established by the Department based on the engineer's estimates. The contract is awarded to the Design Build team whose responsive proposal is evaluated as providing the highest score and, hence, the maximum value to the Department. The Adjusted score approach is a proper procurement method when the Department's requirements and performance expectations can be clearly defined and a number of alternatives can be used in order to fulfill these expectations. The selection of the Adjusted Score procurement method as the basis of awarding the Design Build contract indicates that, besides the proposal price, the Department is concerned with the quality of delivered project. This approach has been used by several State DOTs. For instance, the Washington Department of Transportation (WsDOT) used the Adjusted Score selection approach for procuring the SR 500 Thurston Way Interchange in Vancouver, Washington. The notional example below describes the process of Adjusted Score approach.

Suppose that the Department has received five proposals from teams A, B, C, D, and E as shown in Table 7.4. The Department decided to use a technical scoring system to evaluate technical aspects of Design Build teams' proposals. Each technical proposal is evaluated and scored on a scale of 0 to 100. Technical scores for these Design Build proposals are summarized in the Table 7.4 along with Design Build teams' bid prices. Suppose that the engineer's estimate for the project is $2,900,000. For each Design Build team, the technical score is multiplied by the engineer's estimate and then, divided by the bid price. The resulting value is the Adjusted Score, which is used as the basis for awarding the contract. The Department awards the contract to the Design Build team with the highest Adjusted Score, Design Build team C (bid price: $2,800,000), although Design Build team E has submitted the lowest bid price (bid price: $2,600,000). The lump sum contract is awarded to Design Build team C at $2,800,000.

TABLE 7.4

Design Build Teams' Technical Scores, Bid Prices, and Adjusted Scores

Team	Technical Score	Price Proposal ($)	Adjusted Score
A	95	3,000,000	91.83
B	90	2,900,000	90.00
C	**90**	**2,800,000**	**93.21**
D	80	2,700,000	85.93
E	*70*	*2,600,000*	*78.08*

4. WEIGHTED CRITERIA

The Weighted Criteria approach independently evaluates price and technical criteria, assigns weights to price and technical criteria, and uses the weighted score as the basis of awarding Design Build contracts. The Weighted Criteria approach requires the use of a numerical scoring system for evaluating Design Build proposals with respect to different price and other technical criteria. Alternatively, the Department may use a system that applies adjectival ratings, which are later converted to numbers. In this approach, technical and price proposals are evaluated individually. Evaluators score each Design Build proposal with respect to price and each technical criterion. The Department combines these scores using weights assigned to price and technical criteria. The total score (i.e., the weighted average of multiple criteria scores) for each Design Build proposal is calculated and the Design Build proposal with the highest score is selected as the Best Value proposal. The formula for finding the Total Score can be summarized as:

$$Total\ Score = W_{price} \times Price\ Score + W_1 \times S_1 + W_2 \times S_2 + \ldots + W_N \times S_N$$

where N is the total number of technical criteria considered in Design Build proposal evaluation, S_i $i=1,2,\ldots, N$ is the proposal's scores in technical criterion i, and W_i $i=1,2,\ldots, N$ is the respective weight of technical criterion i. The Department should publish this formula along with other details of the selection process in the RFP.

The Weighted Criteria approach is an appropriate procurement method when the Department wants to explicitly emphasize on certain aspects of Design Build projects. The Department highlights the relative importance of price and technical factors by assigning different weights to these factors. For instance, if the Department is concerned about the aesthetics of the project, a proper weight is assigned to evaluate Design Build proposals with respect to the aesthetic appeal criterion. If keeping down the project cost is the Department's high priority, then the price criterion receives the highest weight (this is typically the case for most Design Build projects that various State DOTs procure through Best Value).

Weighted Criteria is a proper method to procure complex Design Build projects, for which the Department would like to encourage innovation, new technologies, shortened schedules, and/or constructability. Also, the Department may specify weights for special technical expertise that the Design Build team must have to manage the project complexity. Explicit identification of technical criteria, scoring system for each criterion, and assigning weights to technical and price criteria help the Department outline performance expectations and requirements for the Design Build project. This method also helps Design Build teams to better understand the Department's expectations for the proposal review and prepare their proposals accordingly. This approach has been used by several State DOTs. For instance, the Alaska Department of Transportation used the Weighted Criteria selection process in the procurement of the Glenn Parks Interchange project in Anchorage, Alaska. Similarly, VDOT has used the Weighted Criteria selection process in procuring the Middle Ground Boulevard Extension Design Build project. The notional example below describes the process of Adjusted Score approach.

Suppose that the Department has received five proposals from teams A, B, C, D, and E as shown in Table 7.5. The Department decided to use a technical scoring system to evaluate technical aspects of Design Build teams' proposals. Each technical proposal is evaluated and scored on a scale of 0 to 100. Technical scores for these Design Build proposals are summarized in the Table 7.5 along with Design Build teams' bid prices. For each Design Build proposal, the price score is calculated as the ratio of the lowest bid price of all proposers to the team's proposed bid price. The calculated price score is scaled from 0 to 100.

Suppose that the Department decided to assign 40% weight on the price score and 60% weight on the technical score. These weights are used to combine technical and price scores. The resulting value is the Total Score, which is used as the basis for awarding the contract. The Department awards the contract to the Design Build team with the highest Total Score, Design Build team C (bid price: $2,800,000), although Design Build team E has submitted the lowest bid price (bid price: $2,600,000). The lump sum contract is awarded to Design Build team C at $2,800,000.

TABLE 7.5

Design Build Teams' Technical Scores, Price Scores, and Total Scores in Weighted Criteria Selection

Team	Technical Score	Price Proposal ($)	Price Score	Total Score
A	95	3,000,000	86.67	90.00
B	90	2,900,000	89.66	89.79
C	**90**	**2,800,000**	**92.86**	**91.71**
D	80	2,700,000	96.30	89.78
E	*70*	*2,600,000*	*100.00*	*88.00*

5. FIXED PRICE - BEST PROPOSAL

The Fixed Price- Best Proposal, which is also known as Fixed Price - Best Design, is a form of Best Value procurement in which the Department establishes the contract price in the advertised RFP. The Department evaluates the design solutions and other technical aspects of Design Build teams' technical proposals and awards the contract to the Design Build team that offers the best technical proposal (or the maximum scope) for the established price.

Each Design Build team should submit a technical proposal that is accompanied by an agreement to perform the work within the specified price constraints. The Department evaluates the submitted technical proposals and scores them based on the criteria set in the RFP. The Department can use a numerical scoring system for evaluating Design Build proposals. Alternatively, the Department may use a system that applies adjectival ratings. Evaluators score each Design Build proposal with respect to each technical criterion including the proposed scope and combine these scores at the end of evaluation process. The award is based only on the technical proposal evaluation. The Design Build team that achieves the highest score (or rating) by providing the best technical proposal will be selected as long as the Design Build team's bid price does not exceed the Department's fixed price.

The Fixed Price – Best Proposal method has the advantage of allowing the Department to determine whether the required scope is realistically achievable within the limits of available budget. It also reduces the selection decision to just the analysis of proposed design alternatives and other non-cost factors. It promotes the efficient use of capital by awarding the contract to the Design Build team that provides the best design or maximum scope. By using the Fixed Price – Best Proposal process, the Department persuades the participating Design Build teams to develop high value, innovative proposals that meet or exceed the performance requirement while meeting the fixed budget allocated to the project. This approach has been used by several State DOTs. For instance, the Utah Department of Transportation (UDOT) used the Fixed Price - Best Design procurement method on a $1.7 billion project. For this project, UDOT wanted the maximum amount of scope that Design Build teams could provide at a set price while meeting the performance requirements identified in the RFP. Compared to other procurement methods, a Fixed Cost - Best Design RFP takes more time and effort to develop. The notional example below describes the process of Fixed Price - Best Design approach.

Suppose that the Department has received five proposals from teams A, B, C, D, and E as shown Table 7.6. The Department decided to set the fixed price at $2,900,000. It is anticipated that all Design Build teams do not leave any money on the table and put $2,900,000 as their bid prices. A numerical scoring system is used to evaluate technical aspects of Design Build teams' proposals. Each technical proposal is evaluated and scored on a scale of 0 to 100. Technical scores for these Design Build proposals are summarized in the Table 7.6. The Department awards the contract to the Design Build team with the highest Technical Score, Design Build team C. The lump sum contract is awarded to Design Build team C at $2,900,000.

TABLE 7.6

Design Build Teams' Technical Scores in Fixed Price – Best Proposal Selection

Team	Technical Score
A	85
B	90
C	**95**
D	80
E	70

Appendix II provides a summary of evaluation criteria that are typically used as the Statement of Qualifications Evaluation Criteria in the RFQ phase of procurement for Design Build transportation projects. Appendix III provides a summary of technical proposal evaluation criteria that are typically in the RFP phase of procurement for Design Build transportation projects.

BEST & FINAL OFFER (BAFO)

The Department may use a BAFO in conjunction with any basis for award. If the Department determines that further information and discussion is necessary after reviewing the submitted Proposals, it may establish a competitive range of the highest rated Design Build teams deemed to be fully qualified and best suited among those submitting Proposals or even with all Design Build teams. Design Build teams in the competitive range will be invited to participate in individual discussions with the Proposal Evaluation Team. Following discussions, the Design Build teams in the competitive range will be offered the opportunity to resubmit their proposals in the form of a BAFO. After the BAFOs are submitted, no further discussions shall be conducted with any of the Design Build teams. The Department will evaluate and score the BAFOs using the same criteria stated in the RFP to evaluate the initial Proposal submittal. The decision to award will be based on the evaluation of the BAFO only and at the Department's sole discretion.

CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Rapid changes in the nature of the nation's transportation demand is placing increasing burdens on the ability of State DOTs to meet the growing needs for renewed and expanded transportation system capacity. Innovative techniques such as Design Build Project Delivery System have been shown to offer the potential to help State DOTs better serve these needs by delivering transportation projects faster and more cost-effectively.

Design Build Project Delivery System facilitates collaborative efforts among State DOTs, designers and contractors, as well as other project stakeholders. Design Build integrates various resources involved in the development of a transportation project. It can provide incentives for a high level of technical performance and consistency with contractual budget and schedule terms. It has the potential to produce a more cost-effective project in less time than a process that contractually insulates the project participants while leaving the State DOT with most of the project risk. Nevertheless, Design Build Project Delivery System is not appropriate for every transportation project. In certain cases, the traditional Design Bid Build can still be the most appropriate Project Delivery System that can meet the State DOT's specific cost, time, and quality goals for transportation projects. Therefore, State DOTs need a systematic approach to determine whether Design Build is the appropriate Project Delivery System for a project. In order to evaluate the appropriateness of Design Build Project Delivery System, this systematic approach should take into account specific project characteristics, as well as the State DOT's strategic objectives and project-specific goals. This evaluation process should also determine whether the identified project risks could be effectively managed if the Design Build Project Delivery System was selected for the project. This research project is aimed at fulfilling the need for a systematic and transparent approach that assists State DOTs in assessing whether the use of Design Build Project Delivery System can produce the best outcome for a project.

As a part of this project, a comprehensive review of academic and professional literature was conducted, in order to analyze and document the emerging trends in using Design Build Project Delivery System. A scanning process was conducted on State DOT websites regarding documented state of practice related to Design Build Project Delivery System. The results of scanning process indicate that the use of Design Build Project Delivery System is mostly driven by the State DOT's need to achieve aggressive delivery schedules for their projects. Encouraging innovation, reducing cost, enhancing quality, maximizing the use of available funds, and managing project complexity are other key factors driving the use of Design Build Project Delivery System by the State DOTs.

This scanning process led to the conclusion that, although State DOTs have uniform understanding of Design Build Project Delivery System and its strengths and weaknesses, the implementation of Design Build is varied. Few State DOTs like Florida, Virginia, and Colorado have utilized Design Build in several projects of various sizes and types, while others have experimented only with a few Design Build projects.

It is found out that State DOTs that are the most progressive in utilizing Design Build Project Delivery System are constantly developing new procedures that support and promote the use of Design Build. This is an important deviation from the common practice of modifying existing Design Bid Build processes and contracts. State DOTs' existing contracting practices and procedures for delivering projects using Design Bid Build Project Delivery System are highly developed. These practices and procedures have long been used to deliver projects of various sizes and values. Nevertheless, these practices and procedures are not appropriate for delivering projects using Design Build Project Delivery Systems. New documents and new administrative and management procedures will need to be developed to allow for the proper control of Design Build procurement and administration processes. Progressive State DOTs have dedicated considerable efforts and resources to the development of appropriate procedures for selecting projects, procurement method and risk allocation, as well as the administration of Design Build contracts.

Using standardized Design Build documents can help the Department in streamlining the Design Build procurement process. Standard Design Build contract documents should at least contain four different parts: (1) Instructions for proposers; (2) The scope of the Design Build contract (project commercial terms, general conditions, and other details that establish the scope of the Design Build contract); (3) Technical requirements associated with the project including drawings and design criteria; and (4) References information (standard specifications and guidelines developed by local, state and federal authorities that should be strictly followed by Design Build Teams).

Following the nation-wide scanning process, several structured interviews were conducted with representatives from three State DOTs (CDOT, VDOT, and FDOT) to further enhance our understanding about the state of practice in using Design Build Project Delivery System in these DOTs. The interviewed State DOTs acknowledged that using Design Build has consistently helped them shorten the project schedule. The interviewed State DOTs believe that using Design Build can also help them achieve cost certainty in the early stages of the project. The officials from the three State DOTs believe that Design Build Project Delivery System can facilitate the use of innovative design and construction methods and techniques that result in cost and time savings.

However, State DOTs participated in this review acknowledged that Design Build Project Delivery System is not appropriate for every transportation project. They emphasized on the great value of a systematic and transparent approach that can help them determine whether Design Build is the appropriate Project Delivery System for a proposed project. All three State DOTs expressed the great need for a formal and comprehensive risk analysis tool that helps them develop an optimized risk management plan. A proper risk management system facilitates the identification and allocation of risks in Design Build projects.

The findings of literature review and in-depth State DOT scanning indicate that several procurement methods can be used in conjunction with Design Build Project Delivery System. Colorado, Florida, and Virginia State DOTs are currently working to optimize their procurement processes, in order to facilitate and expedite Design Build Project Delivery. The major challenge for these State DOTs is to choose the most appropriate procurement method that meets the Department's requirements for the project and fulfills specific project goals. This concern has been shared by several other State DOTs including the Georgia Department of Transportation that were scanned in this research project. Therefore, the research team realized the significance and benefits of developing a systematic approach for selecting appropriate projects for Design Build Project Delivery System. Also, the research team understood that there is a great need from the industry for the development of proper risk allocation matrices for Design Build projects, as well as a suitable selection approach for choosing appropriate procurement method for a proposed Design Build project.

A systematic approach was developed as one of the major deliverables of this research project. The proposed approach first helps State DOTs identify their strategic objectives and determine the alignment of Design Build Project Delivery System with these strategic objectives. It also provides a basis for identifying and articulating the project-specific goals that serve as critical factors in the evaluation of appropriateness of Design Build Project Delivery System. Using the proposed approach, State DOTs can identify and evaluate any deal-breaker issues that can hinder the implementation of Design Build Project Delivery Systems.

This systematic approach provides a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis framework that can be used by the Department to determine the suitability of Design Build Project Delivery System for a transportation project. Several issues are considered in the SWOT analysis including project delivery schedule, innovation, level of design, project delivery cost, quality, staff experience, and marketplace conditions, competition, and Design Build Team experience. The proposed approach helps the Department assess whether the identified project risks can be effectively managed if the Design Build Project Delivery System is selected for the project. It also provides a template for the high-level risk assessment that can be used as a guide to identify project risks as well as the opportunities to mitigate them. If the previous steps indicate that Design Build is a proper Project Delivery System for the project, then the Department can use the proposed approach to conduct a rigorous evaluation of procurement methods and choose the most appropriate procurement method for the project. This evaluation assists the Department to make two critical decisions regarding the procurement method for the project: (1) Decision about what should be the basis for proposal evaluation; and (2) Decision about whether the procurement should be one-phase (RFP only) or two-phase (RFQ and RFP).

Overall, the systematic approach developed in this research can help State DOTs in transparent and consistent implementation of Design Build Project Delivery System. Proper selection of projects for Design Build Project Delivery System, development of appropriate risk allocation matrices, and a selection approach for suitable procurement methods are important subjects that facilitate the growth of Design Build programs in State DOTs with younger history of Design Build. State DOTs with mature Design Build program can consider and utilize the proposed systematic approach as part of their ongoing efforts to streamline and optimize their Design Build practices. In fact, GDOT already started using this systematic tool for the assessment of candidate Design Build projects.

SUGGESTED FUTURE RESEARCH

This research project was aimed at developing a systematic approach to evaluate the appropriateness of Design Build Project Delivery System for transportation projects. Design Build is still a relatively new Project Delivery System in the transportation sector. Therefore, the primary need for future research involves evaluation and refinement of the current Design Build practices in the transportation sector. The research team identified the areas in which further study is warranted and recommended the following topics for possible research consideration at the State and national levels:

1. Evaluate the efficiency of State DOTs in utilizing Design Build Project Delivery System for transportation projects: This study can investigate how experienced State DOTs' Design Build programs evolved from the first projects to the current forms and how these State DOTs are working to optimize and streamline their Design Build practices. The findings of this research can form a baseline for DOTs with less experience with Design Build. This will allow the less-experienced State DOTs to capture lessons learned and be able to improve the efficiency in their Design Build programs. The proposed study should focus on examining the three or four most experienced State DOTs. Design Build project and program performance data should be gathered and used to document the changes in performance over time as the State DOTs' Design Build programs are matured. Information and data should be gathered on legal and contractual issues that were arisen, causing a change in Design Build implementation policies and procedures. An important component of this research should be the development of measurement metrics and testing procedures for evaluating State DOTs' efficiency in implementing various stages of Design Build projects (e.g., plan development process, procurement, and administration). The findings of this study can be used by the State DOTs to monitor and improve their efficiency in implementing Design Build Project Delivery System.
2. Quality Management for Design Build Project Delivery System: There is a lack of clear guidance on how to properly develop and administer design quality management activities in the context of Design Build Project Delivery System. State DOTs are faced with the challenge of determining the required level of design development needed to properly articulate the scope of work in the RFP. It will be prudent to investigate the design

development process before and after the procurement process and identify the roles and responsibilities required to develop a proper design quality management plan. The most important component of this study should be the identification of the possible forms that the Department's design quality management plan can take place. This could lead to the development of a guidebook that can be used by State DOTs as the template for the development of design quality management policies and procedures.

3. Alternative Technical Concepts (ATCs): State DOTs are increasingly considering the use of Alternative Technical Concepts (ATCs) submitted by Design Build Teams. ATCs have huge potential for accruing sizable benefits in terms of cost savings, increased constructability, and schedule reduction. The construction and consulting industry have constantly expressed their concerns regarding the protection of their proprietary as well as sensitive business practices when proposing ATCs for Design Build projects. State DOTs need to work with Design Build Teams to develop transparent procedures that treat all proposers fairly and provide their management with a documented process of ATC approval process and its incorporation into the contract award process. There is a need for research that explores various issues related to the use of ATCs by State DOTs. The research should identify various methods by which State DOTs have successfully implemented ATCs. It should document the methods that promote transparency of the selection process, protect the Design Build Team's right to confidentiality, and assist the State DOT in selecting the proposal that represents the best-value. The product of this research can be a guidebook that presents the procurement procedures that can minimize the overall industry concerns and costs for developing and proposing ATCs, yet encourages both competition and innovation. This guidebook should summarize the ATC evaluation and approval methods that support transparency and objectivity in the ATC evaluation process.
4. Innovative Finance Mechanisms for Design Build projects: Transportation agencies should have a better understanding of the kinds of transportation projects that are compatible with

each type of innovative finance mechanisms so that they can make the best use of their available options (Henkin 2009). The introduction of innovative finance mechanisms provides new opportunities for financing and delivery of transportation projects. However, this adds a new dimension of complexity to the project delivery practiced by transportation agencies. Currently, there is a significant gap in knowledge and expertise as it relates to the appropriate use of innovative finance mechanisms (Henkin 2009). In order to make informed decisions, transportation agencies need a comprehensive understanding of potential benefits and risks of specific innovative finance mechanisms. Research should be conducted, in order to identify and document the experience of transportation agencies with using innovative finance mechanisms, and the benefits that have been realized by transportation agencies through the successful utilization of innovative finance mechanisms. The major risks, challenges, and barriers to the successful utilization of innovative finance mechanisms should be identified and documented (Aldrete et al. 2010; Henkin 2009, Schwartz et al. 2006). In addition, risk management strategies and best practices that have been employed to overcome the barriers to the adoption of innovative finance mechanisms need to be analyzed. This research would lead to the development of tools that can be used to inform lawmakers on the legislative environment required for making the best use of innovative finance mechanisms. Utilizing innovative finance mechanisms requires appropriate analytical tools that can be used for the valuation of investments in transportation projects. Transportation agencies need appropriate financial analysis tools that help them compare alternative innovative financing solutions under varying scenarios and uncertainties (Henkin 2009; Cambridge Systematics et al. 2006). A new class of financial analysis tools should be created, in order to support the evaluation of innovative finance mechanisms for transportation projects. These models would enable effective evaluation of financial risks in transportation projects and facilitate optimal risk and revenue sharing between public and private sectors.

REFERENCES

Aldrete, R., Bujanda, A., and Valdez-Ceniceros, G. A. (2010). "Valuing Public Sector Risk Exposure in Transportation Public-Private Partnerships." University Transportation Center for Mobility, College Station, TX.

Alhazmi, T., and McCaffer, R. (2000). "Project Procurement System Selection Model." Journal of Construction Engineering and Management, 126, 176–184.

Allen, L. N., Gransberg, D. D. and Molenaar, K. R. (2002). "Partnering Successful Design-Build Contracts in the Naval Facilities Engineering Command Southwest Division." The Military Engineer, 94 (616), 47–48.

American Association of State Highway and Transportation Officials (2007). "AASHTO Survey on Design-Build Projects", AASHTO, Washington, D.C, 2007.

American Association of State Highway and Transportation Officials (2008). "AASHTO Guide for Design Build Procurement." Washington, DC, 27-33.

Association for Project Management (2004). Project Risk Analysis & Management (PRAM) Guide. 2nd Edition, High Wycombe.

Barnes, M. (1983). "How to Allocate Risks in Construction Contracts". International Journal of Project Management, 1(1), 24-28.

Beard, J., Wundram, E. and Loulakis, M. (2001). Design-Build: Planning Through Development, McGraw-Hill, New York.

Bennett, J., Pothecary, E. and Robinson, G. (1996). "Designing and Building a World-Class Industry." Report No. ISBN 07049 1, University of Reading. Reading, United Kingdom.

Boothroyd, C., and Emmett, J. (1996). Risk Management: A Practical Guide for Construction Professionals, Witherby & Co Ltd, London.

British Standards Institute (2000) Project Management — Part 3: Guide to the Management of Business related Project Risk, BS6079-3, London, British Standards Institute, ISBN 0-580-33122-9.

Caltrans (2007). "Project Risk Management Handbook Threats and Opportunities." Office of Statewide Project Management Improvement (OSPMI).

Caltrans (2012). "Project Risk Management Handbook: A Scalable Approach." Report of the California Department of Transportation (Caltrans), Office of Project Management Process Improvement. Sacramento, CA.

Cambridge Systematics, Mercator Advisors, Pisarsk, A. E., and Wachs, M. (2006). "Future Financing Options to Meet Highway and Transit Needs." NCHRP Web-only Document 102, Transportation Research Board, Washington, D.C.

Canadian Standards Association (2002). CAN/CSA-Q850-97: Risk Management: Guideline for Decision Makers. Mississauga, Ont: Canadian Standards Association.

Chan A., Ho D., and Tam C. (2001a). "Design and Build Project Success Factors; Multivariate Analysis." Journal of Construction Engineering and Management, 127, 93-100.

Chan, A.P.C., Yung, E.H.K., Lam, P.T.I., Tam, C.M. and Cheung, S.O. (2001b). "Application of Delphi Method in Selection of Procurement Systems for Construction Project." Construction Management and Economics, 19, 699-718.

Chan, C. T. W. (2007). "Fuzzy Procurement Selection Model for Construction Projects." Construction Management and Economics, 25 (6), 611–618.

Chapman, C.B., and Ward, S.C. (2003). Project Risk Management: Processes, Techniques and Insights. 2nd Edition. Chichester: Wiley.

Colorado Department of Transportation (2011). Project Delivery Selection Approach. Prepared by the Innovative Contracting Advisory Committee. Available at: http://www.coloradodot.info/business/designsupport/innovative-contracting-and-design-build/icac/overview.html.

Colorado Department of Transportation (2013). Design Build Manual. Available at: http://www.coloradodot.info/business/designsupport/innovative-contracting-and-design-build/resolveuid/4fa3dfb6ba916dace11b8ed37f9284e4

Construction Industry Institute (2012). "Probabilistic Risk Management in Design and Construction Projects". Research Summary 280-1, Version 1.1. Prepared by: Research Team 280.

del Puerto, C., Gransberg, D., and Shane, J. (2008). "Comparative Analysis of Owner Goals for Design/Build Projects." Journal of Management in Engineering, 24(1).

Design Build Institute of America (2005). Design Build State Laws for Transportation Procurement. Available at: http://www.dbia.org/advocacy/state/procurementslide.htm.

Design Build Institute of America (2010). Design Build State Laws for Transportation Procurement. Available at: http://www.dbia.org/advocacy/state/procurementslide.htm.

Design Build Institute of America (2012). Design Build State Laws for Transportation Procurement. Available at: http://www.dbia.org/advocacy/state/.

Dorofee, A. J., Walker, J.A., Alberts, C.J., Higuera, R.P., Murphy, R.L. and Williams. R.C. (1996). "Continuous Risk Management Guidebook." Carnegie Mellon University, Pittsburgh.

Federal Highway Administration, (2006a). "Design-Build Effectiveness Study - As Required by TEA-21 Section 1307 (f)." Final Report to Congress, Prepared by: SAIC, AECOM Consultant, and University of Colorado at Boulder. Washington, D.C. Available at: http://www.fhwa.dot.gov/reports/designbuild/designbuild.pdf.

Federal Highway Administration, (2006b). "Risk Assessment and Allocation for Highway Construction Management". Report No. FHWA-PL-06-032. Prepared by Ashley, D. B., Diekmann, J. E., Molenaar, K. R. Federal Highway Administration, Washington, DC.

Federal Highway Administration, (2009). "Current Design-Build Practices for Transportation Projects." A Compilation of Practices by the Transportation Design-Build Users Group.

Federal Highway Administration. Washington DC. June, 2009. Available at: http://www.fhwa.dot.gov/construction/contracts/pubs/dbpractice/dbpractice.pdf

Federation of Canadian Municipalities and National Research Council (2006). "Decision Making and Investment Planning: Managing Risk". ISBN 1-897249-10-1.

Florida Department of Transportation (2012). Design-Build Guidelines. Available at: http://www.dot.state.fl.us/construction/designbuild/DBRules/DesignBuildGuidelines.pdf.

Florida Department of Transportation (2013). "Risk Based Graded Approach Worksheet Development Guidelines." Available at: http://www.dot.state.fl.us/projectmanagementoffice/ToolBox/GradedApproachWorksheetDevelopmentGuidelines.doc.

Gibson, G. E., O'Connor, J. T., Migliaccio, G. and Walewski, J. (2007) "Key Implementation Issues and Lessons learned with Design-Build projects." Alternative Project Delivery Procurement, and Contracting Methods for Highways, K.R. Molenaar and G. Yakowenko (editor), American Society of Civil Engineers, Reston, VA.

Golder Associates Inc., Molenaar, K., Loulakis, M., and Ferragut, T. (2011) "Guide for the Process of Managing Risk on Rapid Renewal Contracts". Strategic Highway Research Program 2 (SHRP2) Report No. SHRP2 R09.

Gordon, C. M. (1994). "Choosing Appropriate Construction Contracting Method." Journal of Construction Engineering and Management, 120(1), 196-210.

Gransberg, D. D., and Senadheera, S. (1999). "Design-Build Contract Award Methods for Transportation Projects." Journal of Transportation Engineering, 125(6), 565-567.

Gransberg, D. D., G. M. Badillo-Kwiatkowski, and K. R. Molenaar (2003). "Project Delivery Comparison Using Performance Metrics." AACE International Transactions (CD-ROM), AACE, Morgantown, WV.

Gransberg, D. D., Koch, J. E., and Molenaar, K. R. (2006). Preparing for Design-Build Projects: A Primer for Owners, Engineers, and Contractors, ASCE, Reston, Va.

Gransberg, D., and Barton, R. (2007). "Analysis of Federal Design-Build Request for Proposal Evaluation Criteria." Journal of Management in Engineering, 23 (2), 105-111.

Hale, D., Shrestha, P., Gibson, G., and Migliaccio, G. (2009). "Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Systems." Journal of Construction Engineering and Management, 135(7), 579–587.

Henkin, T. (2009). "Debt Finance Practices for Surface Transportation." NCHRP Synthesis 395, Transportation Research Board, Washington, D.C.

Hillson, D.A. (2002). "What Is Risk? Towards a Common Definition." InfoRM, Journal of the UK Institute of Risk Management. April, 11-12.

Hillson, D. (2003). "Using a Risk Breakdown Structure in project management." Journal of Facilities Management, 2(1), 85-97.

Hillson, D., Grimaldi, S., and Rafele, C. (2006), "Managing Project Risks Using a Cross Risk Breakdown Matrix." Risk Management, 8(1), 61-76.

Ibbs, W., Chih, Y. (2011) "Alternative methods for choosing an appropriate project delivery system (PDS)", Facilities, 29 (13/14), 527-541.

Ibbs, W., Kwak, Y., Ng, T., and Odabasi, A. (2003). "Project Delivery Systems and Project Change: Quantitative Analysis." Journal of Construction Engineering and Management, 129 (4), 382–387.

Institute of Risk Management, National Forum for Risk Management in the Public Sector, and Association of Insurance and Risk Managers (2002). A Risk Management Standard. London: IRM/ALARM/AIRMIC.

Jaafari A, 2001, Management of Risks, Uncertainties and Opportunities in Projects: Time for a Fundamental Shift, International Journal of Project Management, (19), London, United Kingdom.

Kerzner, H. (2009). Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 10th edition. Wiley, Hoboken, NJ.

Konchar, M. D. , and Sanvido V. E. (1998). "Comparison of U.S. Project Delivery Systems." Journal of Construction Engineering and Management, 124 (6), 435-444.

Louisiana Department of Transportation and Development, (2009). Design-Build Manual, Available at: http://www.dotd.la.gov/highways/contractservices/ladotd_designbuildmanual.pdf

Loulakis, M. C. (2005). "Construction Project Delivery Systems: Evaluating the Owner's Alternatives." Reston, VA: A/E/C Training Technologies.

Love, P., Edwards, D., Irani, Z., and Sharif, A. (2012). "Participatory Action Research Approach to Public Sector Procurement Selection." Journal of Construction Engineering and Management, 138(3), 311–322.

Mafakheri, F., Dai, L., Slezak, D., Nasiri, F. (2007). "Project Delivery System Selection under Uncertainty: Multicriteria Multilevel Decision Aid Model." Journal of Construction Engineering and Management, 23(4). 200-206.

Mahdi, I. M., and Alreshaid, K. (2005). "Decision Support System For Selecting The Proper Project Delivery System Using Analytical Hierarchy Process (AHP)." International Journal of Project Management 23, 564–572.

Mandri-Perrott, C. (2010). Private Sector Participation in Light Rail/Light Metro Transit Initiatives, The World Bank Publications

Molenaar, K. R., Songer, A., and Barash, M. (1999). "Public-Sector Design/Build Evolution and Performance." Journal of Management in Engineering, 15(2), 54–62.

Molenaar, K., Gransberg D., Scott, S., Downs, D., Ellis, R. (2005). Recommended AASHTO Design-Build Procurement Guide. Prepared for National Cooperative Highway Research Program, Project NO. 20-7/Task 172. Available at: http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/NCHRP20-07(172)_FR.pdf.

Molenaar, K. R., Sobin, N., and Antillón, A.I. (2010a). "A Synthesis of Best-Value Procurement Practices for Sustainable Design-Build Projects in the Public Sector." Green Building Journal, 5(4), 148-157.

Molenaar, K. R., Anderson, S., and Schexnayder, C. (2010b) "Guidebook on Risk Analysis Tools and Management Practices to Control Transportation Project Costs." NCHRP Report 658, ISBN 978-0-309-15476-5, National Highway Cooperative Research Program, Transportation Research Board of the National Academies, Washington, DC.

Molenaar, K. R., Harper, C., and Tran, D. (2012). "Guidebook for Selecting Project Delivery Systems and Alternative Contracting Strategies." Next-Generation Transportation Construction Management Transportation Pooled Fund Program Study TPF-5(260), Technical Memorandum No. 1, Available at: http://www.colorado.edu/ceae/TCM.

Montana Department of Transportation (2012). "Risk Management Guidelines: Managing Project Costs Through Identification And Management Of Risks." Montana Department of Transportation, Helena, MT.

North Carolina Department of Transportation (2011). Design Build Policy and Procedures. Available at: http://www.ncdot.gov/doh/preconstruct/altern/design_build/policy07.pdf.

Ng, S. and Cheung, S. (2007). "Virtual Project Delivery System Adviser." J. Prof. Issues Eng. Educ. Pract., 133(4), 275–284.

Oyetunji, A. A., and Anderson, S. D. (2001). "Owner's Tool for Project Delivery and Contract Strategy Selection." Research Summary Report No. 165-1, Construction Industry Institute, The University of Texas at Austin, Austin, Texas.

Oyetunji, A. A., and Anderson, S. D. (2006). "Relative Effectiveness of Project Delivery and Contract Strategies." Journal of Construction Engineering and Management, 132(1), 3-13.

Potter, K., and Sanvido, V. (1994). "Design/Build Prequalification System." Journal of Management in Engineering, 10(2).

Project Management Institute (2012). A Guide to the Project Management Body Knowledge (PMBOK Guide) 5th Edition, Project Management Institute, PA.

Roth, M. (1995). “An Empirical Analysis of United States Navy Design/ Build Contracts.” Master’s Thesis, University of Texas at Austin, Texas, United States.

Sanvido, V. E., and Konchar, M. D. (1997). “Project Delivery Systems: CM at Risk, Design-Build, Design-Bid-Build.” Technical Report No. 133, Construction Industry Institute (CII), Austin, TX.

Schwartz, G., Corbacho, A., and Koranchelian, T. (2006). “Financing Transportation Infrastructure: Potential Fiscal Risks of Innovative Financing Mechanisms.” First International Conference on Funding Transportation Infrastructure, Banff, Alberta (Canada).

Shrestha, P. P., Migliaccio, G. C., O’Connor, J. T., and Gibson E. G., Jr. (2007). “Benchmarking Of Large Design-Build Highway Projects: One to One Comparison and Comparison with Design-Bid-Build Projects.” Transportation Research Record, 1994 (1), 17–25.

Songer, A. D., and Molenaar, K. R. (1996). “Selecting Design-Build: Public and Private Sector Owner Attitude.” Journal of Management in Engineering, 12(6), 47–53.

Songer, A.D. and Molenaar, K.R. (1997). “Appropriate Project Characteristics for Public Sector Design-Build Projects.” Journal of Construction Engineering and Management, 123(1), 34-40.

Standards Australia/Standards New Zealand (2004) Australian/New Zealand Standard AS/NZS 4360:2004: Risk Management. Homebush, NSW: Standards Australia/Wellington: Standards New Zealand.

Thomas, S. R., Macken, C. L., Chung, T. H., and Kim, I. (2002). “Measuring the Impacts of the Delivery System on Project Performance – Design-Build and Design-Bid-Build.” NIST GCR 02-840, NIST, Austin, TX.

Tookey, J. E., Murray, M., Hardcastle, C., and Langford, D. (2001). “Construction Procurement Routes: Redefining the Contours of Construction Procurement.” Engineering, Construction and Management, 8 (1), 20-30.

Touran, A., Gransberg, D.D., Molenaar, K.R., Bakhshi, P. and Ghavamifar, K. (2009a). A Guidebook for Selecting Airport Capital Project Delivery Systems, ACRP Report 21, ISBN 978-0-309-11804-0, Airport Cooperative Research Program, Transportation Research Board of the National Academies, Washington, DC, October 2009.

Touran, A., Gransberg, D.D., Molenaar, K.R., Ghavamifar, K., Mason, D.J. and Fithian, L.A. (2009b). A Guidebook for the Evaluation of Project Delivery Systems, TCRP Report 131, ISBN: 978-0-309-11779-1, Transit Cooperative Research Program, Transportation Research Board of the National Academies, Washington, DC, January 2009.

Touran, A., Gransberg, D.D, Molenaar, K.R, and Ghavamifar, K. (2011). “Selection of Project Delivery System in Transit: Drivers and Objectives.” Journal of Management in Engineering, 27(1).

Tweeds (1996). Guide to Risk Analysis & Management. Oxford, UK: Laxtons.

Uhlik, F., and Eller, M. (1999). “Alternative Delivery Approaches for Military Medical Construction Projects.” Journal of Architectural Engineering, 5(4), 149–155.

US Army Corps of Engineers (2009). “Cost and Schedule Risk Analysis Guidance.”

Vesay, T. (1991). “A Project Delivery Selection System.” Technical Report, 26, Computer Integrated Construction Research Program, Pennsylvania State University, University Park, Pa.

Virginia Department of Transportation (2011). Design Build Procurement Manual. Available at: http://www.virginiadot.org/business/resources/ipd/DB_Manual_FinalCopy20111011.pdf.

Warne, T. R. (2005). “Design Build Contracting for Highway Projects: A Performance Assessment.” Tom Warne & Associates, LLC.

Warne, T. R., & Beard, J. L. (2005). “Project Delivery Systems Owner's Manual.” Washington DC: American Council of Engineering Companies.

Washington State Department of Transportation (2010). “Project Risk Management Guidance for WSDOT Projects.” Washington State Department of Transportation, Olympia, WA.

APPENDIX I

Below are the questionnaires prepared prior to the interview with the representative from each State DOT. These questionnaires include a series of questions concerning the state of practice of Design Build in the respective State DOTs as well as a series of questions directly related to the topic of this research project.

COLORADO DOT (CDOT)

BACKGROUND QUESTIONS

1. Briefly describe the history of Colorado statutory regulations as it pertains to Design Build procurement (e.g., using the Two-Phase Selection Method)? Did it always include the Best Value? Has it always given the current level of flexibility to the Chief Engineer for the procurement method selection?

QUESTIONS ABOUT THE SELECTION OF PROCUREMENT METHOD

2. Describe how the Colorado DOT makes decision about the procurement method selection for Design Build projects (i.e., Single Phase, Two-Phase Best Value, or Modified Design Build)? What factors are important in this selection process?
3. Where can we obtain RFQs and RFPs for recent Design Build projects that were procured under the above methods?
4. Describe how the dynamics of the RFQ and the RFP may be different with respect to the various selection methods?
5. Does the dynamics of Pre-qualification change based on the choice of procurement method? Is Pre-qualification always done before issuing RFPs in Low Bid Design Build projects?
6. How does Colorado DOT make decision about short-listing?

7. Has CDOT used Design Build Finance? Does the dynamics of RFQ and RFP change for Design Build Finance projects? How is the proposed financing alternative evaluated for Design Build Team Selection?
8. Describe how CDOT makes decision about the stipend amount.
9. Describe the conditions under which CDOT typically uses the Best and Final Offer (BAFO).

QUESTIONS ABOUT CDOT ORGANIZATION STRUCTURE FOR DESIGN BUILD PROCUREMENT

10. What is the organizational structure in Colorado DOT for Design Build project procurement? Which CDOT units are involved in different steps of Design Build project procurement (e.g., RFQ and RFP developments, Bidding, Proposal Evaluation, and Short-listing)?
11. Is there a process map or organization chart for Design Build project procurement?
12. How does DOT manage the Design Build procurement documents internally for Design Build projects (e.g., RFQ and RFP preparation, advertisement, evaluation and selection)?
13. How does the administrative burden and speed of implementing the project procurement change based on the Department's choice of procurement method?

QUESTIONS ABOUT RIGHT-OF-WAY ACQUISITION, UTILITIES COORDINATION, AND NEPA APPROVAL

14. For Federal-aid or State projects, can the letting process be initiated before the final titles to right of way, utility agreements and NEPA approval are acquired? Can CDOT accept the respective risk and let the project early?
15. Have there been any benefits realized from past Design Build projects for which the Design Build team handled Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval processes?

16. How does the dynamics of procurement method selection change considering the transfer of ownership and control of Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval?

Questions about ACCs (Alternative Configuration Concepts) and ATCs (Alternative Technical Concepts)

17. Describe the differences between ACCs and ATCs. Where can we obtain ACC and ATC examples in recent Colorado Design Build projects?
18. Does CDOT provide the Design Build Teams with the opportunity to propose ACCs and ATCs for any of the Design Build procurement methods? If yes, have there been any benefits realized from incorporating ACCs and ATCs in the past Design Build projects by the CDOT? Also, are there any limits on the number of ACCs and ATCs proposed by Design Build Teams?
19. Does the CDOT hold the Intellectual Property right for ACCs and ATCs that are proposed by non-winning Design Build Teams? Is the policy different for cases that the stipends are paid versus the cases that stipends are not paid?
20. How does the dynamics of Right-of-way Acquisition, Utilities Coordination, and NEPA Approval change considering design changes proposed as ACCs and ATCs?

Administrative Efficiency

21. Briefly describe CDOT level of effort with plan reviews. Has this proven successful? If not, what changes would you consider to achieve optimal efficiency?

Miscellaneous Questions

22. Does CDOT use performance-based specifications for any part of the RFP package? If yes, what are the performance measures?

23. How do you see the next-generation Design Build Procurement and Contracting in Colorado? What are the emerging trends that should be considered in the next-generation Design Build Procurement and Contracting?

FLORIDA DOT (FDOT)

BACKGROUND QUESTIONS

1. How did the flexibility in Design Build procurement method (e.g., using the Best Value Selection Method) end up in the Florida statutory regulations?
2. How was the Best Value Selection adopted as an alternative procurement method besides the Low Bid Selection Method?

QUESTIONS ABOUT THE SELECTION OF PROCUREMENT METHOD

3. How does the Florida DOT make decision about the procurement method selection for Design Build projects (i.e., selecting Low Bid Design Build (LBDD), Adjusted Score Design Build Bid Process (ASDB), Design Build Hybrid, Design Build Maximum Price or Design Build with Options for my projects)? What factors are important in this selection process? How?
4. Would you please provide us with a few examples of RFQs and RFPs for recent Design Build projects that were procured under the above methods?
5. How does the dynamics of RFQ and RFP change based on the choice of procurement method?
6. How does the dynamics of Pre-qualification change based on the choice of procurement method? Is Pre-qualification always done before issuing RFPs in Low Bid Design Build projects?
7. How does the Florida DOT make decision about short-listing?
8. How does the dynamics of RFQ and RFP change for Design Build Finance projects? How is the proposed financing alternative evaluated for Design Build Team Selection?

QUESTIONS ABOUT FDOT ORGANIZATION STRUCTURE FOR DESIGN BUILD PROCUREMENT

9. What is the organizational structure in Florida DOT for Design Build project procurement? Which FDOT units are involved in different steps of Design Build project procurement (e.g., RFQ and RFP developments, Bidding, Proposal Evaluation, Long-listing and Short-listing)?
10. Is there any process map or organization chart for Design Build project procurement?
11. How does FDOT manage procurement documents internally for Design Build projects (e.g., RFQ and RFP preparation, advertisement, evaluation and selection)?
12. How do the administrative burden and speed of project procurement change based on the choice of procurement method?

QUESTIONS ABOUT RIGHT-OF-WAY ACQUISITION, UTILITIES COORDINATION, AND NEPA APPROVAL

13. For Federal-aid or State projects, can the letting process be initiated before the final titles to right of way, utility agreements and NEPA approval are acquired? Can the FDOT accept the respective risk and let the project early?
14. Have there been any benefits realized from past Design Build projects for which the Design Build team handled Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval processes?
15. How does the dynamics of procurement method selection change considering the transfer of ownership and control of Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval?

QUESTIONS ABOUT ATCS

16. Have there been any benefits realized from incorporating ATCs in the past Design Build projects by the FDOT?

17. Are there any limits on the number of ATCs proposed by Design Build Teams?
18. How are the Intellectual Property issues addressed for ATCs that are proposed by non-winning Design Build Teams? Is the policy different for cases that the stipends are paid versus the cases that stipends are not paid?
19. How does the dynamics of Right-of-way Acquisition, Utilities Coordination, and NEPA Approval change considering design changes proposed as ATCs?

MISCELLANEOUS QUESTIONS

20. Does FDOT use performance-based RFPs? If yes, what are the performance measures?
21. How do you see the next-generation Design Build Procurement and Contracting in Florida? What are the emerging trends that should be considered in the next-generation Design Build Procurement and Contracting?

VIRGINIA DOT (VDOT)

BACKGROUND QUESTIONS

1. Briefly describe the history of Virginia statutory regulations as it pertains to Design Build procurement (e.g., using the Best Value Selection Method instead of the Low Bid Method). Did it always include the Best Value?

QUESTIONS ABOUT THE SELECTION OF PROCUREMENT METHOD

2. Describe how the Virginia DOT makes decision about the procurement method selection for Design Build projects (i.e., Single Phase or Two-Phase Best Value, Low Bid, Best and Final Offer (BAFO)). What factors are important in this selection process?
3. Describe how the dynamics of the RFQ and the RFP may be different with respect to the various selection methods (RFP may be more prescriptive when using low-bid vs. a best value).
4. Does the dynamics of Pre-qualification change based on the choice of procurement method? Is Pre-qualification always done before issuing RFPs in Low Bid Design Build projects?
5. How does Virginia DOT make decision about short-listing?
6. Has VDOT used Design Build Finance? Does the dynamics of RFQ and RFP change for Design Build Finance projects? How is the proposed financing alternative evaluated for Design Build Team Selection?
7. In the best value proposal evaluation, does the 30%-70% balance between the weights of Technical Proposal and Price Proposal (as mentioned in the Design Build manual) always remain the same?
8. Where can we obtain RFQs and RFPs for recent Design Build projects that were procured under the above methods?

Questions about VDOT Organization Structure for Design Build Procurement

9. What is the organizational structure in Virginia DOT for Design Build project procurement? Which VDOT units are involved in different steps of Design Build project procurement (e.g., RFQ and RFP developments, Bidding, Proposal Evaluation, Long-listing and Short-listing)?
10. Is there a process map or organization chart for Design Build project procurement?
11. How does DOT manage the Design Build procurement documents internally for Design Build projects (e.g., RFQ and RFP preparation, advertisement, evaluation and selection)?
12. How do the administrative burden and speed of implementing the project procurement change based on the Department's choice of procurement method?

Questions about Right-of-way Acquisition, Utilities Coordination, and NEPA Approval

13. For Federal-aid or State projects, can the letting process be initiated before the final titles to right of way, utility agreements and NEPA approval are acquired? Can VDOT accept the respective risk and let the project early?
14. Have there been any benefits realized from past Design Build projects for which the Design Build team handled Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval processes?
15. How does the dynamics of procurement method selection change considering the transfer of ownership and control of Right-of-way Acquisition, Utilities Coordination, and/or NEPA Approval?

Questions about ATCs

16. Does VDOT provide the Offerors with the opportunity to propose Alternative Technical Concepts for any of the Design Build procurement methods? If yes, have there been any

benefits realized from incorporating ATCs in the past Design Build projects by the VDOT? Also, are there any limits on the number of ATCs proposed by Design Build Teams?

17. Does the VDOT hold the Intellectual Property right for ATCs that are proposed by non-winning Design Build Teams? Is the policy different for cases that the stipends are paid versus the cases that stipends are not paid?
18. How does the dynamics of Right-of-way Acquisition, Utilities Coordination, and NEPA Approval change considering design changes proposed as ATCs?

ADMINISTRATIVE EFFICIENCY

19. Briefly describe VDOT level of effort with plan reviews. Has this proven successful? If not, what changes would you consider to achieve optimal efficiency?

MISCELLANEOUS QUESTIONS

20. Does VDOT use performance-based specifications for any part of the RFP package? If yes, what are the performance measures?
21. How do you see the next-generation Design Build Procurement and Contracting in Virginia? What are the emerging trends that should be considered in the next-generation Design Build Procurement and Contracting?

APPENDIX II

STATEMENT OF QUALIFICATIONS (SOQ) EVALUATION CRITERIA

SOQ criteria focused on the Qualifications of the Firm are:

- Capabilities
  - Financial capacity
  - Resource capacity and availability
  - Staff available (Project Manager, Design Manager, Construction Superintendent, Quality Manager, etc.)
  - Specialized design capability for the key project elements
  - Specialized construction capability for the key project elements
  - QA/QC organization
- Experience
  - Corporate experience with Design Build contracting
  - Experience with formal partnering activities
  - Experience in similar types of work
  - Experience in the execution of fast-track projects
  - Experience with complex construction staging, traffic control, site conditions

    - Specialized expertise that reduces risk and assures quality of work

- Past performance on awarded contracts (completion, liquidated damages, quality, claims, fines, schedule)

- History of performance (unsubstantiated claims, fines, suits, quality, accuracy, schedule)

- Current work load on specific issues pertinent to the Design Build project

- Project team organization

- Bonding record or proof of bonding ability

- Understanding of local environment

- Legal and Financial disclosure

SOQ criteria focused on the Key personnel are:

- Individual experience of team members with Design Build contracting;
    - Minimum qualification requirements for key members;
    - Key member resume

- Experience in the execution of fast-track projects

- History of the proposed team working together

- Specialized design capability for the key project elements

- Specialized construction capability for the key project elements

- Experience with complex construction staging, traffic control, site conditions
- Construction team member safety records
- Specialized expertise that reduces risk and assures quality of work

SOQ criteria focused on the Information of the Firm's technical approach are:

- Approach and understanding of the project
- QC/QA approach
- Scheduling and control systems to track and manage project

Based on the Department's strategic goals as well as the specific project goals, a numerical, adjectival or Pass/Fail approach to the evaluation of proposers can be used.

APPENDIX III

Technical Proposal Evaluation Criteria

Criteria to be considered may include the following but should be tailored to meet the individual needs of the project. The selection of major non-price factors should be aligned with specific Design Build project goals specified by the Department.

Environmental Protection/Commitments

Credit is given for minimizing impacts to the environment during all phases of design/construction and to insure that all environmental commitments are honored.

Maintainability

Credit is given for a design that minimizes periodic and routine maintenance. The following elements should be considered: access to provide adequate inspections and maintenance, maintenance of navigational system lighting, access to structure's lighting system, and quality of construction materials. Credit is assigned for exceeding minimum material requirements to enhance durability of structural components.

Design Build Firm Guaranteed/Valve Added

Credit is given for the extent of the coverage.

Schedule

Credit is given for a comprehensive and logical schedule that minimizes Contract duration. Proper attention should be provided to the project's critical path elements.

Coordination

Credit is given for a coordination plan/effort that includes, as a minimum, coordination with the following groups:

- Department management team
- Community and boat users

- Permitting/Environmental agencies
- Utility owners
- Local governments

Quality Management Plan

Credit is given for a timely, complete and comprehensive quality management plan, which incorporates effective peer reviews and includes all phases of the project.

Maintenance of Traffic (MOT)

Credit is given for a MOT scheme that minimizes disruption of roadway traffic. This shall include, but not be limited to, minimization of lane closures, lane widths, visual obstructions, and drastic reductions in speed limits.

Aesthetics

Aesthetics is considered in the geometry, economy, and appropriateness of structure type, structure finishes, shapes, proportion and form. Architectural treatments such as tiles, colors, emblems, etc., are considered as primary aesthetic treatments.

Design and Geotechnical Services Investigation

Credit is given for the quality of the following elements:

- Quality and quantity of design resources
- Design coordination and plans preparation schedule
- Construction coordination plan minimizing design changes
- Geotechnical investigation plan
- Test load program
- Structural design

Construction Methods

Credit is given for construction methods that minimize impacts to the traveling public and the environment, reduces costs, improves worker safety, and minimizes Contract duration. Credit is given for exceeding minimum material requirements to enhance durability of structural components.

Design Build Firm Experience

Credit is given based on the Design Build Team’s experience on similar work and the individual Design Build Firm member’s successful Design Build experience. Considerations are given to:

- Design Build Firm leadership and areas of responsibility
- Design Build Firm internal coordination plan
- Design Build Firm commitment to partnering and history of a quality project completed on time and within budget

Landscaping

Credit is given for the quality of the elements presented.