Texas A&M Transportation Institute

Design-Build Highway Projects:

A Review of Practices and Experiences

Final Report

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TRANSPORTATION
Policy Research CENTER

Design-Build Highway Projects:
A Review of Practices and Experiences

Texas A&M Transportation Institute

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Table of Contents

List of Figures

List of Tables

Executive Summary

Texas has employed different project delivery methods in recent years in an effort to add capacity, reduce congestion, and improve the effectiveness and efficiency of the state's transportation system. These transportation improvement projects are also important to the state's economy.

This report:

- Examines the academic literature about the design-build project delivery method.
- Reviews national experiences and practices as reported by state departments of transportation.
- Summarizes recent design-build legislative changes in Texas.
- Provides a summary of design-build projects in Texas.

Design-Build versus Design-Bid-Build

In the design-build project delivery method, the state executes a single contract for both the design and construction, awarded on either a low-bid or best-value basis. This project delivery method is sometimes pursued as a way to reduce project duration and cost over more traditional approaches. Under the traditional transportation project delivery method, known as design-bid-build, a project owner contracts with separate entities to design and construct a transportation project.

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For most of the 20th century, the design-bid-build approach was the primary method used for transportation projects in Texas. Facing increased pressure to deliver transportation projects needed to keep up with the state's significant economic and population growth, the Texas Department of Transportation (TxDOT) and its regional partners are increasingly considering alternative methods of project delivery to keep up with this demand.

Summary of Literature Review

This project reviewed literature about the design-build project delivery method that was national in scope. Much of the literature examines a combination of projects from many states. For example, work by Migliaccio examines 146 design-build projects from 15 states. Some reports examine only one state, such as the pilot project study conducted by the Kentucky Transportation Cabinet.

A review of the literature found limited instances of benefits of design-build; most academic studies on the topic varied widely in their findings. The most notable benefit of the design-build method is the reduction in overall project delivery time. However, other benefits were not always realized. While a reduction in project change orders and lower legal expenses have the potential to reduce costs, evidence of project cost savings was mixed. The same was true for claims of improved project quality.

Additional concerns have been raised about smaller firms being unable to participate on teams competing for design-build contracts, especially in leading roles. This is due to a larger scale, more stringent qualifications, and higher bonding requirements. Additionally, some experts have raised concerns that some of the risk transfer advantages of public-private partnerships may not be fully realized in design-build projects. These experts claim this is because with the design-build method, the public sector still retains nearly all of the project risk. However, no quantitative evidence was obtained that supports or refutes these concerns in Texas.

National Case Study Summary

To augment the scholarly literature review, researchers selected eight case study states for further analysis: Arizona, California, Colorado, Florida, Ohio, Utah, Virginia, and Washington. Generally, the research found that many of these states had experience with design-build projects, yet differences in enabling legislation made comparison of projects in different states difficult.

Several states have established estimated design-build project price minimum thresholds or annual spending caps to a specified range. For example, Utah has the highest minimum estimated design-build price cap set at $50 million. However, this cap does not apply to the state department of transportation (DOT) or public transit units of greater than 200,000 residents. Other states offer low minimum estimated design-build price thresholds, such as Washington's $10 million value, yet this minimum can be avoided if certain criteria are met. Ohio caps design-build spending per fiscal year to $1 billion.

Design-Build in Texas

Texas has used the design-build project delivery method more frequently for larger projects than almost any other state. Most of the projects are clustered around the state's four largest cities, with many located in the Dallas–Fort Worth area. Projects have included capital maintenance, routine maintenance, and operations, depending on the project.

The research team conducted an in-depth analysis of design-build projects in Texas procured under both design-build and comprehensive development agreement legislation, reviewing the following:

- Project schedule and budget.
- Federal, state, and local funding and financing methods used.
- Agencies involved.
- Long-term public control and flexibility issues.

Because most of the projects in Texas have not been in operation for a long period of time, reaching conclusions concerning the success of the design-build program is difficult. Of the 12 projects reviewed for this study, most are currently under development or construction. However, several projects that have been completed or are close to being completed have demonstrated schedule reduction when compared to the time they would have taken under the traditional design-bid-build approach.

Overall, the following findings emerged:

- **Project cost savings:** The literature found that, generally, cost reduction can be achieved through a variety of methods, including the shift of risk and control, a shortened time frame, and fewer change orders. All three can be methods to achieve cost reduction in design-build. TxDOT's use of alternative technical concepts (ATCs) (i.e., cost or schedule saving ideas submitted by a private-sector proposer) has provided project cost savings. Of the 12 projects reviewed, ATCs have been implemented in 11 projects, and TxDOT has realized savings of $326.3 million on 90 ATCs. In addition, TxDOT has noted that its best-value design-build proposals usually come in 15 to 20 percent below the engineer's estimate.

- **Project time savings:** Academic sources have come to a consensus that the design-build method has resulted in schedule savings over the traditional design-bid-build method. The assessment of projects across the chosen states included in this study verifies this finding; 13 of the 22 projects reviewed claimed some type of time savings. Texas projects also follow this trend, with at least 10 of the 12 projects realizing time savings based on the successful proposer's schedule when compared to the engineer's original estimate of expected project time. TxDOT notes that its experience has been that these projects typically finish 3 to10 months early.

- **Project quality:** In Texas, design-build projects typically come with a capital maintenance agreement, a comprehensive maintenance agreement, or a warranty that covers a period of time with renewals to follow. With this practice, quality has not been an issue. All 12 design-build projects in Texas have some maintenance option. Many require the contractor to maintain the assets for five years with additional five-year periods at TxDOT's discretion. This is similar to the arrangement in many other states.

Researchers examined how the design-build contracting method impacts small business participation in the procurement process in Texas. The literature has not reported that small businesses cannot compete with the larger firms or that the design-build method can benefit mostly larger, national companies when contracts are awarded.

New Texas Legislation on Design-Build

Recent legislative changes have had an impact on how the state and local authorities procure design-build projects:

- House Bill (HB) 20, enacted during the 84th Legislative Session, increases the minimum threshold for delivering a project via the design-build method from $50 million to $150 million. Texas's minimum is higher than that of other case study states. HB 20 also prevents the state from using the design-build method if a project is mostly already designed and prohibits more than one project being procured under a single design-build contract.

- Rider 47 for TxDOT in the General Appropriations Act appeared to further restrict the design-build method to projects with an estimated project cost of $250 million or more. However, an April 2016 Texas Attorney General opinion clarified that Rider 47 limits only the number of design-build contracts with estimated costs exceeding $250 million that TxDOT may enter into.

Introduction

Texas has employed different project delivery methods in recent years in an effort to add capacity, reduce congestion, and improve the effectiveness and efficiency of the state's transportation system. These transportation improvement projects are also important to the state's economy.

This report:

- Examines the academic literature about the design-build project delivery method.
- Reviews national experiences and practices as reported by state departments of transportation.
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Definition of Design-Build in Texas

Many academics and government agencies have attempted to define what the term *design-build* means. While further information contrasting the different public-private-partnership (P3) delivery methods is provided later in this report, most scholars agree that the design-build method usually involves the greatest level of public-sector control among all P3 delivery method types, with the only significant departure from the traditional design-bid-build method being in how design and construction contracts are devised (*1*).

In Texas, due to each design-build project being unique, risk transfers and operations and maintenance responsibility vary. TxDOT maintains project oversight through auditing and monitoring during the design and construction phases. However, any day-to-day design/construction and management control is relinquished. In the traditional design-bid-build, TxDOT retains nearly all risks associated with a project (*2*).

Notable Facts about Design-Build

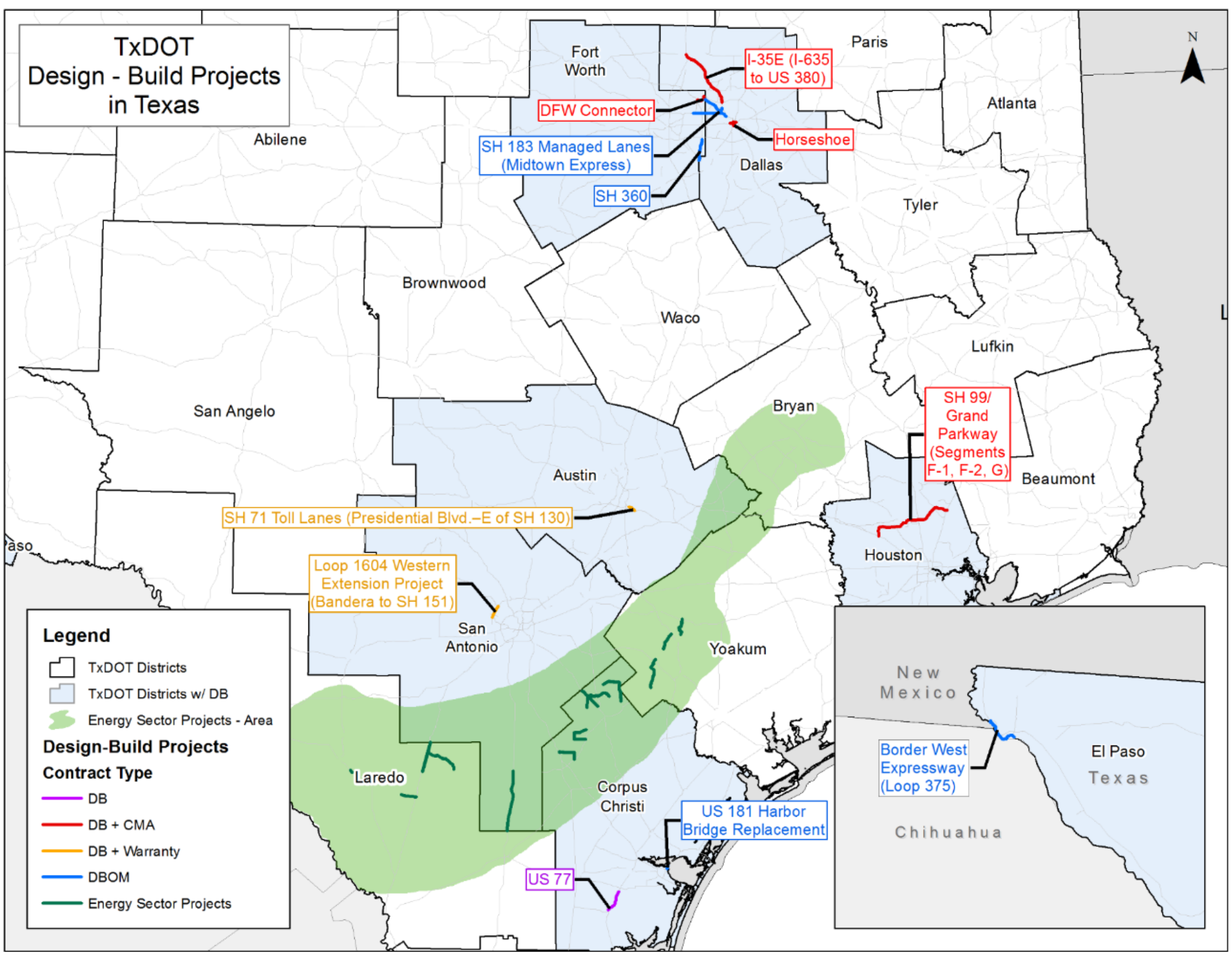
Federal agencies have published work assessing the benefits of the design-build delivery method:

- In 1990, the Federal Highway Administration (FHWA) published a report on innovative contracting that encourages states to use a more efficient project delivery method (*3*).
- According to an effectiveness study prepared for the U.S. Department of Transportation, around 300 projects totaling approximately $14 billion were completed using the design-build method between 1990 and 2002 (*4*).
- In 2003, as a part of the Transportation Equity Act for the 21st Century, the final rule making for the design-build project delivery method became effective (*4*). This rule making set criteria and regulations for the design-build process at a national level.

Location of Design-Build Projects in Texas

Many of TxDOT's large design-build project contracts from 2002 to 2015 were located in the state's four largest metropolitan areas: Houston, Dallas–Fort Worth (DFW), Austin, and San Antonio (the Texas Triangle). As Figure 1 shows, only the Loop 375 Border West Expressway project in El Paso and the US 77 and US 181 projects in South Texas are not located in the Texas Triangle megaregion.[1] These energy-sector projects were considered more of a series of small projects rather than one large project.

Many of TxDOT's design-build project contracts from 2002 to 2015 were located in the state's four largest metropolitan areas: Houston, Dallas–Fort Worth, Austin, and San Antonio.



Note: DB stands for design-build. CMA stands for capital maintenance agreements. DBOM stands for design-build-operate-maintain.

Figure 1. TxDOT Design-Build Project Contracts Executed in 2009–2015.

[1] TTI researchers created Figure 1 using project data provided by TxDOT.

Overview of Report

The purpose of the research project described in this report is to provide policy makers with an informed understanding of the design-build method with respect to transportation projects.

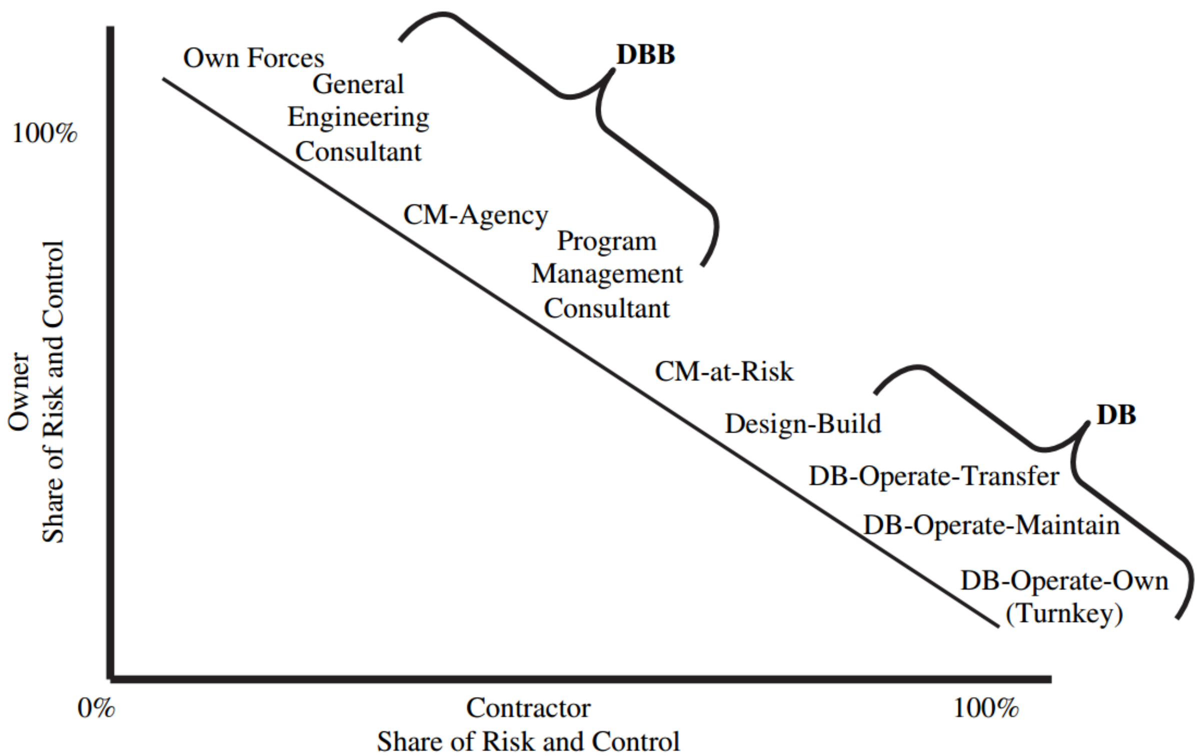
This report has the following sections:

- **Literature review:** This section defines delivery methods, contrasts the design-build delivery method with other common project delivery methods, and discusses common benefits and limitations based on scholarly literature.
- **Design-build projects in other states:** This section summarizes the literature findings from a review of eight case study states.
- **Design-build projects in Texas:** This section discusses the design-build projects currently under construction or in procurement in Texas.
- **Summary of key findings:** This section summarizes some of the key characteristics of the design-build method that emerged from the research.
- **Summary of Texas projects:** This section summarizes design-build projects in Texas.

Literature Review

The literature review performed for this study includes a variety of documents that encompass highway transportation projects of different types, sizes, and estimated project costs. Because each state's respective enabling legislation can vary widely, each state's experience with design-build may also be different. This can include the size and complexity of each project.

This report identifies key characteristics, variations, and current applications of the design-build method through the design and construction of transportation projects. This method is then contrasted against the more traditional delivery method, design-bid-build. Distinctions are also made with the construction manager at risk (CMR) project delivery method. Figure 2 compares the share of risk and control for typical design-bid-build projects as well as variations of design-build methods (*5*). (The design-build variations presented in the figure are discussed later in this report.)



Note: CM stands for construction manager. DBB stands for design-bid-build. DB stands for design-build.
Source: (*5*)

Figure 2. Project Delivery Method Risk and Control Comparison.

Key Characteristics

In addition to thinking about the varying delivery methods in terms of how risk between a project owner and the contractor is shared, it is also important to consider the specific characteristics that constitute each method. Table 1 provides key characteristics of the design-bid-build, design-build, and CMR delivery methods.

Table 1. Key Characteristics of the Design-Bid-Build, Design-Build, and Construction Manager at Risk Project Delivery Methods.

Delivery Method	Key Characteristics
Design-bid-build	• Owners procure design and construction separately • Sometimes owners perform design in-house • Typically characterized by two separate contracts • Owners are responsible for schedule and cost growth
Design-build	• Fixed price at proposal stage • Owners design and construct simultaneously • Owners hire a design-build contractor • Typically characterized by one single contract • Construction can start before detailed design is complete (*6*) • Owners can allocate risks associated with schedule and cost growth to the contractor (*6*)
Construction manager at risk	• The guaranteed maximum price is determined after a substantial amount of design is completed • Owners give construction management responsibility to the construction manager • The construction manager shares the profit and loss of the project • CMR is an integrated team approach to the planning, design, and construction of a project (*7*) • CMR collaborates with the owners and designer during the project construction phase

Source: Adapted from (*3*).

Due to the nature of transportation project construction, it can be challenging to compare one project delivery method to another, partly because of differences in project size, scope, and geography. In this study, researchers focused their attention on three of the most prevalent variables that these alternative delivery methods impact:

- Cost impacts.
- Schedule impacts.
- Quality impacts.

Researchers examined these three measures through a series of case studies conducted throughout the United States in recent years. The general findings of these reports were recorded and summarized by each of the key variables.

Definition of Project Delivery Methods

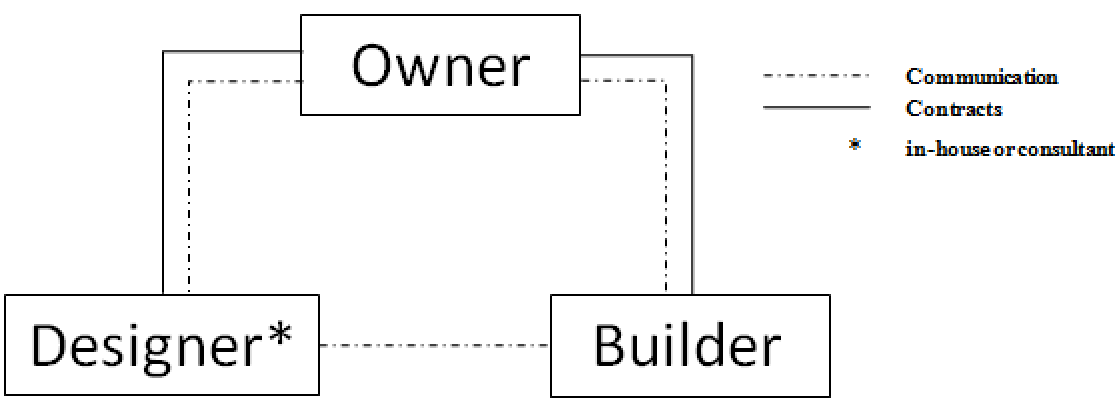
Design-Bid-Build

> *Design-bid-build is the more traditional method of project delivery. Design-bid-build uses a two-procurement-phase process to deliver projects.*

Design-bid-build is the more traditional method of project delivery. Design-bid-build uses a two-procurement-phase process to deliver projects:

- The first procurement phase seeks a designer to prepare the project's construction documents on a negotiated price basis (*4*). These construction documents then become the property of the sponsoring agency once design work is complete.
- Following design, the sponsoring agency often initiates a second procurement phase to contract a construction firm on a low-cost basis (*4*). This second procurement phase uses design documents that are complete, which allows for the sponsoring agency to closely estimate the project costs and total project time. However, the second procurement phase adds additional overall projected delivery time, as well as any additional soft costs, such as staff and administration costs, to the project.

The design, or in some cases construction, of projects can sometimes be completed in-house by the sponsoring agency, as shown in Figure 3. In some cases, the flexibility added by using a two-procurement-phase process allows for risks to be distributed appropriately for each project. As shown in Figure 3, some variations of design-bid-build allow the sponsoring agency to shift project responsibilities to the private sector. This not only mitigates agency risks but also allows firms specializing in contracted work to complete more demanding tasks.



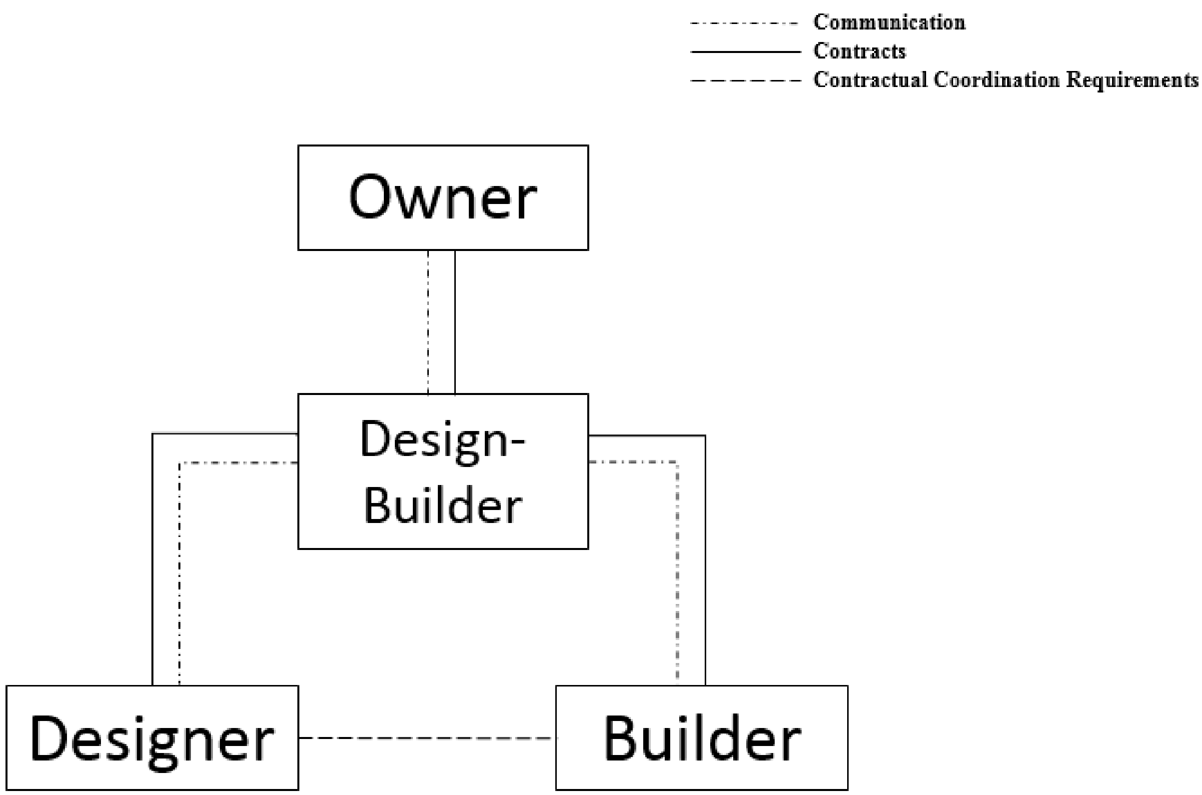
Source: (*5*)

Figure 3. Design-Bid-Build Project Delivery Method.

Using design-bid-build, the owner often assumes risks for any schedule or cost growth incurred during the project. This differs from design-build and CMR in that the design-builder or construction manager assumes a majority of the risks during design and construction.

Design-Build

Design-build is an alternative project delivery method that executes a single contract for both the design and construction, awarded on either a low-bid or best-value basis. Figure 4 shows the basic framework of design-build (*5*).



Source: (*5*)

Figure 4. Design-Build Project Delivery Method.

Under the design-bid-build project delivery method, the sponsoring agency receives bids and awards a contract for the design of a project. Once the design is completed, the agency seeks to procure a contract for the construction phase. Design-build, in theory, reduces the project delivery timeline by eliminating the need to acquire two contracts for every project. Supporters of this method also argue that it allows the contractor to work directly with the project design partner to construct the most cost-effective project possible using the resources and techniques available to that team. This method also allows for construction to begin before the design has been finalized.

Selection of a design-builder usually follows one of two processes:

- **Low-bid scenario:** The project is completely and clearly defined and presented to competing firms. The lowest bidder is awarded the contract.
- **Adjusted-score or best-value scenario:** This type of process is used when the end result is defined but the method of design and construction may not be fully known (*8*). This method allows the sponsoring agency to choose a contractor based on technical merit and price, instead of price alone.

The National Cooperative Highway Research Program (NCHRP) defines best-value procurement as "a procurement process where price and other key factors are considered in the evaluation and selection process to minimize impacts and enhance the long-term performance and value of construction" (*9*). This scenario avoids awarding a contract solely on the basis of cost.

FHWA notes that risk may be associated with the single bidding process that could adversely affect small businesses competing for design or construction contracts (*4*). Specifically, the concern is that this method "will lead to fewer business opportunities for small businesses, including disadvantaged business enterprises, minority-owned firms, and female-owned firms" (*4*). The NCHRP report *Best-Value Procurement Methods for Highway Construction Projects* also mentions these concerns. The report states that best-value procurement methods "may be administratively burdensome, time consuming, and costly. It may also introduce greater subjectivity into the selection process, possibly increasing the risk that awards will be challenged, and may favor larger contractors with more resources, thereby reducing participation by smaller or Disadvantaged Business Enterprise contractors" (*9*).

In practice, however, there are little data supporting these claims. In its design-build effectiveness study, FHWA concluded (*4*):

> Two-thirds of agency design-build program respondents indicated that on average, the prime contractors and subcontractors for design-build projects are similar in size to their counterparts on design-bid-build projects. The remaining one-third indicated that prime contractors for design-build projects were significantly larger than their counterparts for design-bid-build projects (5.4 on a 6-point scale with 1 being smaller and 6 being larger), while subcontractors for design-build projects were only marginally larger in size than their counterparts for design-bid-build projects (3.4 on the same 6-point scale).
>
> While the size of prime contractor firms may have been somewhat larger for design-build projects than for design-bid-build projects (though not always so), the size of subcontractor firms was essentially the same. To the extent small businesses are currently involved in the design and construction of design-bid-build projects, similar opportunity appears to exist for design-build projects, particularly in the role of subcontractor. These results suggest small businesses

are playing a comparable role for design-build projects as for design-bid-build projects, and that the design-build project delivery process is not preventing small businesses from participating in design-build projects to a comparable degree.

In addition, states—through enabling legislation, administrative actions, or both—can and have built in safeguards to alleviate these concerns.

Design-Build Variations

Many types of design-build delivery methods are currently in use. While all combine design and construction into a single contract, the need for financing, operations, and maintenance remains. Variations of design-build allow sponsoring agencies to distribute risks and costs according to the needs of each project. In the literature, Shrestha et al. (*3*) illustrate the key characteristics of each variation in a general sense.

The design-build delivery method varies by offering:

- Design-build-operate-maintain.
- Design-build-finance.
- Design-build-finance-operate.
- Other variations.

Design-Build-Operate-Maintain

Design-build-operate-maintain is an extension of design-build and allows the selected contractor to also operate and maintain facilities in a single contract. The financing for the project remains with the sponsoring agency, whether that is a city, county, regional agency, etc. This process allows the contractor to find internal efficiencies when delivering projects, much like the standard design-build process. However, design-build-operate-maintain requires the contractor to develop a long-term maintenance and operation plan.

Because of the involvement from the design process through construction, the contractor can tailor a proactive approach to maintenance and operation before problems become much larger and costlier. The downside to this method is that long-term planning of available funding may not always meet the needs of the project. This may weaken the contractor's ability to create a financially viable long-term plan.

Design-Build-Finance

Design-build-finance allows the private sector to finance, design, and build a project but then transfers maintenance and operation back to the public sector. This method allows for the sponsoring agency to defer payments to later dates, while the private sector provides upfront capital costs. This method expedites project delivery times and transfers financial risk to the private partner.

Design-Build-Finance-Operate

Design-build-finance-operate is an extension of the design-build-operate-maintain delivery method but places the financing of projects with the private sector. This method is more frequently seen in the creation of toll roads or an alternative debt-leveraging revenue stream. This delivery method can also be used in concert with local funding contributions to make projects more viable to private-sector companies. Right-of-way acquisition is an example of a contribution made by public-sector agencies.

Other Variations

Additional variations include:

- **Design-build with a warranty:** Design-build with a warranty creates a time frame where the private sector guarantees the quality of workmanship and materials. This method allows for a reduction in inspection and testing by the public sector.
- **Design-build with full delivery or program management:** Full delivery or program management contracts allow the private sector to be involved throughout the process. This begins with planning and conceptualization and continues through the life of the project.

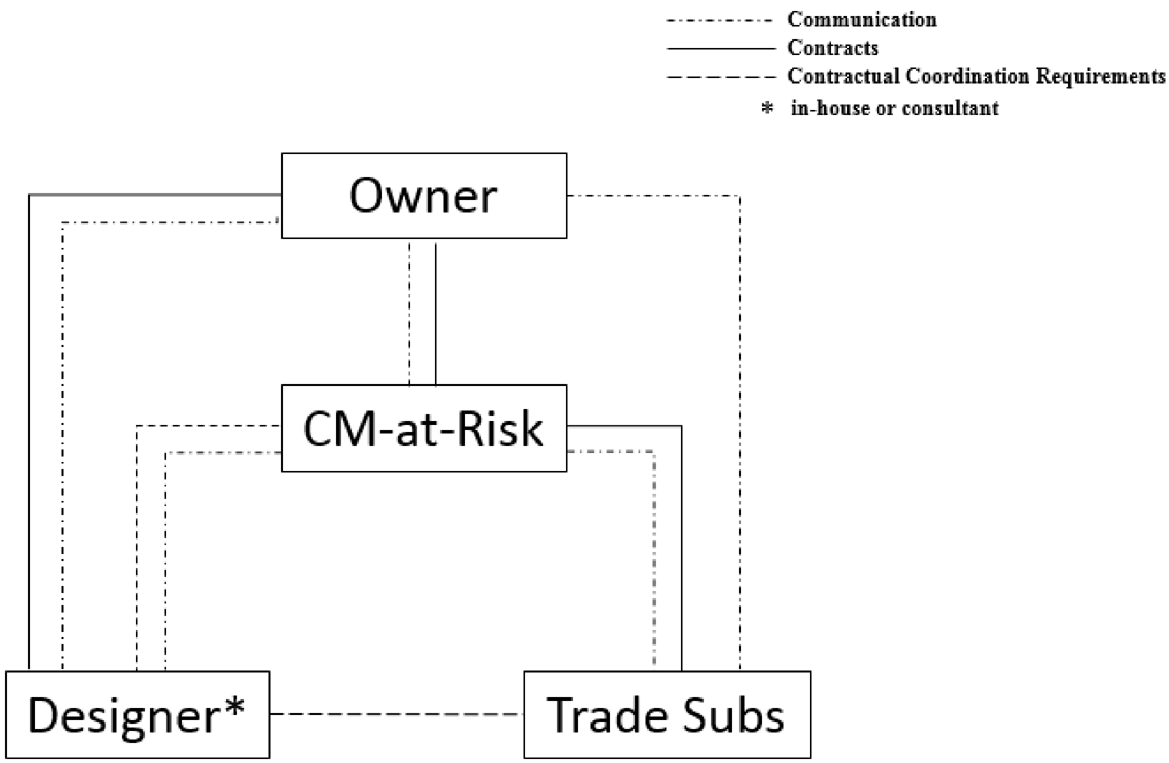
These variations of design-build project delivery provide the P3 flexibility in how to best approach each scenario. Each delivery method allows distribution of risks determined by communication between the public and private sector to result in a mutually beneficial arrangement. Financing for these projects determines where risks are placed and which delivery method is ideal.

Some states use a combination of methods. For example, in Texas, the design-build method is sometimes used in combination with a warranty agreement. A warranty agreement typically guarantees the quality of work, materials, and equipment for one year. For certain projects, a warranty guarantees durability of the capital assets for five years and non-capital assets for two years.

Construction Manager at Risk

An alternative to design-bid-build and design-build is a delivery method known as construction manager at risk, also known as construction manager/general contractor, which can be used to reduce overall project costs and risks to the sponsoring agency. In terms of risks, the CMR project delivery method falls between design-bid-build and design-build, as shown in Figure 2. CMR projects are "characterized by a contract between an owner and a construction manager who will be at risk for the final cost and time of construction. In this agreement, the owner authorizes the construction manager to provide input during project design" (*5*). The construction manager also provides oversight during the design process.

Unlike design-build, CMR uses two contracts to complete design and construction. Figure 5 shows this structure.



Note: CM stands for construction manager.
Source: (*5*)

Figure 5. CMR Project Delivery Method.

The construction manager (CM), in most cases, sets a guaranteed maximum price (GMP) after a substantial amount of the design has been completed. The CM becomes liable for any costs over the GMP but is also allowed to share funds if the project is under the GMP. This helps incentivize the CM to produce cost savings. These cost savings, much like in the design-build process, can be achieved through additional communication during the design phase.

Unlike design-build, two contracts are issued. However, because the CM is overseeing the design phase, there is less risk of time overruns.

Cost Savings

What Is Claimed

Streamlined Process

Design-build could result in an overall cost savings in many ways, mostly stemming from a perceived streamlined process that integrates the design and construction processes into one entity and thus shifts risks and project oversight to the design-builder. An example provided in the literature is a reduction in construction and engineering inspection costs for the sponsoring agency (*4*), which shifts the risk and cost to the design-builder.

Fewer Change Orders

Another perceived cost saving comes from the lower expected number of change orders (*4*). More complete and accurate data compilation by the sponsoring agency helps identify potential hazards early, and those contingencies can be better planned for.

Lower Risks

The contractor handles design error risks internally, further reducing risk to the project sponsor. This is also a result of quality communication between parties and early involvement. In addition, project sponsors see cost savings through lower risks of claims and litigation after the project is completed because the design-builder handles them (*4*).

Fewer Overhead Costs

The shortened timeline reduces overhead costs to each agency (*4*).

What the Literature Shows

By using design-build, these perceived cost savings have the ability to come to fruition. However, the claimed cost savings from the literature may not be realized for a number of reasons. Researchers found several studies that investigated multiple projects and compared them to similar design-bid-build projects and/or projects using some other delivery method, such as CMR.

Florida Department of Transportation

In an internal evaluation, the Florida Department of Transportation (FDOT) examined the effects the design-build method had on 33 completed transportation projects in Florida. These projects varied drastically in size and scope. FDOT's evaluation found that cost comparisons between design-build and design-bid-build projects were difficult because no two projects are alike (*8*). Nevertheless, FDOT conducted a cost analysis on these projects.

Some projects came in much lower than original estimates, such as seven resurfacing projects. However, many projects had cost overruns. Six projects had an overrun of 10 percent or higher. In the report, FDOT stated that "Every significant cost and time over-run in Design-Build contracts has been due to a change or omission in the project's scope of services" (*8*). FDOT also stated that changes in the scope of work, in its experience, produce the most dramatic changes in cost and that clearly defined scopes are essential to reducing project costs.

Kentucky Transportation Cabinet

A pilot program conducted by the Kentucky Transportation Cabinet (KYTC) evaluated nine projects in 2006. Results showed some positive impacts of using the design-build delivery method compared to design-bid-build. Specifically, the report found evidence suggesting that a cost premium is associated with design-build over the traditional design-bid-build method. For example, the evaluation revealed a higher cost growth rate using design-build than using design-bid-build. The average cost growth was 4.17 percent using design-build compared to

3.51 percent using design-bid-build (*10*). However, this cost premium typically comes from accelerated project delivery.

This study found evidence suggesting the design-build delivery method was especially effective with right-of-way acquisitions and utility relocation coordination (when these responsibilities fell within the private consortia's scope of work).

The evaluation also revealed that change orders in the design-build process had a larger impact on costs than did change orders in design-bid-build.

Journal of Construction Engineering and Management

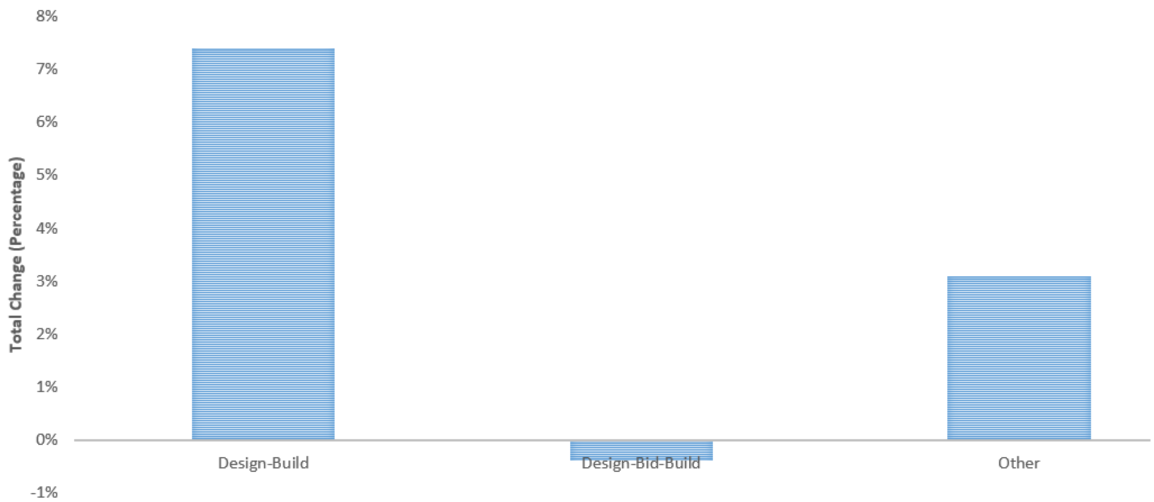
Another study, conducted by Ibbs et al. and published in the *Journal of Construction Engineering and Management*, investigated total project costs when using design-build. The study identified project data from 67 global projects from the Construction Industry Institute's (CII's) records (*11*).

These projects ranged in total costs from $5 million to more than $1 billion. Projects included those that used varying forms of project delivery methods: 45 percent of projects used design-bid-build, 36 percent used design-build, and 19 percent used some other method of contracting (*4*). When using design-bid-build, the project had a longer delivery time, but the sponsoring agency had a completed design to begin the construction procurement process. This allowed for the sponsoring agency to have a much more accurate estimate of total project costs.

The findings in the Ibbs et al. report demonstrate that design-bid-build projects experienced −0.4 percent total project cost growth, while design-build projects saw an average increase of 7.4 percent (Figure 6) (*11*). (For this study, the change in cost was defined as the difference between the cost of the completion of the project and the original budget.)

The study also showed that productivity for each method was dependent on how the value was being measured. For example, "CII's definition of a project's productivity ratio is earned labor-hours divided by expected labor-hours" (*11*). These projects were measured as either a function of cost or a function of schedule. Specifically, for this study the change in schedule was defined as the difference between the time used to complete the whole project and the estimated time to complete the project. When the schedule experienced growth, design-bid-build project delivery had a higher productivity (*11*). Ultimately, Ibbs et al. found only marginal benefits from using the design-build method over design-bid-build. While the project delivery time can be shortened in theory, the uncertainty of cost can be detrimental to the project (*11*).

One study found only marginal benefits from using the design-build method over design-bid-build. While the project delivery time can be shortened in theory, the uncertainty of cost can be detrimental to the project.



Source: (*11*)

Figure 6. Total Cost Change Comparison of Design-Build versus Design-Bid-Build.

Time Savings

What Is Claimed

Claimed time savings using design-build stem in part from the lack of a second procurement process, the concurrent design and construction of different portions of the same project (i.e., phases), and a reduction in errors or omissions (*4*).

Lack of a Second Procurement Process

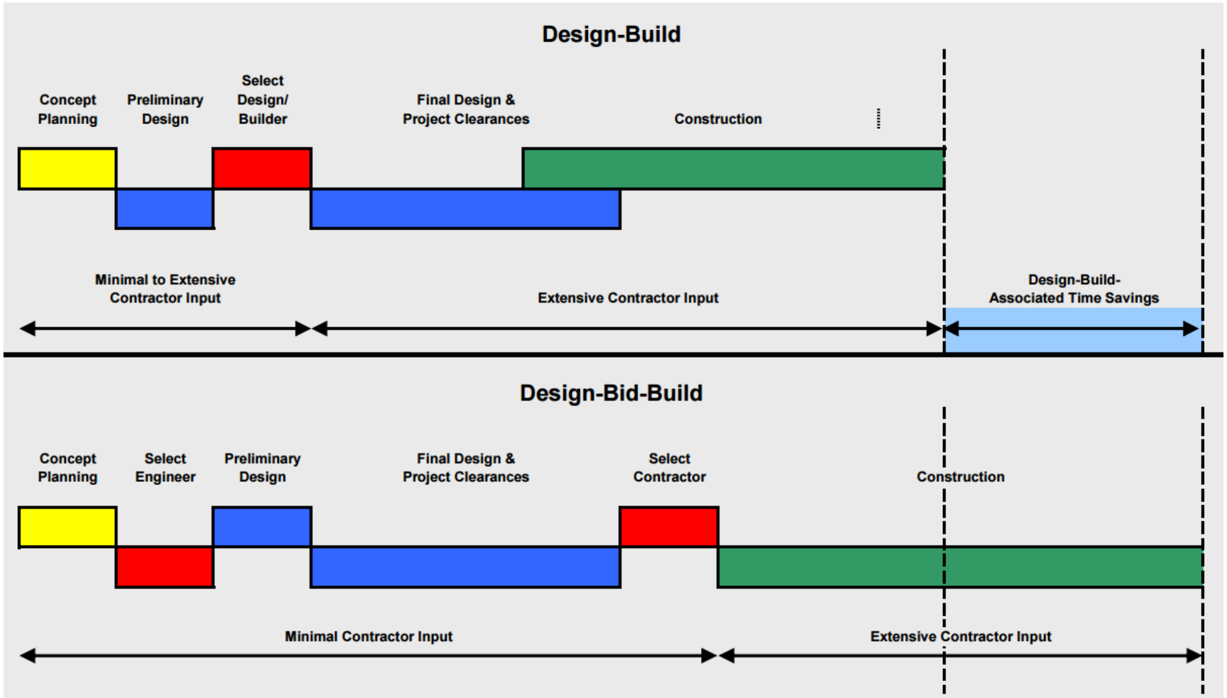
In the traditional design-bid-build project delivery method, the sponsoring agency is required to begin a new procurement process once the design of a project has been completed. Using the design-build system, both the design and construction contracts are combined into a single contract. This, in turn, saves time by avoiding the need for a second procurement stage.

Concurrent Design and Construction

Time savings are also realized if the design-builder starts construction during the design phase. This allows for both processes, which are independent of each other in design-bid-build, to progress simultaneously. Figure 7 shows this process (*4*).

Reduction in Errors or Omissions

Financial and schedule incentives for designs that require fewer design fixes can also generate time savings (*4*).



Source: (*4*)

Figure 7. Comparison of a Typical Design-Build and Design-Bid-Build Project.

What the Literature Shows

Time savings were realized in a majority of the studies reviewed. The reduction of project procurement time, reduced change order delays, and more efficient project delivery resulted in what FDOT noted as the true savings of the design-build method (*8*).

Kentucky Transportation Cabinet

A series of nine pilot projects observed by KYTC notes time savings associated with design-build. While KYTC did not find that all aspects of design-build were ideal, positive impacts were seen in the permitting, right-of-way acquisition, and overall project delivery times. Average schedule growth was over 65 percent less compared to the design-bid-build method (*10*). Goodrum et al. note that this is due to the expedited schedule requirements of design-build.

University of Washington

A study by Migliaccio et al. (*12*) investigated the impacts of design-build on two variables: schedule growth and cost growth. The authors collected data from 146 design-build transportation projects from across the United States and hypothesized a direct correlation between contract procurement duration and schedule growth. The authors used linear regression methods and found that a correlation did exist. The findings showed that when the sponsoring agency had a contract procurement duration of approximately 3.4 months, the project delivery schedule was unaffected. Procurement stages lasting longer than 3.4 months experienced 0 percent schedule growth, with some projects nearing a 60 percent reduction in total project time. Nearly all projects that had a procurement stage less than 3.4 months had increased schedule growth (*12*).

Procurement stages lasting longer than 3.4 months experienced 0 percent schedule growth, with some projects nearing a 60 percent reduction in total project time. Nearly all projects that had a procurement stage less than 3.4 months had increased schedule growth.

The authors also hypothesized a correlation between contract procurement time and cost growth. The findings showed insignificant correlation between the two variables. The authors concluded that sponsoring agencies must be as thorough as possible during the procurement process. This thoroughness ensures adequate preparedness, which reduces schedule growth by a significant amount when using the design-build delivery method.

Not all of Migliaccio's work shows that design-build has a positive impact on project delivery time. A report by Migliaccio et al. details the cumbersome nature of the procurement of design-build contracts (*13*). The procurement of design-build projects took longer than anticipated compared to that of the more routine, better understood design-bid-build method. The literature looked in depth at two Texas design-build projects, including interviews with parties at all stages of the projects. Results were presented as a summary of all phases of the project. The procurement of one project took nearly 35 percent of the total anticipated project time. The other project required 26 percent of the total project time to complete the procurement process (*13*). This reduced the benefit of not needing the second procurement procedure necessary in traditional design-bid-build.

Florida Department of Transportation

An evaluation conducted by FDOT also showed schedule growth using the design-build delivery method. The number of days it took to build all of the 33 monitored design-build projects exceeded the FDOT estimation by 18 percent. FDOT estimated a total of 10,877 days, but the actual project time was 12,708 days (*8*).

These numbers, however, did not represent a comparison to traditional methods. To create a distinction, FDOT compared seven resurfacing projects using design-bid-build against seven similar resurfacing projects using design-build. According to FDOT's evaluation, the seven design-bid-build projects took a combined total of 5,992 days, while the design-build projects took only 1,452. This shortened project delivery, according to FDOT, is the true savings of the design-build method. These savings, in turn, allow the sponsor agency to quickly construct needed projects. Another added benefit is the streamlined process, which allows for better communication between the sponsors and the design-builder.

University of Nevada, Las Vegas

A study by Shrestha et al. at the University of Nevada, Las Vegas, investigated the effectiveness of the design-build method on large transportation projects (costing more than $50 million) compared to the traditional design-bid-build method (*3*). In the study, Shrestha et al. used project selection criteria to limit the differences between projects. Using the criteria, 16 design-bid-build projects and six design-build projects were selected for comparison. Numerous tests between the data were run to determine the distinctions for several categories.

The researchers concluded that design-build projects are superior in many of the categories. While the study findings showed no statistical difference in cost-related metrics, the study did find statistically significant differences in the overall project time: "The mean project delivery speed per lane distance and construction speed per lane distance for design-build projects was significantly faster than that for design-bid-build projects, indicating that design-build projects are delivered and constructed faster than design-bid-build projects" (*3*). The study's report does state that there was a limited sample size for these projects, but the reduction in overall project time existed for these large projects.

Quality Assurance

What Is Claimed

The last claimed benefit of the design-build method is a higher project quality upon completion. For example, one study found overall quality performance of a project is determined by the design quality from the onset of the project (*14*).

Contract Tailored to Abilities

A single contract allows the design-builder to tailor the design to meet the capabilities of the design-builder. This not only allows the design-builder to stay within set limitations but also to develop innovative methods during the design phase that can be implemented during construction. During the design-bid-build method, there is an added level of complexity to communication between the designer and builder, so projects may not be tailored to a specific design-builder.

Quality Control

With design-build, the design-builder can implement quality control measures on a continuous basis by addressing any potential issues throughout the process and further improving overall project quality.

However, the question still remains: does project quality, whether in design or construction, actually suffer from the increased speed, loss of control by the sponsoring agency, or two-party approach to design and construction of a project (*15*)? When using the traditional design-bid-build method, an inherent checks-and-balances system is created between the project sponsor, design team, and construction team. Critics claim that by combining project design and construction, the inherent system is removed. This raises concerns that sufficient controls may not be in place to ensure the following (*4*):

- Product quality.
- Integrity in the procurement function.

- Fairness to the established businesses that compete for these contracts.

What the Literature Shows

Researchers examined the literature to determine what efforts sponsoring agencies are making to ensure oversight and management of design-build projects are taking place.

Bowling Green State University

One study examined the change in project quality management practices during the procurement stage—in particular, the requirements set by contracting agencies when procuring a design-builder. Gad et al. at Bowling Green State University authored a report on the change in quality management (QM) during the request for proposal (RFP) and request for qualifications (RFQ) stages of project procurement (*15*). Their research examined 58 DOT design-build solicitation documents from 22 different states from 2000 to 2013. These documents were split into two groups, 2000–2004 and 2009–2013, and were examined based on their QM documentation.

Gad et al. examined the change in sponsoring agencies, from evaluating design-builder qualifications to submitting QM plans in the design-build documents. Aiming to determine if project owners are changing the way they approach QM in design-build contracts, an analysis of 58 state DOT design-build projects suggests a shift from DOT dependence on qualifications; now, most DOTs evaluate each design-build team design and construction project quality plans before the award is issued. Sponsoring agencies give more latitude regarding how design-builders conduct their QM in the design-build process. Sponsoring agencies can counteract the loss of checks and balances by using this process, and these practices have grown over time.

> *According to FHWA, "There is little quantitative data on the quality of design-build versus design-bid-build, although what exists indicates the two approaches produce similar quality results."*

Federal Highway Administration

High project quality is not guaranteed through the increased requirements of QM plans from sponsoring agencies. Researchers also searched through the literature to identify what effect this has on construction quality. An FHWA study identified over 300 design-build projects that were built following the *Special Experimental Project Number 14 (SEP-14)—Innovative Contracting Report*. These projects were completed between 1990 and 2003. The FHWA report states that "there is little quantitative data on the quality of design-build versus design-bid-build, although what exists indicates the two approaches produce similar quality results" (*4*).

Due to little quantifiable data on project quality, the FHWA study also used agency satisfaction as a metric to determine the overall effects on the quality of design-build projects. The FHWA study distributed surveys to collect overall satisfaction on 69 design-build projects. The respondents were asked to rate overall agency satisfaction, compliance with warranty provisions, and conformance with standards/specifications. The average rating for these three metrics was

4.7, 4.7, and 4.8 out of 6, respectively (*4*). This finding shows a high level of satisfaction from sponsoring agencies using the design-build project delivery method.

In addition, the FHWA report also includes results from a survey conducted for 19 pairs of design-build and similarly designed design-bid-build projects. The same metrics were used and showed that design-build was on par with design-bid-build in all categories. However, design-build fell slightly behind in the categories of compliance with warranty provisions and conformance with standards specifications (*4*).

The FHWA design-build effectiveness study found that "Design-build does not appear to be a threat to the quality of highway projects. Indeed contracting agencies expressed equal satisfaction with the results of design-build and design-bid-build projects, suggesting that the choice of project delivery approach is neither a determinant of nor a threat to project quality" (*4*).

Summary of Literature Review Findings

Due to the nature of transportation project construction, it is difficult to compare one project delivery method against the other. Projects are unique in size, scope, and location. To deal with this, many scholarly documents identify a large number of projects with varying project delivery methods. These delivery methods were analyzed and evaluated on their cost savings, time savings, and overall quality.

Cost Savings

Cost savings linked to the design-build method were not definitive in the literature. Some cases, such as FDOT's design-build evaluation, saw an average reduction in cost of 35 percent (*8*). Other cases saw no cost savings. As shown in the pilot program conducted by KYTC and the report by Dr. Ibbs et al., there were many instances where cost growth was higher using design-build than when using design-bid-build. Most importantly, based on the collected literature, it can be assumed that there is little correlation between the total cost of the project and the delivery method used. Project-specific variables play a larger role than the procurement method itself.

Time Savings

Time savings were shown to be a large benefit of design-build. In the multiple reports and case studies examined, schedule reduction in design-build projects versus comparable design-bid-build projects was attributed to the reduction in procurement phases and efficiencies offered by design-build.

Quality Assurance

Quality assurance when using design-build appears to stay within acceptable ranges of design-bid-build. In the scholarly research, design-build projects managed to counteract worries about a drop in quality due to a faster schedule and potential lack of oversight from loss of inherent checks and balances. Communication may play a major role in quality assurance. An understanding of QM between the sponsoring agency and design-builder is a result of good communication. In addition, removing the barrier of communication from the design and construction teams plays a role in maintaining quality during the process.

Trends

While there are certainly many claimed benefits and limitations of the design-build project delivery method, not all are realized in practice. Based on an examination of several reports and case studies conducted throughout the country, it is evident that there is no definitive measure of the effectiveness of design-build. This is because each transportation project is unique. However, the literature does show some trends in projects where design-build may be more or less effective than traditional design-bid-build.

> *Projects contracted to a design-builder with unclear scopes and limited communication may be subject to higher growth of cost and time, and thus subject to reduced project quality.*

The literature shows that the size and scope of the project have a correlation with cost, timeliness, and overall quality. Some authors, such as Ibbs et al., observed some negative effects of the design-build method "due to the fact that D/B projects do not start with a well-defined scope" (*11*). Projects with a simpler scope of work, such as resurfacing projects, should see more benefits from design-build. This was apparent in FDOT's evaluation of its design-build program (*8*). The literature suggests that complex projects suffer. However, Migliaccio et al. found the opposite to be true. Their report shows that high-complexity projects outperformed medium- to low-complexity projects in both cost and schedule growth (*12*).

Many factors can affect the effectiveness of design-build compared to that of the traditional design-bid-build. These factors vary from state to state for numerous reasons. The most likely is the differences in enabling legislation and the requirements set by the states in which these projects are delivered. Two elements, found in nearly all literature examined by researchers, showed that open lines of communication between the sponsoring agency and the design-builder and a well-defined scope played a significant role in determining the success of a design-build project. As FDOT states, "Several factors are critical to the success of a Design-Build project. The most important factor is having a well-defined scope" (*8*).

Design-Build Projects in Other States

Case Study States

To augment the literature review effort, researchers also examined highway projects procured as design-build projects in other states. Researchers used the following three criteria to select states as case studies:

- Is highway design-build legislation in place?
- Has the state conducted at least one large design-build contract closure?
- Has the state DOT established design-build administrative procedures?

Based on these criteria, the following states were selected for further review: Arizona, California, Colorado, Florida, Ohio, Utah, Virginia, and Washington. Table 2 summarizes the major projects completed or in construction and highlights each state's enabling legislation. Details for each case study are provided in Appendix A.

Table 2. Summary of Key Design-Build Projects Reviewed.

State	Projects	Enabling Legislation Highlights
Arizona	• Santan Freeway (SR 202L) High-Occupancy Vehicle (HOV) (I-10 to Gilbert) • I-10 Widening (Prince to 29th) • SR 101 HOV	• Must have two-phase procurement method • Phase 1: selection team criteria • Phase 2: how projects are awarded • Allows for stipends (2/10 of 1 percent of costs)
California	• SR 22 • SR 91 Corridor Improvements	• Must have report on details of the project • 2009 legislation allowed for 5 projects for local entities and 10 for state DOT • Needs approval from California Transportation Commission and had a sunset clause (January 1, 2014)
Colorado	• US 285 (Federal Boulevard to Kipling Boulevard) • US 6 Bridges • T-REX Partnership Interstate/Rail	• Recent update in 2014 • Authorizes stipend for any proposal • Authorizes contracts to include warranty provisions after completion (maintenance) • Recent legislation streamlines process
Florida	• Florida Turnpike Project (Eureka to Killian) • I-95 (SR 9) (St. Lucie County Line to SR 60) • Jewfish Creek Bridge	• Enables DB if in "best interest of public" • Florida must have necessary rights of way/easements before construction can begin • Must adopt procedures for contract administration • Must receive three letters of interest to issue RFP
Ohio	• I-71 Morrow Project Phase 1 (part of bigger project) • I-71/I-670 Interchange (Columbus Crossroads)	• Can combine design and construction when director prepares/distributes scope of work • Authorizes use of value-based selection • Limits to $1 billion per fiscal year • Allows Ohio Turnpike and Infrastructure Commission to use design-build • Allows county engineers to use design-build up to $1.5 million, recently bumped up to $5 million

State	Projects	Enabling Legislation Highlights
Utah	• I-15 CORE • Pioneer Crossing: Lehi Design-Build • I-15 South Layton Interchange	• Minimum estimated design-build price threshold at $50 million • DOTs and public transit districts >200,000 residents do not have to follow threshold • Contracts can include maintenance, financing, or operations provisions • Clause repealed July 1, 2015, previously allowed for projects under $5 million if they met criteria
Virginia	• Route 460 Connector—Phase 1 • Route 28 Corridor Improvements • Route 58 Expansion (Hillsville to Stuart)	• Authorizes fixed-priced design-build • New legislation states need for two-step competitive negotiation process • Maximum of five offerors • Design-build contracts can only be used if project designated in procedures of Secretary of Administration • Locality with population >100,000 can enter into fixed-price design-build contracts
Washington	• SR 167 (Puyallup River Bridge) • 190 Snoqualmie Pass East • I-405/SR 520 Interchange Improvements Bellevue Braids	• Grants permission for design-build if highly specialized activities, higher innovation, or cost savings • Must be greater than $10 million • Projects between $2 million and 10 million apply to a committee if they meet criteria • Limits procurements of operations and maintenance to three years; needs committee approval for more than three years

Key Findings

Unique Legislation

While design-build is a relatively new trend in transportation construction, some of the states previously analyzed have had legislation in place for more than a decade. However, while these states may be leading the nation in this alternate procurement method, their legislation is unique.

Quotas, Thresholds, and Caps

Several states establish minimum thresholds or spending caps to limit the price tags to a specified range:

- Utah has the highest minimum estimated design-build price at $50 million, but even this cap can be avoided by the state DOT or public transit units of greater than 200,000 residents.
- Some states offer low minimum thresholds, such as Washington's $10 million value, yet even this can be avoided if a project meets certain criteria and falls between $2 million and $10 million.
- Ohio caps design-build spending per fiscal year to $1 billion.
- California has a project quota, limiting each agency to a certain number per year.

This wide variation of quotas, thresholds, and caps means that these states are using design-build for projects of all shapes and sizes. Many states are even using it on small projects less than $10 million.

Agencies Other than the State DOT

Enabling legislation has also provided a framework in several states for agencies other than the state DOT to have access to the design-build procurement method:

- California allows local transportation agencies up to five projects a year.
- Several states, including Utah and Virginia, set restrictions for local transportation agencies to have access to the design-build method based on factors such as the population of the local municipality.
- Ohio allows the Turnpike and Infrastructure Commission, as well as county engineers, to use design-build but sets a design-build price ceiling on the projects at $5 million.

Stipends for Unsuccessful Proposals

Design-build legislation also allows several states the option to provide stipends for unsuccessful proposals:

- Arizona legislation mandates the maximum amount for stipends for each short-listed firm on an unsuccessful proposal (*16*). This maximum is 0.2 percent of the Arizona Department of Transportation's estimated cost for design of the project.
- Colorado, Florida, and Utah put the stipend amount at the discretion of the agencies involved.

Selection Process during Procurement

Design-build legislation also varies on the selection process during the procurement phase. There are several options for design-build projects, including low bid, value based, and fixed price:

- Arizona's legislation mandates a value-based, two-step procurement process that analyzes projects for price and time and gives an overall technical score.
- Some states have the flexibility to use multiple methods, including Colorado and Ohio, which can authorize the use of value-based procurement.
- Utah and Virginia both have authorization to use fixed price/best design to award projects.
- Two of the biggest projects analyzed in the selected states, Colorado's T-REX project and Utah's I-15 CORE project, used best value and fixed price, respectively.

Claimed Benefits

The design-build projects procured in the states follow the same pattern as the legislation. There is no true set theme; the projects all vary in size and type. While most of the projects analyzed in this report are larger projects, many states have completed work of less than $10 million.

The research shows that almost every project has claimed some type of benefit, whether in time savings, cost savings, or innovation:

- Thirteen of the 22 projects reviewed claimed some type of time benefit for design-build over the traditional approach, whether in the reduced build time or reduced time due to competitive bidding.
- Seven projects resulted in cost savings.
- Ten projects claimed that an innovative feature was present due to the more flexible design-build standards used to construct the project.
- Seven projects claimed multiple benefits. Projects of all sizes claimed these benefits. However, multiple benefits were headlined by several of the larger projects, including the I-15 CORE project and T-REX project, both costing over $1 billion.

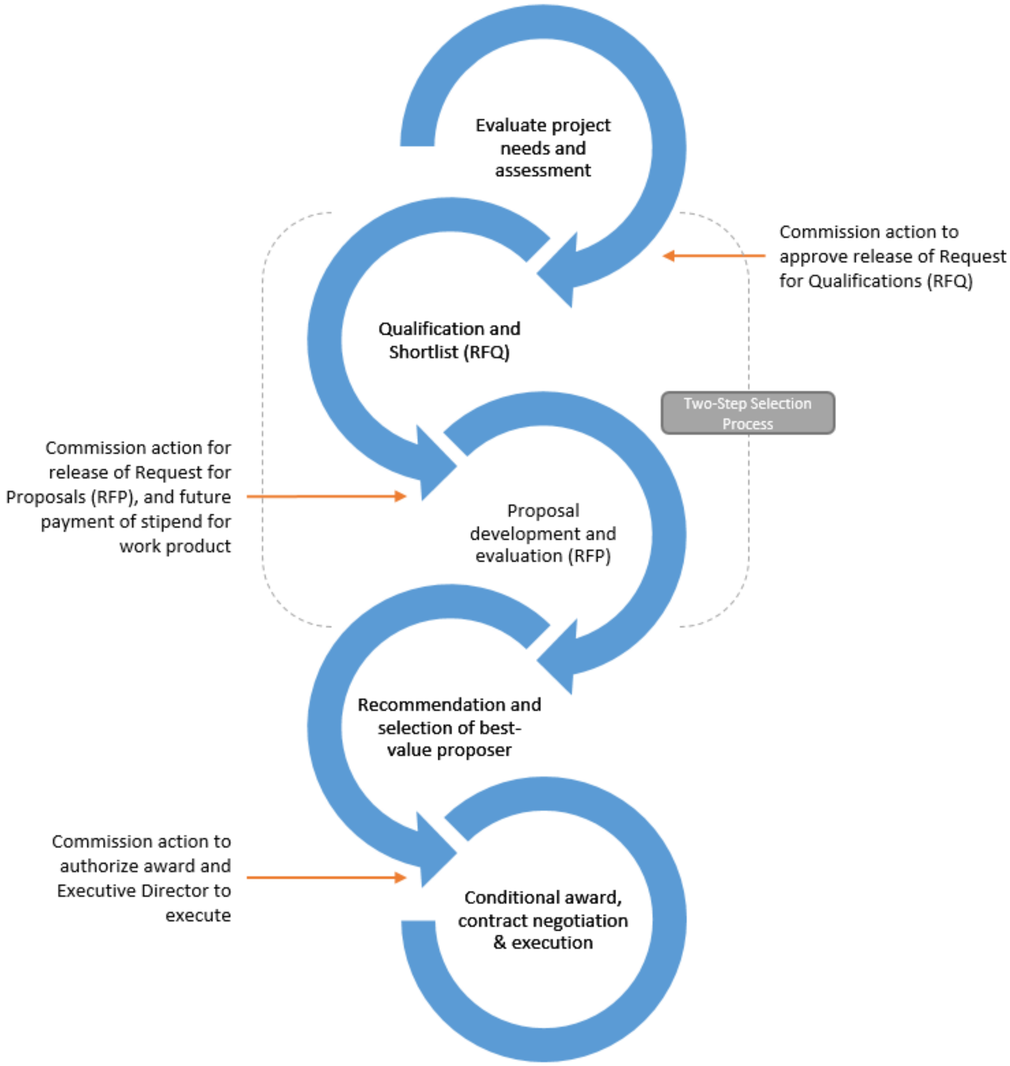
> *Thirteen projects claimed some type of time benefit for design-build over the traditional approach, whether in the reduced build time or reduced time due to the competitive bidding. Seven projects resulted in cost savings.*

Design-Build Projects in Texas

This section of the report provides specific context on the legislative history and current state of the practice for state highway projects that are delivered via the design-build method in Texas. This section also explains TxDOT's two-step procurement process shown in Figure 8.

This section covers the following aspects of current design-build highway projects in Texas:

- Legislative Authority.
- Types of Alternative Project Delivery Methods and evolution on the state-of-practice in Texas.
- Project Procurement Process.
- Common Design-Build Contract Types.



Source: Adapted from (*17*)

Figure 8. TxDOT Two-Step Procurement Process.

Legislative Authority

Texas law contains provisions that define the design-build contracting method and limit how governmental agencies can enter into the process. Texas Government Code Section 2269.353, for example, authorizes a governmental entity to "use the design-build method for the construction, rehabilitation, alteration, or repair" of road and highway projects but stipulates minimum requirements that governmental agencies must follow in soliciting and awarding such contracts (*18*). Provisions in Texas Transportation Code Sections 223 and 371 also stipulate how and under what conditions the design-build contracting method can be used to deliver transportation projects.

Contrasting Design-Build and Comprehensive Development Agreement Legislation

Texas state law authorizes two major types of design-build project delivery methods:

- Design-build.
- Comprehensive development agreement (CDA) design-build.

Few significant differences exist between the two delivery methods in practice. However, a few differences (e.g., differences in the level of design to be completed at the final RFP) are noteworthy. TxDOT has summarized the major differences between design-build and CDA legislation (*17*):

- Private financing is allowed for CDAs (Texas Transportation Code [TTC] 223 Subchapter E).
- Private financing is not allowed for DB (TTC 223 Subchapter F).
- CDA projects are listed and defined by statutes under Senate Bill (SB) 1730 (83rd Legislative Session) and other legislative sessions, and have additional contract types. The recent 84th Legislative Session did not grant CDA extension or additional projects.
- DB projects are not listed in statutes but are in fact limited to three per year with a project cost estimate of $150 million or more. The response from the Office of Attorney General through opinion on differences between HB 20 and Rider 47 indicates that $150 million prevails instead of $250 million (*19*). TxDOT, however, has indicated that it will abide by the $250 million higher minimum.

Table 3 compares some of these key similarities and differences.

Table 3. Comparison of Design-Build and CDA Design-Build Enabling Legislation.

Category	Characteristic	Design-Build	CDA Design-Build
Financial characteristics	Financing	Public entity	Public entity
	Bid development and pricing	Developer focused on shorter asset life and lowering upfront costs	Developer focused on shorter asset life and lowering upfront costs
	Minimum project cost	$150 million—HB 20 $250 million—Rider 47*	No minimum price
Legislative requirements	Level of design at final RFP	30% schematic design finalized	No minimum design required
	Stipend	Minimum of up to 0.25% of contract amount	No minimum required
	SB 1420 committee**	Not required	Required for certain toll projects
	Per-year project limit	3	No per-year project limit***
Other	General approach	Some standards are performance based	More standards are performance based
	Traffic and revenue risk allocation	TxDOT retains	TxDOT retains
	Maintenance term	Three 5-year terms	Three 5-year terms
	Operations responsibility	TxDOT retains	TxDOT retains
	Maintenance responsibility	TxDOT retains but may require project developer to provide capital maintenance	TxDOT retains but may require project developer to provide capital maintenance
	Warranty period	Set period of time following final acceptance	Set period of time following final acceptance

Source: (*20*,*21*)

*A determination from the Texas Attorney General has been made, with the $150 million minimum cost prevailing.

** By law, an SB 1420 project committee must be comprised of the following (per TTC Section 228.013): a representative of TxDOT, every local toll project entity for the area in which the project is located, the applicable metropolitan planning organization, and each city and county that will provide revenue or right of way for the project.

*** Neither CDA extension nor additional projects were granted in the recent 84th Legislative Session.

Evolution of Design-Build Legislation in Texas

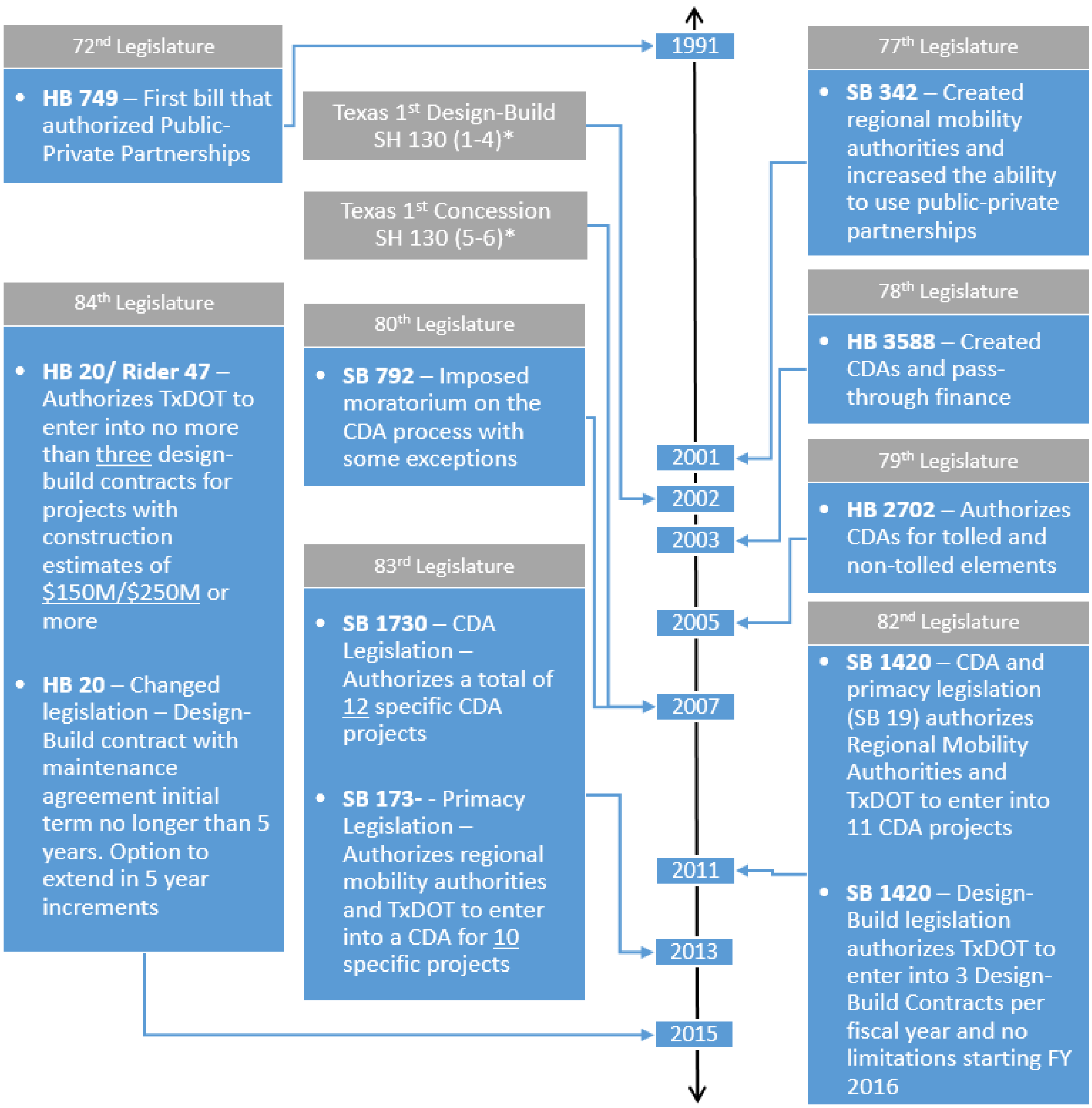
During the 80th Legislative Session, lawmakers passed SB 792. This legislation prohibited most CDA projects. During the 82nd Legislative Session, lawmakers passed SB 1420 (otherwise known as the TxDOT Sunset Bill). This legislation is significant because it clarifies the meaning of a design-build project and establishes a framework by which TxDOT shall keep the legislature informed of project progress. This legislation also required the Texas Transportation

Commission to adopt rules for considering a design-build project. Specifically, the legislation requires the Texas Transportation Commission to address project size, complexity, time constraints for delivery, staff training requirements, and other factors.

As was the case during previous sessions, during the 84th Legislative Session, lawmakers passed legislation that made several changes to how governmental agencies enter into highway design-build agreements. HB 20 (which amends parts of Section 223 of the TTC) increases the threshold by which TxDOT can enter into a design-build contract for a highway project from $50 million to $150 million (*22*). In addition, Rider 47 in the state's fiscal year (FY) 2016–2017 budget further increases this minimum threshold to $250 million (*23*). HB 20 now prohibits TxDOT from using the DB method for the construction, expansion, extension, rehabilitation, alteration, or repair of a highway project if the project is substantially designed. Figure 9 provides a timeline of the enabling legislation.

Within TxDOT, the primary division responsible for administering design-build projects is the Project Finance, Debt and Strategic Contracts Division (PFD). Within this division, the Strategic Contracts Management Section focuses primarily on procurement and program administration. This section supports the districts in the delivery of design and construction, and operations and maintenance. Major design-build project activities performed under the districts and PFD include (*20*):

- Right-of-way acquisition.
- Selection and management of procurement engineering consultants.
- Traffic analysis.
- Project feasibility analysis in consideration of available funds and proposed project design.
- Life-cycle cost analyses.
- Procurement of design-build contractors (which can include pre-procurement plans, documentation, federal and local agency coordination, stakeholder participation, advertising, qualifications, shortlisting, proposal, evaluation and selection, etc.).
- Coordination of the execution of the design-build agreement.
- Operations and maintenance.



* Contract execution year.

Source: Adapted from TxDOT (*17*)

Figure 9. Enabling Legislation Timeline for Design-Build and CDAs in Texas.

In addition, design-build contracts can include maintenance obligations with the design-build contractor after substantial completion of the project. To facilitate the pricing of the work, bonding, and insurance, TxDOT has included maintenance and operating obligations in a separate agreement executed by the design-build contractor concurrent with commercial close of the design-build contract. PFD typically includes one of three types of maintenance agreements, as shown in Table 4.

Table 4. Typical TxDOT Maintenance Agreements.

Maintenance Agreement Type	Description
Warranty	Guarantees quality of work, materials, and equipment for one year. For certain projects, a warranty guarantees durability of the capital assets for five years and non-capital assets for two years.
Capital maintenance agreement (CMA)	Typically provides for only capital maintenance on specified elements, such as pavements and bridges.
Comprehensive maintenance agreement (COMA)	Provides for an all-inclusive maintenance program by the project developer on all project elements (i.e., capital maintenance and routine maintenance).

Source: (*20*)

TxDOT Process for Determining Project Delivery Method

As concluded in the literature review of this report, not all projects are viable candidates for the design-build delivery method. Currently, TxDOT PFD, along with the districts, chooses viable projects for design-build and helps coordinate planning and programming with the respective districts during the development.

What characteristics of the project make it a viable option for design-build? According to TxDOT, the best projects are those that are large and/or complex with potential for innovation. TxDOT uses the following guidelines in determining suitable projects for the design-build delivery method (*24*):

- Does the project have support from the local district office and local stakeholders?
- Are funds available?
- Does the project have time constraints that need to streamline the delivery of the project?
- Is there potential for innovation (in both design and construction)?
- What is the status of the project development?
    - Is the environmental document complete or near completion?
    - Has detailed design started?
    - Is additional right of way required?
    - Has the project been modeled for feasibility and delivery method?
    - Are the scope and project goals clearly identified?
    - Have the risks been clearly identified and assessed?
    - Has the project been evaluated using the project delivery support tool to determine whether TxDOT will realize a benefit from alternative delivery?
- What are the maintenance requirements after completion of the project?

The TxDOT district initiates the selection process; district officials then communicate and coordinate this selection with PFD. This includes a process that evaluates whether TxDOT will benefit from using an alternative delivery methodology. The University of Texas Center for Transportation Research has developed a project delivery method selection tool, the Project Delivery Decision-Support Tool (PDDST). This tool allows stakeholders to make an objective analysis to determine which project delivery method is the most suitable. A selection committee chooses viable projects to use the design-build method. The characteristics of each project determine which form of design-build will be used.

Design-Build Procurement in Texas

While federal legislation on the design-build delivery method allows for agency discretion in project selection methods (*25*), Texas primarily uses some form of adjusted-score or best-value contractor selection process when delivering projects using the design-build method. An adjusted-score or best-value selection incorporates non-price factors into the decision-making process. SB 1420 requires that any highway project using the design-build method use a two-step contractor selection process. This involves the issuance of an RFQ followed by an RFP.

Process to Issue an RFQ

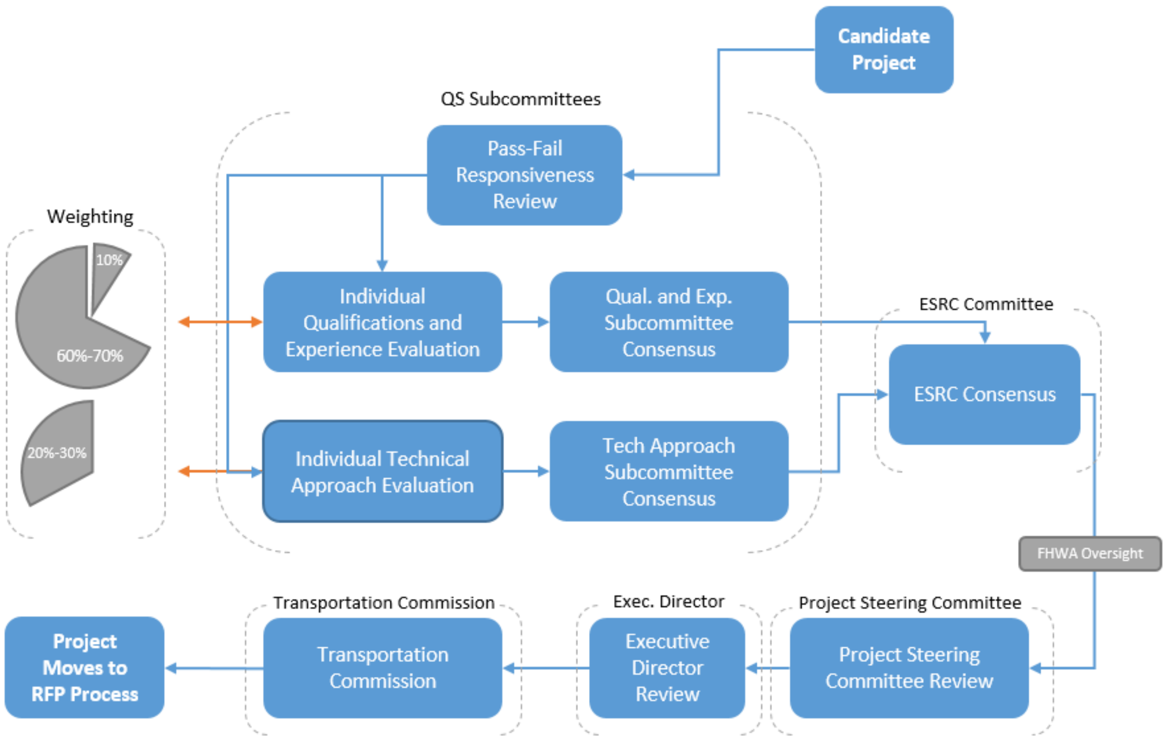
According to this legislation, the TxDOT RFQ should include the following (*26*):

- Information about the proposed project's location, scope, and limits.
- Information about funding that may be available for the project.
- Criteria that will be used to evaluate the qualifications statements, which must include a proposer's qualifications, experience, technical competence, and ability to develop the project.
- The relative weight to be given to the criteria.
- The deadline by which TxDOT must receive the qualifications statements.

The process shown creates a short-list of at least two teams, and the criteria are issued in the RFQ. Figure 10 shows the process of a project as it moves through the RFQ process. Safeguards are embedded into this process to ensure fair and transparent selection. The teams are then asked to submit detailed proposals in the RFP phase. The RFP issued by TxDOT should include the following (*26*):

- Information on the overall project goals.
- Publicly available cost estimates for the design-build portion of the project.
- Materials specifications.
- Special material requirements.

- Schematic design approximately 30 percent complete.
- Known utilities, provided that TxDOT is not required to undertake an effort to locate utilities.
- Quality assurance and quality control requirements.
- The location of relevant structures.
- Notice of any rules or goals adopted by TxDOT relating to awarding contracts to disadvantaged business enterprises or small business enterprises.
- Available geotechnical or other information related to the project.
- The status of any environmental review of the project.
- Detailed instructions for preparing the technical proposal, including a description of the form and level of completeness of drawings expected.
- The relative weighting of the technical and cost proposals and the formula by which the proposals will be evaluated and ranked.
- The criteria to be used in evaluating the technical proposals, and the relative weighting of those criteria.



Source: Adapted from (*17*)

Note: ESRC refers to the Evaluation and Selection Recommendation Committee and QS refers to Qualifications Statements.

Figure 10. Evaluation Process for Qualification Statements.

Process to Issue an RFP

As part of the RFP submittal process, each responder to the request must provide a cost proposal and a separate technical proposal.

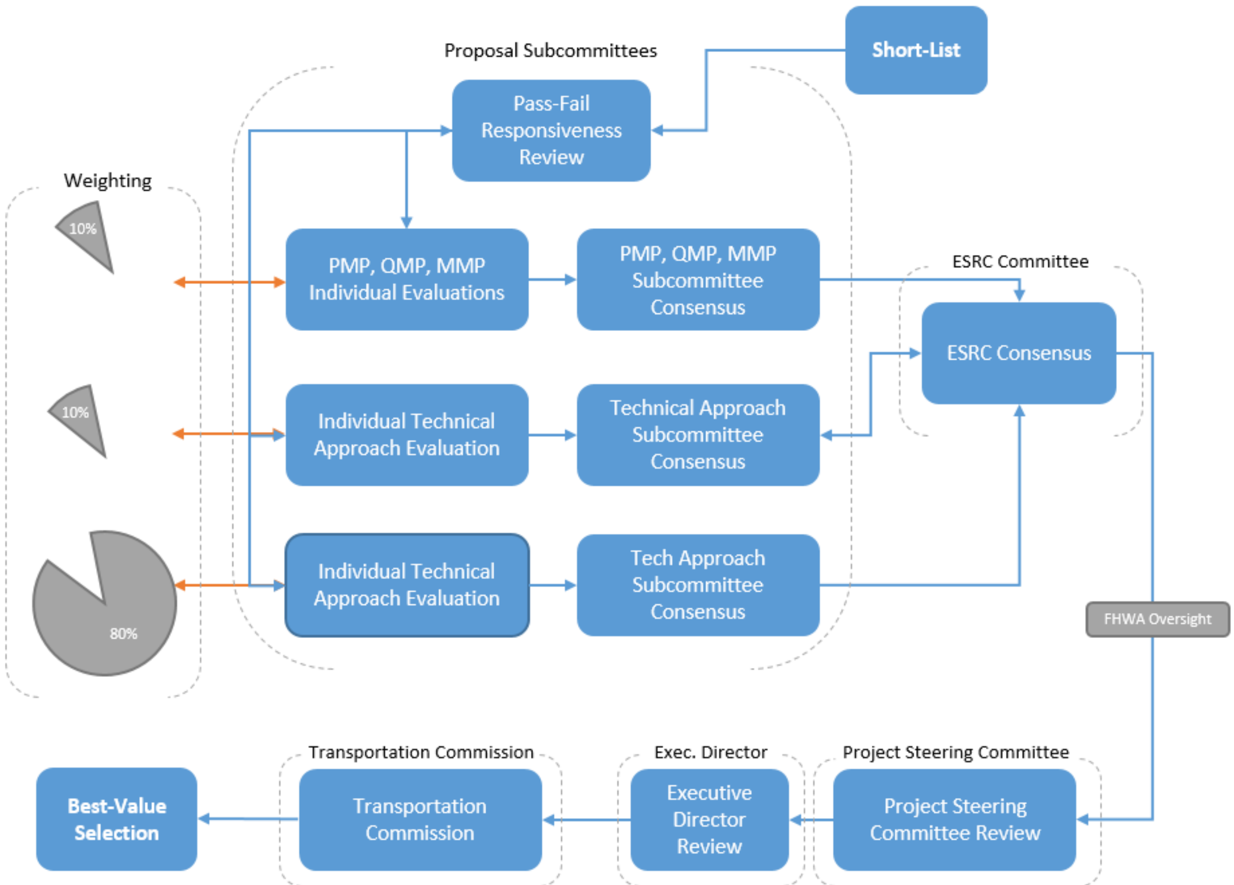
Figure 11 shows the complete selection process from short-list to award. Much like the RFQ process, several safeguards are in place to ensure a fair and transparent selection process.

Cost Proposal

The cost proposals must include detailed project costs and an anticipated schedule. This proposal must be weighted at a minimum of 70 percent in the scoring as stated in Section 223.246(b) of SB 1420.

Technical Proposal

The technical proposal must identify non-price factors such as the anticipated problems and ability of the proposer to meet schedules. The proposer's qualifications and demonstration of technical competence must also be provided if not already done so adequately in the RFQ process. This technical proposal must not exceed 30 percent weight allocation in the scoring process.



Source: Adapted from (*17*)

Note: ESRC refers to the Evaluation and Selection Recommendation Committee; PMP refers to the Project Management Plan; QMP refers to the Quality Monitoring Program; and MMP refers to the Maintenance Management Plan.

Figure 11. Evaluation Process for Proposals.

Contract Format

As stated in Section 223.242 of the TTC, "an authority may use the design-build method for the design, construction, expansion, extension, related capital maintenance, rehabilitation, alteration, or repair of a highway project" (*27*). The contracts, as noted in the literature review, can vary based on the requirements of each project. Because of these variations, design-build contracts are often tailored to fit the needs of each project. However, because of the difference in legislative authority in which these projects are delivered, projects using CDA design-build legislation differ slightly from those under the design-build legislation. These distinctions are noted in the section "Contrasting Design-Build and Comprehensive Development Agreement Legislation."

Contracts include provisions that follow TxDOT's Disadvantaged Business Enterprise (DBE) Program to counteract negative concerns raised in the literature. Contracts also include equal-opportunity and non-discrimination provisions, which are found in all TxDOT contracts.

Passage of HB 20 in 2015 placed restrictions on design-build contracts in Texas. One change is that design-build contracts cannot used when the "construction, expansion, extension, rehabilitation, alteration, or repair of a highway project is substantially designed…by the department or another entity other than the design-build contractor" (*22*).

Furthermore, only one highway project can be included in a design-build contract. The Energy Sector Roadway Repair Project, which is an atypical use of design-build in Texas, has been the only contract involving more than one highway project. HB 20 defines a *highway project* as (*22*):

- A single highway facility between two defined points in a corridor.
- Two or more contiguous highway facilities.

As noted previously in the section "Evolution of Design-Build Legislation in Texas," contracts had been limited to a $150 million minimum by an amendment to the TTC by HB 20, and further limited to a $250 million project minimum by the passage of Rider 47. The Texas Attorney General issued an opinion in favor of the $150 million minimum (*19*)

Alternative Technical Concepts

Any technique, method, process, or information included in any successful or unsuccessful proposals that TxDOT determines to be of value to the project, also known as an alternative technical concept (ATC), can be acquired through the use of a stipend. SB 1420 requires TxDOT to pay a minimum of 0.25 of 1 percent of the estimated contract amount for use of these ATCs (*20*). TxDOT prepares an estimate of the contract amount during procurement and advertises the stipend in the instructions to proposers. The minimum stipend amount, as noted previously, differs from that of the CDA design-build legislation. CDA design-build does not require a minimum amount. If TxDOT believes that the ATC is valued at less than the required stipend amount, TxDOT prepares a detailed explanation of such valuation. In addition, any use of these ATCs by TxDOT is under the sole discretion of the department itself. The unsuccessful proposal does not retain any risks associated with the ATCs (*20*).

The project case studies found in Appendix B have identified the number of submitted and accepted ATCs, as well as how many ATCs were incorporated into the executed contracts. The case studies also note any recognized time, cost, or quality benefits. The individual project funding sheets used to develop the case studies can be found in Appendix C.

During the procurement process, the project developer may determine that an ATC appears to be financially beneficial to the project and submit it to TxDOT for approval. However, during final preparation of the price proposal, the developer may determine that the ATC is too costly and then remove it.

Summary of Key Findings

The literature review examined both existing literature and the existing practice in a number of selected states concerning transportation projects delivered via the design-build method. This study also examined 12 design-build Texas projects and their proposed schedule, costs, and use of innovative techniques and concepts. Because highway projects are only delivered one time, it can be difficult to identify and calculate the savings associated with delivering a project using one method over another. Using engineers' estimates of both project duration and cost, however, allows for some level of analysis and comparison.

This section summarizes experiences with the design-build method found in the literature and the experiences in Texas and other states. The study examined the three typical measures of success in these cases concerning project delivery:

- Cost savings.
- Time savings.
- Quality assurance.

Researchers also examined:

- Procurement length.
- Impacts on small businesses.

Cost Savings

The literature found that, generally, cost reduction can be achieved through a variety of methods, including the shift of risk and control, a shortened time frame, and fewer change orders. All three can be methods to reduce costs in design-build.

While some studies have found instances of higher cost growth rates on design-build projects compared to the traditional design-bid-build method, this has not been the case in Texas. Change orders can also have a greater impact on the overall project cost than in design-bid-build. The research attributes some cost increases to poor scope, which can cause more change orders and higher growth rates. In Texas, 11 of the 12 projects reviewed in this study realized some cost savings that were not directly related to time savings. These savings were measured using the estimated value of the ATCs.

While some studies have found instances of higher cost growth rates on design-build projects compared to the traditional design-bid-build method, this has not been the case in Texas.

The use of ATCs has provided TxDOT with project cost savings. Of the 12 projects reviewed, 11 have implemented ATCs, and TxDOT has realized savings of $326.3 million on 90 ATCs (*17*).

In addition, TxDOT has noted that its best-value design-build proposals usually come in 15 to 20 percent below the engineer's estimate.

Time Savings

Several studies do provide evidence that design-build has resulted in schedule savings over the traditional design-bid-build method. There are several reasons why time could be saved by using design-build over traditional build. The major result of design-build's time savings comes from eliminating the second procurement phase, fewer change orders, and more efficient delivery.

Most states also find time savings significant. The assessment of projects in the case study states verifies this finding; 13 of the 22 projects reviewed claimed some type of time savings. Texas projects also follow this trend, with at least 10 of the 12 projects realizing time savings. TxDOT's experience has been that these projects typically finish 3 to10 months early (*2*).

Quality Assurance

The last of the three major claimed benefits from using this alternate procurement method stems from a perceived increase in quality. The literature reviewed suggests that the design-build method may increase project quality. Of the analyzed projects, 10 out of 22 projects reported some type of innovative feature that enhanced the project quality.

In Texas, design-build projects typically come with a capital maintenance agreement, a comprehensive maintenance agreement, or a warranty that covers a period of time with renewals to follow. With this practice, quality has not been an issue. All 12 design-build projects in Texas came with some maintenance option. Many require the contractor to maintain the assets for five years with additional five-year periods at TxDOT's discretion. This is similar to the arrangement in many other states.

Procurement Length

One important characteristic in design-build stems from the procurement length of design-build projects. Poor scope can lead to cost and time increases. In the reviewed literature, a procurement length of 3.4 months or more showed significant time benefits in design-build projects. Once a project met this threshold, the project either finished on time or earlier than planned. The longer procurement times allowed for better evaluation of time and finances needed to properly complete the projects and helped reduce the number of change orders because of a clearer scope.

Impacts on Small Businesses

Some have raised concerns about how the design-build contracting method impacts small business participation in the procurement process. However, the literature does not support the concerns that small businesses cannot compete with larger firms and that the design-build method can benefit larger, national companies when contracts are awarded.

For example, a recent FHWA report noted that critics of the design-build project delivery method say it provides an opportunity for favoritism to enter into the contract award process by including non-price factors as the basis of project selection (*4*). However, this same report noted that FHWA and many states have taken steps recently to enact legislation and administrative policies that ensure firms of all sizes are evaluated objectively.

TxDOT has summarized the process in the following way in an effort to address any concerns related to small business or favoritism (*2*):

> The procurement process at TxDOT attempts to be fair and consistent regardless of the location of the project and bases the final score on two separate elements: price and the technical portion of the proposal. As stated previously, the prices typically represent 70–80 percent of the score. Determining the technical score requires the establishment of local evaluation team consisting of local District and Strategic Project Office staff that will be responsible for the oversight during design, construction and maintenance. The price proposal evaluation team is unaware of the technical score and the technical proposal evaluation team is unaware of the price score. The procurement steering committee members are the only individuals who see both the price and technical score.
>
> To provide transparency of the procurement process, TxDOT uses a CDA third party review process to protect the State's interest. The Office of Attorney General (OAG) reviews all CDA project agreements for legal sufficiency with focus on procedural, statutory and regulatory requirements in the agreement. In addition, state law requires the Legislative Budget Board (LBB) to review both the CDA and its supporting documents prior to authorizing signature on the contract.

In Texas, the law requires that these projects be procured using a competitive best-value process. TxDOT notes that the selection process considers factors such as experience, safety, expedited construction schedules, innovation, maintenance, and price to determine the best value; price accounts for 70 to 80 percent of the evaluation criteria.

Summary of Texas Highway Design-Build Projects

Of the 12 projects reviewed for this study, most are currently under development or construction. The DFW Connector has completed some work, with some phases still ongoing. Additionally, some segments of the SH 99/Grand Parkway project have been completed.

Most of these projects have achieved some time or costs savings or both. In addition, many used ATCs that have resulted in additional innovation and cost savings.

Many of the projects that were delivered via the design-build method were executed within the past several years. As a result, it is difficult to conduct an in-depth before-and-after analysis of projects that were delivered through this method. Table 5 shows that many design-build projects are estimated to reach the substantial completion phase in 2016 and 2017. Some projects, such as the Loop 375 project in El Paso and the US 181 project in Corpus Christi, are expected to reach substantial completion by 2018 and 2020, respectively.

Table 6 summarizes key elements of Texas design-build projects. Of the 668 ATCs submitted, 304 were accepted, and 90 were executed, with a total estimated value of $326,000,000.

Table 5. Summary of Design-Build Projects in Texas.

Project	Region in Texas	Legislation	Delivery Method	Estimated Project Substantial Completion Date*
DFW Connector	DFW	CDA DB	DB and CMA	Nov. 2013 (base), Jan. 2017 (option)
Energy-Sector Roadway Repair Project	South Texas	DB	DB	Oct. 2015
The Horseshoe	DFW	DB	DB and CMA	Feb. 2017 (Segment A), April 2017 (Segment B)
I-35E Managed Lanes (ML)	DFW	CDA DB	DB and CMA	May 2017
SH 183 ML (Midtown Express)	DFW	CDA DB	DBOM	June 2018
SH 360	DFW	DB	DB and COMA	Aug. 2017
Loop 375 Border Highway West Expressway (BWE)	El Paso	CDA DB	DB and COMA	Feb. 2018
Loop 1604 Western Extension	San Antonio	DB	DB and warranty	Oct. 2016 (base), Jan. 2017 (option)
SH 99/Grand Parkway Segments F1, F2, and G	Houston	CDA DB	DB and CMA	Feb. 2016 (Segment F1), Feb. 2016 (Segment F2), March 2016 (Segment G)
SH 71 Toll Lanes	Austin	DB	DB and warranty	Oct. 2016
US 181 Harbor Bridge	Corpus Christi	DB	DBOM	Winter 2020
US 77	Kingsville	DB	DB and CMA	June 2016

* Estimated project schedules current as of April 2016.
Note: CDA stands for comprehensive development agreement. DB stands for design-build. CMA stands for capital maintenance agreement. DBOM stands for design-build-operate-maintain. COMA stands for comprehensive maintenance agreement.

Table 6. Summary of Key Elements in Texas Design-Build Projects.

Project	Cost Savings*	Time Savings	Quality	Submitted ATCs	Accepted ATCs	Executed ATCs	Efficiency**	Estimated Value*	Engineer's Estimate (Days)	Successful Proposer's Estimate (Days)
DFW Connector	Y	Y	CMA	52	16	4	25%	$31,400,000	1,734	1,702
Energy Sector	N***	Y	Warranty	29	9	0	0%	$0	754	540
The Horseshoe	Y	Y	CMA	32	17	9	53%	$16,700,000	1,530	1,455 (Segment A) 1500 (Segment B)
I-35E ML	Y	Y	CMA	71	31	7	23%	$75,400,000	1,460	1,269
SH 183 ML	Y	Y	COMA	82	37	13	35%	$66,200,000	1,540	1,260
SH 360	Y	Y	COMA	84	36	10	28%	$10,900,000	1,025	810
Loop 375 BWE	Y	N	COMA	72	43	8	19%	$47,000,000	1,095	1,095
Loop 1604 Western Extension	Y	N	Warranty	39	15	5	33%	$1,900,000	910 (base) 700 (option)	910 (base) 700 (option)
SH 99/Grand Parkway F1, F2, and G	Y	Y	CMA	42	18	13	72%	$27,700,000	1,092—F1 1,092—F2 1,092—G	845—F1 845—F2 845—G
SH 71	Y	Y	Warranty	36	25	9	36%	$5,500,000	893	644
US 181 Harbor Bridge	Y	Y	COMA	95	41	7	17%	$37,200,000	1,945	1,885
US 77	Y	Y	CMA	34	16	5	31%	$6,400,000	1,092	1,092
Total				**668**	**304**	**90**	**3.72**	**$326,300,000**		

* Only values provided by TxDOT were included. Costs savings refers to cost savings from ATCs.

** Refers to number of executed ATCs divided by accepted ATCs.

*** Does not consider potential cost savings from reduced schedule.

Source: Adapted from (*17*)

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Appendix A: State Case Studies

Arizona

Legislation

The State of Arizona's design-build legislation contains some unique features. The government set up specific guidelines that all projects must use a two-phase procurement method to award a contract:

- The first phase mandates Arizona must use a selection team of no fewer than three people, with half being qualified architects or engineers and one being a senior management employee of a licensed contractor not involved in the project.
- The second phase involves how projects are awarded. Arizona mandates that each project receive a technical score and then divides that by the price of the proposal to get an adjusted score. Arizona also has the option to adjust bids with time components.

The legislation allows for the department to give stipends (2/10 of 1 percent of the design and construction costs). These unique features appear to have translated into some success in the design-build program (*1*).

Projects Reviewed

Analysis of several completed construction projects in the state shows that Arizona is experiencing some success with this alternative project delivery method. Table A-1 shows the projects reviewed.

I-10 Widening

The highlight of Arizona's design-build projects is the I-10 widening project. When this project began, it was the largest contract awarded to date. The Arizona Department of Transportation (ADOT) originally had an enormous, decade-long project with three phases of construction planned. However, after realizing the burden the lengthy project would put on the growing economy, ADOT looked to design-build for an alternative to this time constraint. Sundt, a major design-build firm, managed to reduce the construction phase down to three years (instead of 10), finish several months ahead of the design-build schedule, and stay within budget.

SR 101 High-Occupancy Vehicle

The SR 101 high-occupancy vehicle (HOV) project also showed some positive results for alternative project delivery. While the project did not appear to have any overly complicating features and seemed to be a typical expansion project, the 30 miles of HOV lanes—costing about $100 million—were completed in nine months, under half the original time allotment. This time savings also allowed for about $15 million in cost savings on this project.

Table A-1. Summary of Key Arizona Design-Build Projects.

Project	Construction Period (Years)	Project Cost (Millions)	Specifications	Reported Outcomes
I-10 widening (Prince to 29th)	2007–2010	$212	• 16 new bridges/traffic interchanges • Widen from six to eight lanes	• Finished several months ahead of schedule • Timeline significantly shortened from original decade-long ADOT plan • Completed on time and within budget
SR 101 HOV	2012–2013	>$100	• Five bridges • Eight ramps • 30 miles of HOV lanes	• Completed in nine months, instead of two-year original estimate • Completed under budget; approximately $15 million saved • Able to put that money into upgrading the roadway
Santan Freeway (SR 202L) HOV (I-10 to Gilbert)	2011	$89	• Two freeway-to-freeway connections • 10 miles of new HOV lanes • 20 lane miles of paving	• Bid came in 41 percent under budget • Bid came in 46 percent under time constraint

Source: (*2*,*3*,*4*,*5*,*6*,*7*,*8*)

Santan Freeway HOV

The Santan Freeway (SR 202L) HOV project cost $89 million and was awarded to Pulice Construction Company in a partnership with Granite Construction. The project included a fast-track design of only 300 days, with a bid proposal coming in 41 percent under budget and 46 percent under the allotted time constraint.

California

Legislation

California's legislation authorizes design-build, which then must be communicated in a report detailing the project. However, legislation in 2009 allowed for a design-build program that legalized up to five projects for local transportation entities and 10 for the state department of transportation (DOT). These projects had to be approved by the California Transportation Commission and had a sunset clause for January 1, 2014 (*9*).

Projects Reviewed

Table A-2 shows the projects reviewed.

Table A-2. Summary of Key California Design-Build Projects.

Project	Construction Period (Years)	Project Cost (Millions)	Specifications	Reported Outcomes
SR 22	2004–2007	$550	• 12 miles of corridor widening • 12 new bridges • 23 widened bridges • State-of-the-art traffic management system	• Claims to have saved $150 million • Claims to have brought project in a year sooner than other bid would have • Proactive community outreach; kept all lanes open during the day • Finished three years ahead of original schedule
SR 91 Corridor Improvements	2014–2017	$664	• Expand existing five lanes to eight • Improve interchange • 32 bridges • 100 retaining walls and sound walls	• Should be completed three to four years ahead of projected schedule

Source: (*10*,*11*,*12*)

SR 22

The SR 22 design-build widened 12 miles of road and 23 bridges, replaced nine bridges, and built three new bridges. The project claimed to have saved $150 million and finished a year sooner than any other competing bid would have. The project also led to the construction finishing three years ahead of the original schedule. It was the first design-build project on an operating freeway in California and was completed on time and within budget. The project was delivered by Parsons.

SR 91 Corridor Improvements

The SR 91 Corridor Improvements project is a joint venture between Atkinson and Clark. This project looks to expand and update the roadway by constructing three new lanes, bringing the total to eight. There will be 32 bridges and 100 retaining and sound walls constructed. One positive from this design-build comes from the shortened time frame for the build; approximately three to four years will be saved from the original schedule.

Colorado

Legislation

Colorado recently passed new legislation in 2014 that delineates how design-build should progress. The state can authorize stipends for any proposal; however, there is no guideline on the maximum amount awarded. Colorado also authorizes contracts to include warranty provisions for any period of time after completion, meaning that the construction companies must maintain the roadway too. This legislative update streamlines Colorado's design-build program, which has been operating for years.

Projects Reviewed

Based on an analysis of several projects from Colorado, the state appears to be finding some success in its usage of design-build. Table A-3 shows the projects reviewed.

Table A-3. Summary of Key Colorado Design-Build Projects.

Project	Construction Period (Years)	Cost (Millions)	Specifications	Reported Outcomes
US 285 (Federal Boulevard to Kipling Boulevard)	2010–2011	$41	• 4.7 miles of roadway • Design six new bridges and rehabilitate seven • Design roadway reconstruction	• Got more done for the value of the project compared to original specs • Construction and design were on schedule and within budget
US 6 Bridges	2014–2015	$98	• Replace and build six new bridges • Build new pedestrian bridge • Add new ramp structures to alleviate traffic	• Timeline is nearly one year shorter than original Colorado Department of Transportation proposal
T-REX partnership interstate/rail	2001–2006	$1,300	• Replace 18 bridges • Redo interchange between I-25 and I-225 • Add lanes in each direction • 19 miles of light rail	• Came in almost two years ahead of schedule • Came in 3 percent under budget (39 million) • Combined interstate expansion and light-rail construction to save more than $300 million

Source: (*13*,*14*,*15*,*16*,*17*)

US 285

The US 285 project began in 2010 and finished in just 19 months. This project saw 4.7 miles of roadway under construction, with six new bridges added and seven bridges rehabilitated. Constructed by Tsiouvaras Simmons Holderness, this design-build project cost $41 million. According to the company's website, this project incorporated more value than the original specifications called for, an apparent positive of using design-build. The project also finished on time and within budget, even though there were a couple of months lost due to poor weather (*18*).

US 6 Bridges

The US 6 Bridges project was awarded to Edward Kraemer and Sons, Inc. This project consisted of replacing six bridges with new ones, as well as building a new pedestrian bridge and new ramp structures to alleviate traffic congestion. Starting in 2014, this $98 million project was completed in August 2015, nearly one year faster than the original proposal.

T-REX Partnership Interstate/Rail

The highlight of Colorado design-build comes from the T-REX construction project. The $1.3 billion expansion project was the largest in Colorado history. This design-build project, done using a best-value approach, weighed technical aspects and price (*17*). Constructed by Kiewit-Parsons, this project resulted in one of the most well-known, successful usages of design-build. The project, which included reconstructing 18 bridges and the interchanges between I-25 and I-225, came in nearly two years ahead of its original schedule and saved $39 million from the original cost.

Constructed by Kiewit-Parsons, the T-REX construction project resulted in one of the most well-known, successful usages of design-build. The project, which included reconstructing 18 bridges and the interchanges between I-25 and I-225, came in nearly two years ahead of its original schedule and saved $39 million from the original cost.

Florida

Legislation

Florida has relatively simple design-build legislation. In the enabling statute, if the DOT determines it to be in the best interest of the public, it can use design-build. However, the statute does mandate that Florida have the necessary rights of way and easements before construction can begin. The legislation also stipulates that the DOT must adopt procedures for administering contracts, which include:

- Prequalification requirements.
- Public announcement procedures.
- Scope-of-service requirements.
- Letters-of-interest requirements.
- Short-listing criteria and procedures.
- Bid proposal requirements.
- A technical review committee.
- Selection and award processes.
- Stipend requirements.

However, the legislation does not mandate how this should be done. One final key aspect stipulates that the DOT must receive at least three letters of interest to proceed with a request for proposals. The legislation also allows for any non-selected firms to receive a stipend but does not specify the amount (*19*).

Projects Reviewed

Although Florida has used design-build for a lot of projects that fall under the minimum threshold, several projects were large enough to use for this case study. Table A-4 shows the projects reviewed.

Table A-4. Summary of Key Florida Design-Build Projects.

Project	Construction Period (Years)	Cost (Millions)	Specifications	Reported Outcomes
I-95 (SR 9) (St. Lucie County Line to SR 60)	2011–2015	$54	• Add 6.8 miles, one lane in each direction • Replace several bridges • Sound walls	• Able to redesign ramps and never close • Developed an algorithmic program with Geopak that optimized use of overbuild and identified trouble areas • Significant savings on time (cut proposed contract time to 850 days, almost half of the estimated 1,600)
Jewfish Creek Bridge	2005–2008	$160	• Reconstruct 4.5 miles of US 1 and barrier wall • 7,500-foot-long high-level bridge (65 feet)	• Massive innovation: solution for managing organic soils (first time in the United States) • Bridges received several awards • Helped restore original water flow (part of Comprehensive Everglades Restoration Program)
Florida Turnpike project (Eureka to Killian)	2014–2017	$145	• Major extension of SR 874 • Widen roads/bridges	• Minimizes construction impacts • Claims it has time and economic benefits (no numbers)

Source: (*20*,*21*,*22*,*23*,*24*,*25*,*26*)

I-95

Florida's I-95 (SR 9) project from the St. Lucie County Line to SR 60 represents a lower-priced project at $54.4 million. Completed by De Moya, this construction project added one lane in each direction for approximately 6.8 miles while also replacing several bridges and adding sound walls along the route. While not an overly complicated build, this project featured aspects that helped limit the timeline for construction, including redesigning ramps so they never had to close; developed an algorithmic program that optimized the use of overbuild; and established major time savings, with the bid coming in at 850 days instead of the original estimate of 1,600.

Jewfish Creek Bridge

The Jewfish Creek Bridge reconstruction project represented a design-build of a bridge and corresponding roadway done by Granite Construction. This $160 million project took several years to complete because it reconstructed 4.5 miles of US 1, the barrier wall, and the jewel of the project, the 7,500-foot-long high-level bridge at 65 feet high.

Because of the project's use of design-build, innovative features were incorporated that may not have happened through traditional methods. The soil stabilization process used on the muck under the bridge was the first seen in the United States. Instead of demucking, the contractor used a technique called soil mixing. The contractor also used other improvements such as specially coated corrosion protection to help protect the bridge. This project also helped protect the environment as part of the Comprehensive Everglades Restoration Program; the bridge helped restore the original water flow.

Florida Turnpike Project

The Florida Turnpike project from Eureka to Killian is a $145 million design-build being done by De Moya. This project is a major expansion of SR 874 and includes widening the roads and bridges. With a project estimate of three years, the design-builder claims it provides time and economic benefits because of the design-build method.

Ohio

Legislation

Ohio's design-build enabling legislation has been updated as recently as 2012. The recent update allows for the combining of design and construction in highway and bridge projects in which the director prepares and distributes the scope of work. The update also authorizes the use of value-based selection and sets a limit at $1 billion per fiscal year (*27*). Another part of the legislation enables the Ohio Turnpike and Infrastructure Commission to combine design and construction into one contract (*28*). One final aspect of Ohio's enabling legislation grants permission for county engineers to combine design and construction up to $1.5 million. However, this clause was replaced on July 1, 2015, with a new threshold of $5 million (*29*).

Projects Reviewed

Table A-5 shows the projects reviewed.

Table A-5. Summary of Key Ohio Design-Build Projects.

Project	Construction Period (Years)	Construction Cost (Millions)	Specifications	Reported Outcomes
I-71/I-670 Interchange (Columbus Crossroads)	2010–2014	$200	• 22 bridges • 28 retaining walls • 18 ramps • Two new flyover bridges	• Able to start construction 2.5 years earlier • Saved approximately $40 million from original estimate
I-71 Morrow Project Phase 1 (part of bigger project)	2012–2013	$42	• 7.5 miles of road expansion • Three bridges	• Cut down the overall timeline (no numbers)

Source: (*30*,*31*,*32*,*33*)

I-71/I-670 Interchange

The Columbus Crossroads project on the I-71/I-670 Interchange was a $200 million design-build project awarded to Kokosing Construction. The project featured reconstruction of 1 mile of I-71, 0.5 miles of I-670, and 18 ramps, 22 bridges, and 28 retaining walls. Because this project was design-build, construction was able to begin approximately 2.5 years earlier than with a traditional method, and the project saved $40 million.

I-71 Morrow Project Phase 1

The I-71 Morrow Project Phase 1 was a design-build awarded to Kokosing Construction. This project looked to expand 7.5 miles of road as well as rehabilitate or reconstruct three bridges. Costing $42 million, this project was under construction from 2012 to 2013 and cut down the overall timeline, according to an Ohio Department of Transportation pamphlet.

Utah

Legislation

Utah's design-build legislation has several key characteristics that make it unique. First, the legislation establishes a minimum estimated design-build price threshold at $50 million and allows a stipulated fee to be paid to unsuccessful proposals. The legislation then establishes that the DOT, as well as a public transit district with more than 200,000 residents, is not obligated to follow the price threshold and can award a project of any size. The legislation also allows contracts to include provisions for operations, maintenance, or financing (*34*). In addition, the legislation includes a clause stating that a project can be awarded for $5 million or less if it meets a certain level of criteria (*35*). However, this clause was repealed July 1, 2015 (*36*).

Projects Reviewed

Table A-6 shows the projects reviewed.

I-15 CORE

The I-15 CORE project is one of the highlights of design-build in the United States. This project, costing $1.1 billion and procured using a fixed-price/best-design method, allowed dollars to be stretched to give the project the best overall value. Provo River Constructors rebuilt 24 miles of roadway, added two additional lanes in each direction, and fixed 55 bridges. This project was completed at a substantial $260 million under the original budget, as well as two years ahead of the original schedule. This fast-paced build became the fastest billion-dollar public highway project ever built in the United States (*37*).

Pioneer Crossing: Lehi Design-Build

Pioneer Crossing was a $175 million design-build constructed by Kiewit and Clyde. Completed in 20 months, this project featured design innovation not originally envisioned by the sponsor but, due to the best-value approach, incorporated into the project. A divergent diamond interchange was added into the project, becoming the first one in Utah and only the third one in the United States (*38*). The implementation of the interchange into the design saved the state an estimated $17 million. This project was highlighted by 6 miles of a new five- to seven-lane road.

Table A-6. Summary of Key Utah Design-Build Projects.

Project	Construction Period (Years)	Construction Cost (Millions)	Specifications	Reported Outcomes
I-15 CORE	2009–2012	$1,100	• Reconstruct 24 miles of roadway • 80 structures • Diverging diamond interchange	• Able to stretch budget to add thicker concrete • Fastest billion-dollar highway construction project ever built in the United States • Completed $260 million under budget • Completed two years ahead of schedule • Won several awards
Pioneer Crossing: Lehi Design-Build	2008–2010	$175	• 6 miles of arterial roadway • New interchange with I-15 • New bridge over Jordan River • Divergent diamond interchange • Install a 60-inch pipe	• Because of allowed innovation, new building plan included the divergent diamond interchange (not in original plan) • Provided $17 million cost savings over original plan • Had to cope with poor soil and ground conditions with several innovative processes
I-15 South Layton Interchange	2009–2011	$95	• Bridge reconstruction • Remove original surface • Widen 2 miles of roadway	• Had to deal with poor soil conditions underneath bridge; adjusted accordingly • Had to work around limiting travel on I-15

Source: (*39,40,41,42,43,44,45*)

I-15 South Layton Interchange

The Layton Interchange on I-15 was a $95 million design-build project. Constructed by Ralph L. Wadsworth, this project featured reconstructing a bridge, widening 2 miles of roadway, and removing the original surface of the roadway. This project had to cope with poor soil conditions underneath the bridge and the need to minimize impacts on the traveling public on I-15 to the greatest extent possible.

Virginia

Legislation

Virginia's design-build enabling legislation has recently been updated. The old codes were repealed as of October 1, 2014, and replaced with Section 2.2-4306, which authorizes fixed-price design-build contracts. Under this new code, procurement should take place through a two-step competitive negotiation process with no more than five offerors being allowed to submit proposals. Design-build contracts can only be used for projects designated in the procedures adopted by the Secretary of Administration. The legislation also establishes that any locality with a population greater than 100,000 can enter into fixed-price design-build contracts (*46*).

Projects Reviewed

Table A-7 shows the projects reviewed.

Table A-7. Summary of Key Virginia Design-Build Projects.

Project	Construction Period (Years)	Construction Cost (Millions)	Specifications	Reported Outcomes
Route 460 Connector Phase 1	2011–2015	$113	• Twin bridges about 1,700 feet long and 250 feet high	• Design innovation (built across fault line/needed special peers) • Dealt with complexities due to location in mountains
Route 28 Corridor Improvements	2002–2009	$349	• 10 interchanges • Widen Route 28 from six to eight lanes	• First six interchanges opened ahead of schedule • Received a change order to construct another four • One of the next set of four opened two years early, two opened two months early, and one opened on time
Route 58 Expansion (Hillsville to Stuart)	Completed/ funded in three phases: 2004–2006 (1), 2011 (2), and 2016 (3)	$222	• Expand 36 miles between these cities in phases	• Needed first section completed quickly to avoid permit expiration • First two sections completed ahead of schedule and within budget (no numbers)

Source: (*47*,*48*,*49*,*50*,*51*,*52*)

Route 460 Connector Phase 1

The Route 460 Connector Phase 1 was a design-build awarded to Bizzack Construction, LLC, and cost $113 million. Under construction from 2011 to 2015, this project featured a complicated twin bridge structure 1,700 feet long and 250 feet high. Design innovation was a key component of this build because the bridge spanned a fault line that needed special peers. The project also had to cope with the complexities of the mountainous terrain.

Route 28 Corridor Improvements

The Route 28 Corridor Improvements project cost $349 million and was constructed by Clark Construction, Inc. The project added capacity and improved travel workflow by adding 10 new high-capacity interchanges, as well as widening Route 28 from six to eight lanes. The first group of six interchanges all opened ahead of schedule. This resulted in a change order for the next four, which saw one interchange open two years early and two others open two months ahead of schedule (*53*).

Route 58 Expansion

The Route 58 Expansion project from Hillsville to Stuart is being completed in three phases as funding becomes available. Constructed by Branch Highways, Inc., Phases 1 and 2—completed in 2006 and 2011, respectively—both finished within budget and ahead of schedule. Phase 3 was completed in summer 2016, ahead of schedule.

Washington

Legislation

Washington's design-build legislation grants permission to use this procurement method as long as the project has highly specialized activities in which design-build is critical, will lead to higher innovation, or will result in significant cost savings. One stipulation is that in most cases, the project must be over $10 million to be delivered via the design-build method. However, one key feature is that Washington law allows for projects between $2 million and $10 million to apply for design-build usage as long as they meet one of the stipulations listed above. Washington's design-build legislation also limits the amount of time a design-build can be used to procure operations and maintenance to three years. If a project needs more than three years, it must go to a committee for approval (*54*).

Projects Reviewed

Table A-8 shows the projects reviewed.

SR 167

Although the SR 167 Puyallup River Bridge falls short of the minimum threshold, this project was analyzed for its innovative process. This $31 million project was completed by Atkinson and Jacobs from 2014 to 2015 and replaced the existing outdated bridge structure. This project combined many innovative techniques, such as specially drilled shafts to withstand soil conditions and high-tech vibration monitors to make sure nothing else was damaged. One of the most interesting aspects of this build was the ability of the company to save the original, outdated bridge for later use by the Washington State Department of Transportation (WSDOT).

I-405/SR 520 Interchange Improvements Bellevue Braids

The I-405/SR 520 Interchange Improvements project cost $110 million. Designed and built by Atkinson and Jacobs, this project employed many innovative techniques to combat the problems originally associated with WSDOT's plan. The builders used massive communications programs to minimize the impact on the roadways, reducing the vehicles by 75 percent, thereby minimizing delays. The project also used different drilling techniques around the hospital area, which reduced drilling, noise, air quality concerns, and vibrations from the original WSDOT design. Work on this project included seven new bridges, more than 30 retaining walls, and pedestrian and biker safety features. This project was also completed more than seven months ahead of schedule.

Table A-8. Summary of Key Washington Design-Build Projects.

Project	Construction Period (Years)	Construction Cost (Millions)	Specifications	Reported Outcomes
SR 167 (Puyallup River Bridge)	2014–2015	$31	• Replace existing (outdated) bridge • Design new bridge with capacity for more lanes later • Enhance safety	• Able to replace steel bottom of bridge to allow trucks to use it • Saved the old bridge for later use • Design innovation: high-tech vibration monitor to make sure other areas are not damaged • Design innovation: drilled shafts to withstand soil conditions
I-405/SR 520 Interchange Improvements Bellevue Braids	2009–2012	$110	• Keep key access points for emergency vehicles • Seven bridges, 30 retaining walls, and recycling of pavement • Comprehensive public outreach • Stack ramps on top of each other	• Public campaign reduced vehicle use by 75 percent (minimized delays) • Completed seven months ahead of schedule • Large efforts in coordination/ communication
190 Snoqualmie Pass East	2011–2017	$177	• 1,200-foot-long bridge over avalanche chutes • Perform rock bolting • Improve 3 miles of roadway in Cascade Mountains	• Atkinson created a cost reduction incentive proposal • Had to adapt to changing soil conditions • Design innovation led to no road closures for avalanches • Environmental/wildlife crossing

Source: (*55*,*56*,*57*,*58*,*59*)

190 Snoqualmie Pass East

The 190 Snoqualmie Pass East project demonstrates a design-build with some positive outcomes. Although this project is still under construction, several effects of design-build can already be seen. Atkinson proposed a different idea than the original design, and Atkinson will now replace the snowshed with a bridge-type structure to allow avalanches to go underneath the highway instead of over it. This innovation will all but eliminate road closures and save an estimated $37 million in maintenance costs. This project includes twin 1,200-foot-long bridges, drill and blast rock excavation, and 3 miles of roadway widening at the summit of Snoqualmie Pass. Atkinson's website currently lists a completion date of 2016 even though the project was scheduled through September 2017.

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Appendix B: Texas Project Summaries

DFW Connector

Project Description

The DFW Connector project involves the expansion and rehabilitation of the SH 114 and SH 121 corridors in the Dallas-Fort Worth (DFW) metro area. The project is 14.4 miles in length, 4.1 of which is tolled, and runs through parts of Southlake and Grapevine (*1*). The original project would also have reconstructed six interchanges along seven highways in the area. According to the Texas Department of Transportation (TxDOT), the original scope of the DFW Connector project intended to double the existing capacity of highway facilities along the north entrance to the DFW International Airport. However, funding constraints deferred some segments of the project (*2*).

In early 2013, funding was identified for one of the deferred segments, the FM 2499 segment, which included rebuilding the main lanes of the facility from SH 121 to Denton Creek. In addition to the FM 2499 segment, funding was identified for two more segments originally deferred. The SH 121/360 ramps project identified funding in late 2014, and the SH 121/SH 360 interchange project identified funding in early 2016 (*2*).

TxDOT identified several needs that the project addressed (*3*):

- Improve regional mobility and air quality.
- Enhance safety and address acute and growing congestion.
- Significantly rehabilitate existing infrastructure.
- Reflect a high-priority project in the DFW region.
- Provide managed lanes with complete electronic toll collection, compatible with all other toll road networks in Texas.

Procurement and Contract

The procurement for this project used a best-value approach. A request for qualifications (RFQ) was issued in December 2006. TxDOT short-listed four proposing teams and then issued a subsequent request for detailed proposals in March 2008. The revised pricing proposals garnered two responses: Gateway Connector Constructors, JV, and NorthGate Constructors, JV.

The scoring for the project used two factors. Out of a possible 100-point total, 80 points were allocated for cost proposals, and 20 points were allocated based on a qualitative technical evaluation. The qualitative technical evaluation consisted of (*3*):

- Technical solutions.
- Project management plan.

- Quality management plan.

The price proposal also consisted of three configurations, each with a corresponding point total. The three included the “price value for each configuration calculated as sum of Present Value of monthly construction payments, ATC adjustments and fifteen years of capital maintenance” (*3*). The lowest price in each configuration received full point value.

In March 2009, TxDOT identified NorthGate Constructors, JV, as the best value. The group was conditionally awarded the contract to develop, design, and construct the project.

For the project, TxDOT used a comprehensive development agreement (CDA) design-build to deliver this project. In addition to the CDA, a capital maintenance agreement (CMA) was reached. The CMA outlined three five-year terms of maintenance requirements by the contractor after the project has reached substantial completion; the next two five-year terms are optional (*3*).

Project Cost and Funding

The estimated total cost for the DFW Connector project is $1.3 billion. Table B-1 shows a more detailed breakdown of project costs.

Table B-1. DFW Connector Estimated Costs.

Description	Estimated Cost
Design/construction	$1,097,343,138
Right of way	$127,800,000
Utilities	$30,300,000
Tolling/intelligent information systems (ITS)	$33,429,005
Contingencies	$5,862,513
Total capital costs	**$1,294,734,656**

Source: (*1*)

Table B-2 shows the funding sources identified for the completion of this project.

Project Schedule

The NorthGate Constructors, JV, was conditionally awarded the contract in March 2009. The CDA design-build contract was then executed, and the first notice to proceed was in October 2009. The initial project scope reached substantial completion on November 22, 2013, and was open to traffic on April 1, 2014 (*1*). Construction of the FM 2499 section of the project began in August 2013 after funding was identified and is expected to be completed in January 2017.

Table B-2. DFW Connector Estimated Funding.

Funding Source	Amount
Approved TxDOT funds	$687,000,000
American Recovery and Reinvestment Act of 2009 funds (stimulus)	$260,800,000
Proposition 14 tax exempt bond proceeds (TxDOT)	$127,800,000
Utilities/Proposition 14	$30,300,000
Proposition 12	$31,700,000
Proposition 14 (fall 2012 Certificates of Obligation)	$17,200,000
Surface Transportation Program—Metropolitan Mobility (STP-MM)	$7,500,000
Category 1-FTW	$1,400,000
FM 2499 Certificates of Obligation — Proposition 14	$97,605,651
Tolling ITS	$33,428,005
Total funding sources	**$1,294,734,656**

Sources: (*1*)

Alternative Technical Concepts

For this project, 52 ATCs were submitted by all proposers. Of these, 16 ATCs were accepted, six of which came from the winner of the contract. During the course of the project, four of the accepted ATCs were executed in the contract, all of which came from the winning contractor (*4*).

Project Cost and Time Savings

According to data received by TxDOT, the use of ATCs reduced proposed project delivery time from the original engineer's estimate from 1,734 days to 1,702 days (*4*). The estimated value of the ATCs is $31,400,000.

Energy-Sector Roadway Repair Project

Project Description

The Energy-Sector Roadway Repair Project provided for the reconstruction, rehabilitation, or repair of 31 roadways and bridges in different locations across the Eagle Ford Shale region of Texas. The project locations were all on the state highway system, and the roadway damage was a result of higher than normal use of heavy vehicles used in the development and production of oil and gas (*5*). The 31 locations included in this project were in four TxDOT districts: the Corpus Christi, Yoakum, Laredo, and San Antonio Districts.

Procurement and Contract

This project was not a typical design-build project. According to TxDOT, all proposers were given design plans during the procurement phase prior to contract execution. Those proposing on the project were asked to construct the roadways based on their ability to deliver the project within the allotted 540 days. Additionally, as part of the competitive procurement process, TxDOT asked each of the proposers to submit a price along with the number of projects it could deliver for a budget of $150 million.

The request for proposals (RFP) allowed for up to 31 project locations to be included in the contract. The selected, best-value proposal included 27 projects, for a price of $149,995,000. A cost for each of the four additional projects was submitted with the proposal, and these costs were factored into the determination of the best-value proposal. Because of the favorable prices received from the selected proposal, TxDOT exercised its option to add four additional project locations to the contract. This was later reduced to three additional project locations due to TxDOT-initiated change orders. This increased the base contract by $27.55 million for the three additional project locations. Change orders initiated by TxDOT totaled nearly $12 million, while the only change order initiated by the contractor resulted in a reduction of $26,560 (*6*).

The contractor did provide a warranty as part of the contract.

Project Cost and Funding

The total cost of the Energy-Sector Roadway Repair Project was approximately $189,328,347. Table B-3 provides additional details of the project costs.

Table B-3. Energy-Sector Roadway Repair Estimated Project Costs.

Description	Cost
Original contract base	$149,995,000
Additional contract options	$27,555,500
Revised contract base	$177,550,500
Change orders	$11,777,847
Revised total project cost	**$189,328,347**

Source: (*6*)

The funding for the Energy-Sector Road Repair Project came from several different TxDOT funding categories, shown in Table B-4.

Table B-4. Energy-Sector Roadway Repair Project Estimated Funding Sources.

TxDOT Funding Source	Amount
Fund 6	$150,000,000
Category 1 (statewide)	$32,870,500
District’s Category 1	$6,448,554
District’s Category 11	$9,293
Total funding sources	**$189,328,347**

Source: (*5*)

Project Schedule

The contract for the project was executed in February 2014, with the first notice to proceed given in March 2014. The estimated substantial completion for the project was set for October 2015 and final acceptance in November 2015.The procurement of this project was completed within the time and budget allotted. The procurement was done on an accelerated schedule of 5.5 months (*6*).

Alternative Technical Concepts

For this grouping of projects, 29 ATCs were submitted, of which nine were accepted. The winning proposal contained five of the nine accepted ATCs. According to data received from TxDOT, none of the ATCs were executed in the contract (*4*).

Project Cost and Time Savings

According to data received by TxDOT, the proposed project delivery time from the original engineer's estimate was reduced from 754 days to 540 days (*4*).

Dallas Horseshoe Project

Project Description

The Horseshoe project will replace the I-30 and I-35E bridges spanning the Trinity River, as well as a portion of the Mixmaster, near downtown Dallas. This includes the construction of the Margaret McDermott Bridges. Additional lane construction and geometric corrections are part of the project.

The project uses the design-build project delivery method. This project was given high priority due to the increasing bridge and maintenance costs (*7*). According to TxDOT, the purpose and need of this project include the following (*7*):

- Within the project limits, I-30 and I-35E carry hundreds of thousands of vehicles per weekday.
- The roadway is ranked in the 20 most congested roadways in Texas.
- Bridges built in the 1930s and 1950s are rapidly deteriorating.
- Maintenance and repair costs have increased in recent years.
- Local stakeholders raised the priority to develop a solution that addresses the safety and congestion concerns and is financially attainable.

Procurement and Contract

On February 20, 2013, a design-build agreement for the design and construction of the Horseshoe project was executed (*8*). Along with the design-build agreement, a CMA was also executed. The CMA will begin one year after substantial completion of Segment A and has an initial term of five years. There are two optional maintenance terms with an additional five years each. The CMA has a maximum term of 15 years (*9*).

TxDOT issued an RFQ on December 9, 2011, for the Horseshoe design-build contract. A short list of teams was announced in March 2012, and teams were invited to submit a detailed proposal. An RFP was originally issued on July 3, 2012.

A best-value scoring method was used, with the following scoring factors (*10*):

- Price (70 points).
- Technical solutions (15 points).
- Project management plan (12 points).
- Quality management plan (3 points).

In November 2012, Pegasus Link Constructors was conditionally awarded to enter into a design, construction, and CMA for the development of the project, with a best-value score of 91.72 out of 100 (*10*,*11*).

Project Cost and Funding

The estimated total project cost for the Horseshoe project is $804,078,967. Table B-5 provides additional details on estimated project costs.

Table B-5. Horseshoe Project Estimated Project Costs.

Description	Cost
Design/construction	$742,078,967
Rights of way	$40,000,000
Utilities	$22,000,000
Total capital costs	**$804,078,967**

Source: (*12*)

The funding for the Horseshoe project came from several different TxDOT funding categories, shown in Table B-6.

Table B-6. Horseshoe Project Estimated Funding Sources.

TxDOT Funding Source	Amount
Proposition 12 P2 Preliminary Engineering/Right-of-Way	$100,755,000
Proposition 12 P2 Transportation Management Area	$87,103,000
Proposition 12 P2 Bridge	$400,500,000
Proposition 12 P1	$16,300,000
Proposition 14	$7,000,000
SH 121 Regional Toll Revenue	$21,450,000
Category 6 Federal Bridge	$75,000,000
Category 7 STP-MM	$4,450,000
Category 10 High Performance Steel Demonstration Project/Earmarks	$106,375,987
Category 3 Local Funds (overrun)	$8,438,228
Category 3 Local Funds (change order)	$1,048,565
Category 9 Transportation Enhancements	$4,000,000
Transfer Funds to Southern Gateway	($20,000,000)
Total funding sources	**$812,420,780**

Source: (*12*)

Project Schedule

The design-build contract was executed on February 20, 2013, and the first notice to proceed was given on February 28, 2013. Segment A of the project is anticipated to reach substantial completion in February 2017, while Segment B is anticipated to reach substantial completion in April 2017 (*12*).

Alternative Technical Concepts

Thirty-two ATCs were submitted as a part of the procurement process. Of these submitted, 17 were accepted by three proposers. Seven ATCs from the best-value proposer were accepted. In addition, TxDOT and the proposer agreed to incorporate two additional ATCs, bringing the total to nine. Nine ATCs were included in the executed contract, seven of which from the best value proposer were accepted (*4*).

Project Cost and Time Savings

Data received from TxDOT show that the use of the nine ATCs in the executed contract represented a total estimated value of $16.7 million (*4*).

Time savings were also seen in this project. The original engineer's estimate for the entire project was 1,530 days. The successful proposer estimated project completion from the first notice to proceed at 1,455 days for Segment A and 1,500 days for Segment B (*4*).

According to TxDOT, "The new tools provide the opportunity to close the project funding gap and construct the project at least four years sooner than conventional project development methods could. Utilizing design-build allowed the project to get underway by late-2013 and be completed as early as summer 2017" (*13*). The estimated value of the ATCs is $16,700,000.

I-35E Managed Lanes

Project Description

The I-35E Managed Lanes project is the reconstruction of the 28-mile corridor of I-35E from US 380 to I-635 in the DFW area. In addition to the reconstruction of main lanes, managed lanes outfitted with dynamic pricing equipment will be constructed. This project consists of three segments:

- Segment 1: the south end, which is from I-635 to Bush Turnpike (5.5 miles).
- Segment 2: the middle portion, which is from Bush Turnpike to FM 2181 (12.1 miles).
- Segment 3: the north end, which is from FM 2181 to US 380 (10.5 miles).

The I-35E corridor functions as a major transportation facility for hundreds of thousands of commuters. The roadway creates linkages for DFW commuters, freight traffic, and students to and from large universities in the Denton area. TxDOT has identified to two major benefits of this project to the existing facility (*14*):

- Reduced congestion; congestion results in lost work time, increased fuel costs, and higher price of goods.
- Improved mobility across Lake Lewisville with construction of a second bridge that will offer more reliability for commuters during major incidents.

Procurement and Contract

The procurement for this project used a best-value scoring method. In January 2012, the original RFQ was issued, and four teams were short-listed for the project. In April 2012, an RFP was issued to the teams.

RFP responses were scored based on scope, price, schedule, and technical factors. The scores were recorded out of a possible 100-point total. The following criteria were the basis for the allocation of points (*15*):

- Base price scope (70 points).
- Options price score (10 points).
- CMA price score (5 points).
- Technical score (15 points).

Through this scoring method, AGL Constructors was selected for the project. In December 2012, AGL Constructors was conditionally awarded the contract.

The contract used for this project was a CDA design-build. In this document, TxDOT enters into an agreement with AGL Constructors to "develop, design and construct tolled managed lanes, general purpose lanes and associated facilities along all or a portion of the 28-mile section of Interstate Highway 35E from I-635 in Dallas County to US 380 in Denton County…" (*16*).

In addition to the development and construction of the project, TxDOT entered into a 15-year CMA for the maintenance of the project. The CMA includes an initial five-year term and has the option for two additional five-year terms. This CMA has a maximum term of 15 years (*16*).

Project Cost and Funding

The total estimated cost for this project is $1,362,916,396. Table B-7 gives a more detailed breakdown of project costs.

The funding sources shown in Table B-8 were identified for the completion of this project.

Table B-7. I-35E Managed Lanes Project Estimated Costs.

Description	Estimated Cost
Design/construction	$1,004,072,051
Utilities	$61,816,554
Subtotal	**$1,065,888,605**
Right of way	$233,509,249
Tolling/ITS	$44,100,000
Environmental commitments	$6,270,849
Contingencies	$13,147,693
Total capital costs	**$1,362,916,396**

Source: (*17*)

Table B-8. I-35E Managed Lanes Estimated Funding.

Funding Source	Amount
Category 2—Mobility Corridors 12	$90,876,056
Category 3—Proposition 12	$44,000,000
Category 3—RTR Funds	$325,476,841
Category 3—Local	$4,064,567
Category 5—Congestion Mitigation Air Quality	$153,875,900
Category 6—Highway Bridge Category 10	$1,780,000
Category 7—STP-MM	$15,506,105
Category 10— High Performance Steel Demonstration Project /Earmarks	$18,046,046
Category 12	$296,390,000
State highway funds	$127,900,881
Pending Transportation Infrastructure Finance and Innovation Act (TIFIA) loan	$285,000,000
Total funding sources	**$1,362,916,396**

Source: (*17*)

Project Schedule

The first notice to proceed for the project was given on May 30, 2013. The project is expected to reach substantial completion by May 2017 (*13*).

Alternative Technical Concepts

Thirty-one ATCs were accepted out of a total 71 submitted by proposers. The winning proposer submitted seven of the accepted ATCs with the other (non-winning) proposers submitting a total of 24. However, the executed contract only included the seven ATCs submitted by the winning proposer (*4*).

Project Cost and Time Savings

This CDA design-build project had an estimated completion date of 1,460 days from the first notice to proceed. The successful proposer estimated 1,269 days from the first notice to proceed, representing a reduction in total project delivery time by nearly 200 days (*4*). The estimated value of the ATCs is $75,400,000.

SH 183 Managed Lanes (Midtown Express)

Project Description

The SH 183 project is the design, construction, financing, and maintenance of 27.8 miles of managed lanes in the DFW metroplex. Reconstruction of portions of the main lanes and frontage lanes, right-of-way acquisition, and construction of one managed toll lane in each direction are included in the agreement (*18*). The project is divided into minimum base scopes and additional scope components. The minimum base scope is 19.6 miles in length and includes the development of the following (*19*):

- SH 183 from SH 121 to I-35E (14.8 miles).
- LP 12 from SH 183 to I-35E (2.5 miles).
- SH 114 from SH 183 to Rochelle (2.3 miles).

There were four additional scope components (roadways) totaling 8.2 miles. The addition of these roadways was not required in proposals submitted by teams but affected ranking in the tiered selection process.

Procurement and Contract

This project used a tiered best-value approach in selecting a contractor: "The best value determination will be based on the responsive Proposal with the highest Total Proposal Score from among those with the highest number of Additional Scope Components in their Base Scope" (*20*). The scoring included a 100-point maximum, with a price score with a maximum of 70 points and a technical score with a maximum of 30 points The price score was adjusted to reflect the base scope price, additional scope price(s), the operations and maintenance (O&M) base scope price, the O&M additional scope price(s), and the schedule adjustment amount as applicable. The technical score was calculated based on the evaluations core from the project development plan (*20*). These projects were then ranked in a tiered system using the following rules (*20*):

1. Proposals will be sorted into tiers based on the number of additional scope components proposers include in their base scope as identified in Form M-1.
2. The price score and total proposal score for each proposal will be calculated by comparing among proposals within the same tier.
3. Proposals within each tier will be ranked in order of highest to lowest total proposal score.
4. As compared between tiers, the proposals in the tier with the greater number of additional scope components in their base scope will be ranked higher than those proposals in a tier with fewer additional scope components regardless of the calculated total proposal score of each proposal.

The scores out of 100, shown in Table B-9, were given as a result of the tiered selection process. A CMA was reached.

Table B-9. SH 183 Managed Lanes (Midtown Express) Best-Value Scoring Results.

Proposer	Scope and Components	Score
Tier 1		
Southgate Mobility Partners	Base minimum scope, plus components 1, 2, 3, and 4	90.57
Tier 3		
Airport Expressway Partners	Base minimum scope, plus components 1 and 2	93.52
SH 183 Mobility Partners	Base minimum scope, plus components 1 and 2	82.76

Source: (*21*)

The best-value proposer was the Southgate Mobility Partners group with a Tier 1 best-value proposer score of 90.57 out of 100 (*21*).

A CDA design-build agreement was executed for the SH 183 Managed Lanes project. The agreement between TxDOT and Southgate Mobility Partners, LLC, requires the design-builder to "develop, design, construct, finance, operate and maintain tolled managed lanes, general purpose lanes and associated facilities along an approximately 14-mile segment of State Highway ('SH') 183 from SH 121 to Interstate Highway 35E ('I-35E'), which includes the portion of SH 183 known as Segment 2E, and related connecting facilities, in Dallas and Tarrant Counties (the 'Project')" (*21*). The contractor is required to perform O&M duties as defined and required by contract documents for up to 25 years. The O&M costs are to be revaluated using a formula set by TxDOT on every five-year anniversary of the project for five consecutive terms (*21*).

Project Cost and Funding

The estimated total project cost for the SH 183 Managed Lanes project is $1,021,746,006. Table B-10 provides additional details on estimated project costs.

Table B-10. SH 183 Managed Lanes (Midtown Express) Project Estimated Costs.

Description	Cost
Design/construction	$759,006,806
Utilities	$97,000,000
Subtotal	**$856,006,806**
Right of way	$150,000,000
Tolling/ITS	$15,739,200
Total capital costs	**$1,021,746,006**

Source: (*22*)

The funding for the Midtown Express came from several different TxDOT funding categories, shown in Table B-11.

Table B-11. SH 183 Managed Lanes (Midtown Express) Project Estimated Funding.

TxDOT Funding Source	Amount
Category 2	$109,440,001
Category 7	$525,000
Category 10	$13,019,178
Category 12 (Commission Strategic)	$602,300,001
Local funds	$10
Total funding identified	**$725,284,190**
Right of way	$177,587,569
Subtotal of funding	**$902,871,759**
Pending TIFIA loan	$119,107,950
Total funding	**$1,021,979,709**

Source: (*22*)

Project Schedule

On May 29, 2014, Southgate Mobility Partners was conditionally awarded a design-build agreement for the completion of the SH 183 Managed Lanes project in Dallas. The contract was executed on November 20, 2014, with a notice to proceed on December 2, 2014. The project is anticipated to reach substantial completion in June 2018 (*22*).

Alternative Technical Concepts

TxDOT reported that 82 ATCs were submitted for this CDA design-build project. Of those submitted, 37 ATCs were accepted, with 13 then being included in the executed contract. Of the 13 included in the contract, the successful proposer submitted 12 (*4*).

Project Cost and Time Savings

This CDA design-build project had an estimated completion date of 1,540 days from the first notice to proceed. The successful proposer estimated 1,260 days from the first notice to proceed, representing a reduction in estimated project delivery time by nearly 300 days (*4*). The estimated value of the ATCs is $66,200,000.

State Highway 360

Project Description

The SH 360 project is the construction of an approximately 9.7-mile, four-lane controlled-access facility in the southeastern portion of Tarrant County. The base scope of work includes the following (*23*):

- Two tolled main lanes in each direction from E. Sublett Road/W. Camp Wisdom Road to Broad Street.
- One tolled main lane in each direction with alternating passing lane (Super 2 configuration) from Broad Street to Matlock Road.

- A northbound frontage road from Heritage Parkway to US 287.
- A continuous northbound and southbound frontage road at Union Pacific Railroad.
- Repair and resurfacing of existing frontage roads.

Three optional project scopes were included in the project. These scopes involved several work items for the SH 360 main lanes, US 287 interchange, and various cross-street improvements.

Procurement and Contract

An RFQ was originally issued on March 3, 2014. On June 26, 2014, TxDOT announced a short list of the most qualified teams (*24*). These teams were invited to submit responses to an RFP originally issued on September 8, 2014 (*25*).

The selection process used a best-value approach, which looked at both price and non-price factors. The following scoring system was used (*23*):

- Price (including design, construction, and maintenance components) (80 points):
  - Base scope (75 points).
  - Option 1 (15 points).
  - Option 2 (5 points).
  - Option 3 (5 points).
- Technical (20 points):
  - Technical solutions.
  - Project management plan.
  - Quality management plan.

The best-value proposer selected was the Lane Construction Company/J.D. Abrams, JV, with a score of 93.02 out of a 100 (*23*).

This project uses a design-build agreement for the design and construction of the SH 360 project. The following work specifications are as found in the Design Build Agreement (*26*):

> Approximately 9.2 miles of improvements to SH 360 consisting of two toll lanes in each direction from approximately E. Sublett Road/Camp Wisdom Road to East Broad Street and one toll lane in each direction with periodic passing lanes (Super 2 configuration) from East Broad Street to US 287, in addition to frontage road and intersection improvements from E. Sublett Road/Camp Wisdom Road to US 287 (the "Project"). The Project includes the Base Scope, Option 1, Option 2, the Authority Options for the Base Scope and Option 1 and, upon the issuance of one or more Option Notices to Proceed for any or all of Options 3A-3I, such Option 3 Work, including the Authority Options for such Option 3 Work. In addition, TxDOT wishes to enter into an agreement with the DB Contractor to, at TxDOT's sole option, maintain the Project for specified optional terms.

In addition to the DBA, a comprehensive maintenance agreement (COMA) was reached between TxDOT and the Lane-Abrams Joint Venture group. The COMA has a 15-year maximum term split into three five-year terms (*27*).

Project Cost and Funding

The estimated total project cost for the SH 360 project is $323,935,034. Table B-12 provides additional details on estimated project costs.

Table B-12. SH 360 Project Estimated Costs.

Description	Cost
Design/construction	$221,686,000
Utilities	$9,987,000
Tolling/ITS	$15,841,000
Option 1	$2*
Option 2	$11,659,000
Option 3	$26,516,891
Subtotal	**$285,689,893**
Right of way	$6,737,800
Contingencies	$31,507,341
Total capital costs	**$323,935,034**

* TxDOT received an offer from the best-value proposer to deliver Option 1 basically at no cost. Option 1 consists of extending two toll lanes in each direction from E. Broad Street to south of Matlock Road. Option 1 includes grade-separating the SH 360 toll lanes at Matlock Road and providing ramp connections from the main lanes to the frontage roads south of Matlock Road to access US 287 as shown on the Option 1 exhibit (2+2 to US 287 including Matlock Road Overpass) (*4*).

Source: (*28*)

The funding for the SH 360 project came from several different TxDOT funding categories, shown in Table B-13.

Table B-13. SH 360 Project Estimated Funding.

TxDOT Funding Source	Amount
Category 3	$300,000,000
Category 11	$2*
TxDOT Right of way	$3,053,200
Subtotal	**$303,053,202**
Regional funding	$31,120,000
Total funding	**$334,173,202**

Note: Category 11 refers to District Discretionary, meaning this source of planning dollars is more flexible in its uses than Surface Transportation Program or Maintenance categories. This category serves as a place holder in case future additional money is needed from this category.

Source: (*28*)

Project Schedule

Environmental assessments for the project and agreements between North Texas Tollway Authority and TxDOT were completed in early 2014. The design-build contract execution for the SH 360 project and a notice to proceed both occurred on May 15, 2015. The project is expected to reach substantial completion in August 2017 (*28*).

Alternative Technical Concepts

The SH 360 projects received 84 ATC submittals from proposers. TxDOT accepted 36 of the submitted ATCs and included 10 in the executed contract. All of the 10 selected ATCs belonged to the winning proposer (*4*).

Project Cost and Time Savings

This project received an initial schedule estimate from TxDOT's engineers of 1,025 days to reach substantial completion. The successful proposal estimated that the project would take 810 days, which represents a 21 percent reduction in project delivery time (*4*).

TxDOT engineers estimated a total project cost of nearly $358 million. However, the successful proposal's total estimate was approximately $327 million (*4*). The latest total cost estimate provided by TxDOT is approximately $324 million (*28*). The estimated value of the ATCs is $10,900,000.

Loop 375 Border Highway West Extension Project

Project Description

The Loop 375 Border Highway West Extension will connect the loop around El Paso on the western end. The project limits for this project extend from Racetrack Drive near Doniphan Drive and New Mexico Highway 273 to US Highway 57 east of downtown El Paso. According to the Abbreviated State Final Environmental Impact Statement, this project will be a four-lane, controlled-access toll facility (*29*). Newly constructed lanes will be tolled facilities. All existing non-tolled lanes will remain non-tolled.

According to TxDOT, the Loop 375 Border Highway West Extension Project will provide the following benefits to Texas travelers (*30*):

- Better connectivity around El Paso.
- Additional infrastructure to accommodate future growth.
- Congestion relief.
- Improved access to the university, downtown, and medical centers.
- Better incident management and a safer roadway.

Procurement and Contract

An RFQ for the project was originally issued in July 2013. In October of that same year, TxDOT announced a short list of candidates to compete for the project by submitting detailed proposals. The RFP was originally issued in December 2013, with the final version issued in March 2014 (*31*).

The evaluation and selection of a contractor for the project followed a best-value process. The scoring method used both cost and non-price factors. The following scoring system was used (*31*):

- Price (80 points):
  - Design.
  - Construction.
  - Option.
  - Maintenance.
- Technical (20 points):
  - Technical solutions.
  - Project management plan.
  - Quality management plan.

This project was awarded to Abrams-Kiewit, JV, with a score of 95.07 out of a possible 100 points (*27*).

TxDOT entered into a CDA design-build, with a COMA, with Abrams-Kiewit, JV, to develop, design, construct, and maintain improvements made along Loop 375 (*32*). The COMA on this project was for three five-year terms (*33*).

The project was completed within the schedule and budget set for the project (*33*).

Project Cost and Funding

The estimated cost for this project is $639,500,000. Table B-14 shows these costs in more detail.

Table B-14. Loop 375 Border West Expressway Estimated Project Capital Costs.

Description	Estimated Cost
Design/construction (utilities included)	$447,600,000
Right of way	$102,000,000
Tolling/ITS	$22,000,000
Other costs	$67,900,000
Total capital costs	**$639,500,000**

Source: (*34*)

The project was entirely state funded, and no local or federal money was included. The funding for this project comes from one source: Category 3 Texas Mobility Fund.

Project Schedule

The project contract was executed in August 2014, with the first notice to proceed given in October 2014. At this time, service is expected to begin in October 2017, with final project acceptance in February 2018 (*34*).

Alternative Technological Concepts

The Loop 375 Border Highway West Extension Project received 72 submitted ATCs from proposers. Of the 72, 43 ATCs were accepted by TxDOT, six of which were submitted by the winning proposer. Eight of the 43 accepted ATCs were included in the executed contract (*4*).

Project Cost and Time Savings

The estimated value of the ATCs is $47,000,000. Project time savings data are currently pending.

Loop 1604 Western Extension

Project Description

The purpose of the Loop 1604 Western Extension project is to upgrade Loop 1604 in northwest Bexar County from FM 471 to SH 16. According to TxDOT, the proposed project will be a 5-mile non-toll four-lane expressway that will include a new overpass at Shaenfield Road and Braun Road (*35*). This project also includes frontage roads, city street connections, and tie-in transitions to the existing Loop 1604 highway (*36*).

Procurement and Contract

The original RFQ for this project was distributed in January 2013. In March 2013, the short list of qualified teams and equity members was announced. These teams were invited to submit detailed proposals through an RFP process.

An RFP was issued in April 2013, with the final version of that document issued in July 2013. The submittals by each team were evaluated using a best-value method. The scoring method used both cost and non-price factors. The cost proposals were adjustment based on options and ATCs. The following criteria were used in the scoring process (*37*):

- Price (80 points):
  - Design.
  - Construction.
- Technical (20 points):
  - Technical solutions.
  - Project management.
  - Quality management.
  - Safety and health plans.

This project was awarded to Williams Brothers Construction Co., Inc., with a score of 94.92 out of a possible 100 points (*37*).

The contract used in this project was a design-build agreement with warranty. The project initiated under the design-build legislation as opposed to using CDA authority. The agreement calls for the contractor to "design and construct improvements along Loop 1604 from FM 471 (Culebra Road) to SH 16 (Bandera Road) in San Antonio, Bexar County (the 'Base Scope'), and, at TxDOT's sole option, to design and construct improvements along portions of Loop 1604 farther south at SH 151 (the 'Option')" (*38*).

The procurement of the project was completed within the schedule and budget set for the project (*33*).

Project Cost and Funding

The estimated project costs for the Loop 1604 Western Extension project are approximately $126 million. Table B-15 shows these costs in more detail.

Table B-15. 1604 Western Extension Estimated Project Capital Costs.

Description	Estimated Cost
Design/construction (base)	$80,955,063
Design/construction (option)	$44,031,139
Right of way	$0
Utilities (reimbursable)	$0
ITS (non-tolled)	$600,000
Total capital costs	**$125,586,202**

Source: (*33*)

The funding for this project comes from several different state sources, shown in Table B-16. No local or federal money was used in this project.

Table B-16. Loop 1604 Western Extension Estimated Funding Sources.

Funding Source	Amount
Proposition 14	$59,800,000
Category 3 Advanced Transportation District	$27,200,000
Category 12	$18,000,000
Proposition 14 B	$15,000,000
Proposition 12 PE	$4,000,000
Category 1	$1,500,000
Category 11	$500,000
Total funding sources	**$126,000,000**

Source: (*33*)

Project Schedule

The project contract was executed in December 2013, with the first notice to proceed coming in the same month. In March 2014, the project broke ground. Substantial completion of the base contract is expected in October 2016, and substantial completion of the options is expected to be completed in January 2017 (*33*).

Alternative Technological Concepts

Thirty-nine ATCs were submitted for this project, with 15 being accepted and five being implemented in the final contract. The winning proposer submitted three of the five used, while the other proposers submitted two (*4*).

Project Cost and Time Savings

The five ATCs used in the project received an estimated value of $1,900,000. The engineer's original estimate of project cost was approximately $118 million, while the winning proposer's estimate came in higher at slightly over $126 million (*4*).

The original project timeline estimated by TxDOT was the same as the estimate from the winning proposer at 910 days for the base scope and 700 days for the optional work (*4*).

SH 99/Grand Parkway Segment F-1, F-2, and G

Project Description

SH 99, also known as Grand Parkway, is a 182-mile circumferential highway that will ultimately traverse seven counties in the Houston metropolitan area. The project is broken into 11 segments that are designated A through I-2. This case study focuses on Segments F-1, F-2, and G. These segments constitute 38 miles of new toll roads northwest of Houston in both Harris and Montgomery Counties. The project also calls for discontinuous frontage roads from US 290 to US 59/I-69 (*39*).

As noted on its website, TxDOT is authorized to develop the segments of Grand Parkway that are located in Harris and Montgomery Counties (*40*).

Procurement and Contract

The original RFQ for this project was distributed in November 2011, and a short list of the most qualified teams was announced in February 2012. These teams were invited to submit a proposal through the RFP process. The teams and equity members were evaluated using a best-value selection method. The following scoring method was used (*41*):

- Base price (75 points):
    - Design.
    - Construction.
    - Capital maintenance costs.
- Option price (5 points).
- Project development plan (10 points):
    - Project management plan.
    - Quality management plan.

- Schedule (10 points):
    - Ratio of total days saved to the predetermined schedule benchmark savings.

The Texas Transportation Commission conditionally awarded the contract to Odebrecht Construction and Zachry Construction Corporation on September 27, 2012, with a score of 92.20 out of a possible 100 total points (*41*).

The project delivery method used in this project was design-build with a CMA. The CMA on this project was for three five-year terms, with a mandatory first five-year term and two succeeding optional five-year terms at TxDOT's discretion (*33*). This project was authorized under the CDA authority.

The contractor did provide a warranty as part of the contract.

Project Cost and Funding

The estimated project costs for SH 99 Segments F-1, F-2, and G are approximately $1.5 billion. Table B-17 shows these costs in more detail.

Table B-17. SH 99/Grand Parkway Estimated Project Capital Costs.

Description	Estimated Cost
Design/construction	$969,777,061
Environmental mitigation	$40,380,240
Right of way	$417,000,000
Utilities	$75,866,066
Tolling	$34,600,000
Total capital costs	**$1,537,623,367**

Source: (*39*)

The funding for this project comes from one source, toll revenue bonds, shown in Table B-18.

Table B-18. SH 99/Grand Parkway Segments F-1, F-2, and G Project Estimated Funding Sources.

Funding Source	Amount
Grand Parkway system toll revenue bonds	$1,537,623,367

Source: (*39*)

Project Schedule

The contract for the project was executed in March 2013, with substantial completion expected in the first quarter of 2016 and final acceptance in summer 2016. The project was completed within the time schedule and on budget (*40*).

Alternative Technological Concepts

This project received 42 ATC submittals by prospective contractors. Of the 42, 18 were accepted by TxDOT. The winning proposers submitted seven of these ATCs. The executed contract included 13 of the 18 accepted ATCs, which represents a 72 percent acceptance rate (*4*). This rate is the highest of any design-build or CDA design-build project investigated in this report.

Project Cost and Time Savings

The successful proposer's estimate for each of the three segments was reduced from 1,092 to 845 days based on the original engineer's estimate. The estimated value of the ATCs is $27,700,000.

SH 71 Toll Lanes

Project Description

The SH 71 Express Lanes project will create 3.9 miles of new toll lanes in each direction between Presidential Boulevard at the Austin-Bergstrom Airport and SH 130. Costing under $100 million, this is the smallest design-build project being examined in this report. The project will feature bicycle facilities and an accompanying pedestrian plan (*42*).

Procurement and Contract

For this project, a best-value approach for contractor selection was used. The original RFQ for this project was issued on November 15, 2013. Ten teams responded to the RFQ, and on January 17, 2014, TxDOT announced a short list of the most qualified teams. A short list of teams was invited to submit detailed proposals on the project. TxDOT issued the original RFP on March 4, 2014. The contractor did provide a warranty as part of the contract.

This procurement process used a best-value approach using price and technical/aesthetic criteria. The following details the criteria used as the basis for selection (*42*):

- Price includes (85 points):
  - Design.
  - Construction.
- The technical and aesthetics score is based upon (15 points):
  - Technical solutions.
  - Project management plan.
  - Quality management plan.

McCarthy Building Companies, Inc., was awarded the contract, with a best-value proposer score of 94 out of 100 (*41*).

The SH 71 Toll Lanes project uses a design-build agreement for the design and construction of toll lanes along SH 71. As part of the agreement, the contractor will develop a project management plan and be responsible for all quality assurance and quality control activities during the design and construction (*43*). The contractor will not be responsible for O&M of the toll lanes after the project reaches substantial completion and final acceptance from TxDOT. The Central Texas Regional Mobility Authority (the "Authority") will operate and maintain the project. The design-build agreement states the following (*43*):

> Upon Final Acceptance, TxDOT shall assume the maintenance obligations for all other portions of the Project completed and accepted at such Final Acceptance,

with the Authority remaining responsible for the maintenance obligations of the Toll Lanes and the Authority Improvements, and DB Contractor shall be relieved from responsibility for maintenance of such portions of the Project; provided, however, that DB Contractor shall be responsible for maintenance of improvements owned by third parties until control of and maintenance responsibility for such improvements has been formally transferred to the third parties.

Project Cost and Funding

The estimated total project cost for the SH 71 Toll Lanes project is $145 million. Table B-19 shows these costs in more detail.

Table B-19. SH 71 Toll Lanes Project Estimated Costs.

Description	Estimated Cost
Design/construction	$93,964,732
Central Texas Regional Mobility Authority loan	$5,000,000
Other costs	$15,000,000
Right of way	$24,000,000
Utilities (reimbursable)	$7,200,000
Total capital costs	$145,164,732

Source: (*44*)

The estimated funding sources in Table B-20 were identified for the completion of this project.

Table B-20. SH 71 Toll Lanes Project Estimated Funding Sources.

Funding Source	Amount
TxDOT design/environmental funds	$1,000,000
SH 130 concession agreement	$59,000,000
Category 12	$61,000,000
Total capital funding	**$121,000,000**
Federal funds (right of way)	$20,000,000
State funds (utility reimbursement)	$7,705,000
Total funding	**$148,705,000**

Source: (*44*)

Project Schedule

The Texas Transportation Commission conditionally awarded McCarthy Building Companies, Inc., the SH 71 Toll Lanes project on June 26, 2014. On August 29, 2014, a design-build agreement was executed between TxDOT and the awarded contractor. The first notice to proceed was given on September 5, 2014. The project is estimated to reach substantial completion in October 2016 (*44*).

Alternative Technical Concepts

The SH 71 Toll Lanes project received 36 ATCs to be considered, 25 of which were accepted. The contract for this project incorporated nine of these ATCs at the time of execution, five of which belonged to the winning proposer (*4*).

Project Cost and Time Savings

In data received from TxDOT, the engineer's original estimate for project delivery time was set at 893 days. The successful proposer estimated a project delivery time of 644 days (*4*). The estimated value of the ATCs is $5,500,000.

US 181 Harbor Bridge

Project Description

The US 181 Harbor Bridge project will improve the existing Harbor Bridge between US 181 at Beach Avenue and I-37 in Corpus Christi, Texas (*45*). The project uses the CDA design-build project delivery method. The bridge was identified as being a major issue for the city, and according to a feasibility study conducted by TxDOT, the following four major factors affect the purpose and need for the Harbor Bridge:

- **Obsolescence:** Rehabilitating/replacing Harbor Bridge would reduce maintenance costs and remove the vertical and horizontal clearance restrictions on the channel.
- **Safety:** Constructing the approach roadways to current design criteria, adding shoulders to the bridge, and reducing the conflict points and driver decisions would improve safety.
- **Level of service:** Improving the vertical grade and adding travel lanes and shoulders would improve the level of service.
- **Mobility:** Eliminating the offset alignment between SH 286 and US 181, providing better access to local facilities, and improving the connectivity of the highway network would improve mobility (*46*).

The proposed project addresses these issues by replacing the existing bridge with a new 6.44-mile, six-lane divided Harbor Bridge. The project will add 4- to 6-foot inside and 6- to 10-foot outside shoulders (*47*).

Procurement and Contract

For this project, a best-value approach for contractor selection was used. TxDOT issued the original RFQ in March 2014. A short list was created, and a subsequent RFP was issued in October 2014.

This procurement process used a best-value approach using price and technical/ aesthetic criteria (*45*):

- Price includes (80 points):
    - Design.
    - Construction.
    - Maintenance.
- Technical and aesthetics score is based upon (20 points):
    - Aesthetic requirements.
    - Technical solutions.
    - Project management plan.
    - Quality management plan.
    - Maintenance management plan.
    - Sustainability plan.

The firms were evaluated on their submittal and given a score out of 100 total possible points.

Flatiron/Dragados, JV, was awarded the contract, with a best-value proposer score of 93.74 out of 100 (*45*). The proposal included several aesthetic features including a shared-use path, bridge/pedestrian belvedere, lighting concepts, and an exotic bridge structure.

On September 28, 2015, TxDOT executed a CDA with Flatiron/Dragados, LLC, for the development, design, construction, and maintenance of the expansion project (*48*). In addition to the design and construction of the 6.44-mile bridge, approximately 1.6 miles of I-37 and approximately 1 mile of Crosstown Expressway (SH 286) will be reconstructed as part of the agreement. The demolition of the existing Harbor Bridge is also included in the contract. A 25-year mandatory O&M life-cycle agreement was reached between TxDOT and the design-builder. The project has an anticipated completion date of spring 2021 (*49*).

The maintenance contract on this project is for a period of 25 years (*49*).

Project Cost and Funding

The estimated total project cost for the US 181 Harbor Bridge project is $969 million. Table B-21 shows these costs in more detail.

Table B-21. US 181 Harbor Bridge Project Estimated Costs.

Description	Estimated Cost
Base design/construction + Option 2	$847,190,139
ATC savings	($26,729,189)
Finance cancellation savings	($17,842,354)
Base Design/Construction + Option 2 (subtotal)	**$802,978,595**
Option 1	$7,394,266
Contingencies	$41,000,000
Total design/construction	$851,372,861
Right of way	$109,880,000
Utilities (reimbursable)	$8,698,000
Subtotal	**$118,578,000**
Total capital costs	**$969,950,861**

Source: (*45*)

The funding for this project comes from several different sources, shown in Table B-22.

Table B-22. US 181 Harbor Bridge Project Estimated Funding.

Funding Source	Amount
Category 6	$291,000,000
Category 7	$19,200,000
Category 2	$12,600,000
Category 12	$485,000,000
Local contributions	$46,394,266
Subtotal	**$854,194,266**
Port of Corpus Christi (right of way/utility)	$36,538,000
City of Corpus Christi (right of way/utility)	$16,539,000
Strategy 102 (right of way)	$66,000,000
Right of way/utility subtotal	**$119,077,000**
Total funding	**$973,271,266**

Source: (*45*)

Project Schedule

The CDA design-build contract was executed on September 28, 2015. The Federal Highway Administration (FHWA) approved the environmental record of decision on January 8, 2016. According to TxDOT, the project is anticipated to reach substantial completion in winter 2020, with final acceptance in summer 2021 (*45*).

Alternative Technical Concepts

This CDA design-build project received 95 ATCs from proposers. This represents the most of any project investigated in this report. Of the ATCs submitted, 41 were accepted, and seven were incorporated into the contract at the time of execution. This represents a 17 percent acceptance rate, which is the lowest of all projects investigated as part of this report (*4*).

Project Cost and Time Savings

According to TxDOT, this project had a savings of nearly $27 million from the use of ATCs (*4*). In addition to these estimated cost savings, a schedule reduction is estimated. The engineer's original estimate for the project was 1,945 days from the first notice to proceed. The successful proposer's estimate came in at 1,885 days from the first notice to proceed, which represents an accelerated delivery of 60 days (*4*). The estimated value of the ATCs is $37,200,000.

US 77 Upgrade Project (Kingsville to Driscoll)

Project Description

This project is an upgrade to an 8-mile stretch of US 77 to interstate highway standards from Kingsville to Driscoll. This project is a segment of an overall US 77 improvement in the region. According to TxDOT, the project will (*49*):

- Improve safety.
- Improve mobility.
- Foster economic activity throughout South Texas.

Procurement and Contract

The procurement for this project used a best-value approach for the design, construction, and maintenance of this project. Teams competing for the project were scored on a possible 100-point total. Of the 100 points, a maximum of 85 points were allocated based on a price score, while a maximum of 15 points were allocated based on a technical score.

The price score was calculated by the lowest base price value, and the technical score used the evaluation of three components (*50*):

- Technical solutions.
- Project management plan.
- Quality management plan.

The best-value proposer was Austin Bridge and Road and Bay Limited (Austin-Bay, JV).

The design-build agreement calls for the design and construction of the US 77 Upgrade Project. In addition to the agreement, TxDOT also entered into a CMA with Austin-Bay, JV, for the maintenance of the project upon substantial completion. The CMA includes an initial five-year term with two five-year options after the initial term. There is a maximum of 15 years for this CMA.

Project Cost and Funding

The total estimated cost for this project is $84,195,780. Table B-23 shows a more detailed breakdown of project costs.

Table B-23. US 77 Upgrade Project (Kingsville to Driscoll) Estimated Costs.

Description	Estimated Cost
Design/construction	$78,840,780
Total capital costs	$78,840,780
Right of way	$1,920,000
Utilities	$3,435,000
Subtotal	**$5,355,000**
Total ultimate project costs	**$84,195,780**

Source: (*49*)

The funding sources shown in Table B-24 were identified for the completion of this project.

Table B-24. US 77 Upgrade Project (Kingsville to Driscoll) Estimated Funding.

Funding Source	Amount
National Highway System	$10,402,541
Surface Transportation Program-Flex	$37,597,459
Category 12	$32,000,000
Total capital funding sources	$80,000,000
District right of way/utility funds	$5,355,000
Total funding sources	**$85,355,000**

Source: (*49*)

Project Schedule

The contract between TxDOT and Austin-Bay, JV, was executed in July 2013, with the first notice to proceed given the same day. Construction began on April 1, 2014, and is expected to reach substantial completion on June 23, 2016 (*49*).

Alternative Technical Concepts

Proposers submitted 34 ATCs for this project, with 16 being accepted by TxDOT. Of the accepted ATCs, five were incorporated into the executed contract. All five of these ATCs were submitted by the winning proposers (*4*).

Project Cost and Time Savings

According to TxDOT, the US 77 project had seven ATCs, which are valued at $6,400,000. The design and construction original estimates came in at roughly $77 million, with the winning proposer’s estimate at approximately $79 million (*4*).

The engineer’s estimated schedule of 1,092 days was the same as that of the winning proposer (*4*).

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Appendix C: TxDOT Project Funding Sheets

DFW Connector

CDA-Design-Build

Kiewit and Zachry (NorthGate Constructors, J.V.)

Project Description

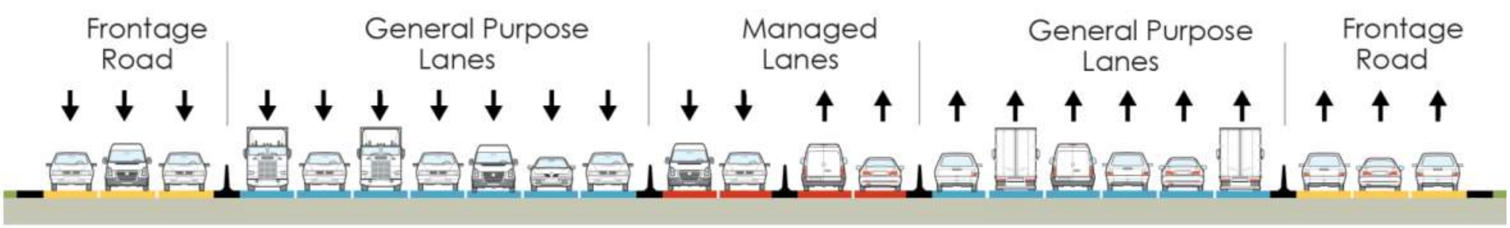
Report Period Apr-16

Stage Operations & Maintenance

Project Scope The DFW Connector rebuilt the north edge of the Dallas/Fort Worth International Airport, SH 114/SH 121 corridors through Southlake, and Grapevine. At its widest point on SH 114, the DFW Connector has 24 lanes, including 14 main lanes, 4 toll-managed lanes, and 6 frontage road lanes. The total project length is 14.4 miles, which includes 4.1 tolled miles.

Proposed Typical Sections

Eastbound at Minters Chapel Road



Estimated Capital Cost[1]

Design/Construction	$1,097,343,138 [2]
Right of Way	$127,800,000
Utilities	$30,300,000
Tolling/ITS	$33,429,005
Contingencies	$5,862,513
Total Capital Costs	**$1,294,734,656**

Note 1: All costs are in nominal dollars

Note 2: Cost includes original contract and all change orders

Estimated Funding Sources

Approved TxDOT funds	$687,000,000
ARRA Funds (Stimulus)	$260,800,000
Prop 14 Tax Exempt Bond Proceeds (TxDOT)	$127,800,000
Utilities/Prop 14	$30,300,000
Prop 12	$31,700,000
Prop 14 (Fall 2012 CO)	$17,200,000
STPMM	$7,500,000
CAT 1-FTW	$1,400,000
FM2499 CO - Prop 14	$97,605,651
Tolling ITS	$33,429,005
Total Funding Sources	**$1,294,734,656**

Schedule

Finding of No Significant Impact	April 23, 2009
Contract Execution	October 6, 2009
Notice to Proceed 1	October 6, 2009
Notice to Proceed 2	December 8, 2009
Substantial Completion	November 22, 2013
Capital Maintenance Agreement Began	November 22, 2013
Open to Traffic	April 1, 2014
Service Commencement	April 1, 2014
Final Acceptance	April 11, 2014
Started Collecting Tolls	July 7, 2014

DFW Connector - FM 2499 (Change Order 43)

CDA-Design-Build

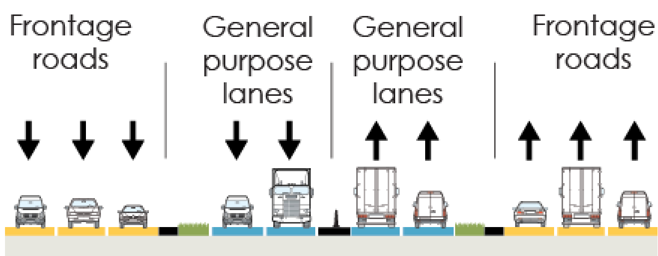
Kiewit and Zachry (NorthGate Constructors, J.V.)

Project Description

Report Period	Apr-16
Stage	Design & Construction
Project Scope	This project includes the upgrading of FM 2499 from an arterial roadway to a freeway facility at Dallas/Fort Worth International Airport. This freeway facility includes two depressed main lanes in each direction and two-to-three frontage road lanes in each direction before transitioning back to existing FM 2499 six lane arterial south of Gerault Lane. This segment of FM 2499 includes the addition of system interchanges at Stars and Stripes Way and Grapevine Mills Boulevard.

Proposed Typical Sections

Grapevine Mills Boulevard



Estimated Capital Cost[1]

Design/Construction	$92,656,343 [2]
Right of Way	$0
Utilities	$0
Total Capital Costs	**$92,656,343**

Note 1: All costs are in nominal dollars

Note 2: Cost is included in the main DFW Connector Capital Cost

Estimated Funding Sources

Prop 14 - FM 2499 CO	$97,605,651
Total Funding Sources	**$97,605,651** [3]

Note 3: Funding is included in the main DFW Connector Funding Sources

Schedule

Change Order Execution	May 31, 2013
Substantial Completion	January 2017
Final Acceptance	May 2017

All future dates are anticipated

Horseshoe

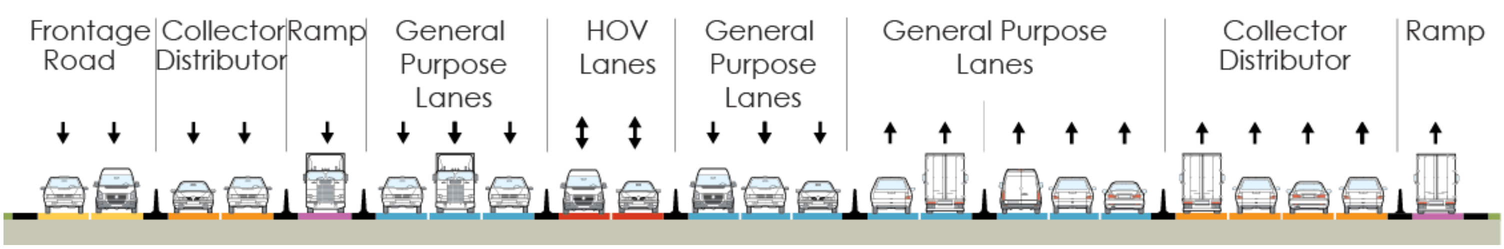
Design-Build

Balfour Beatty Infrastructure and Fluor Enterprises (Pegasus Link Constructors)

Project Description

Report Period	Apr-16
Stage	Design & Construction
Project Scope	The Horseshoe Project will replace bridges that cross the Trinity River on IH 30 and IH 35E as well as the connecting roadways where they converge near downtown Dallas' Central Business District. The project will upgrade outdated roadway geometry, improving safety, and increasing capacity and mobility. Project length is five miles total.

Proposed Typical Sections



Estimated Capital Cost[1]

Design/Construction	$742,078,967 [2]
Right of Way	$40,000,000
Utilities	$22,000,000
Total Capital Costs	**$804,078,967**

Note 1: All costs are in nominal dollars

Note 2: Includes $20 M in Other Costs and Woodall Direct Connector Change Order

Estimated Funding Sources

Prop 12 P2 PE/ROW	$100,755,000
Prop 12 P2 TMA	$87,103,000
Prop 12 P2 Bridge	$400,500,000
Prop 12 P1	$16,300,000
Prop 14	$7,000,000
SH 121 RTR	$21,450,000
Cat 6 Federal Bridge	$75,000,000
Cat 7 STP-MM	$4,450,000
CAT 10 HPS DEMO Earmarks	$106,375,987
CAT 3 Local Funds (Overrun)	$8,438,228 [3]
CAT 3 Local Funds (Change Order)	$1,048,565 [4]
CAT 9 Transportation Enhancements	$4,000,000 [4]
Transfer Funds to Southern Gateway	($20,000,000)
Total Funding Sources	**$812,420,780**

Note 3: Dallas' MMD Overrun Contribution

Note 4: Dallas' Trails Change Order

Schedule

Finding of No Significant Impact	September 18, 2012
Contract Execution	February 20, 2013
Notice to Proceed 1	February 28, 2013
Notice to Proceed 2	August 9, 2013
Substantial Completion (Seg A)	February 2017
Substantial Completion (Seg B)	April 2017
Final Acceptance	July 2017

All future dates are anticipated

IH 35E Managed Lanes

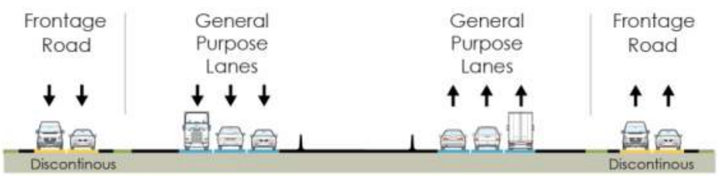
CDA-Design-Build

Archer Western, Granite Construction, and The Lane Construction Company (AGL Constructors)

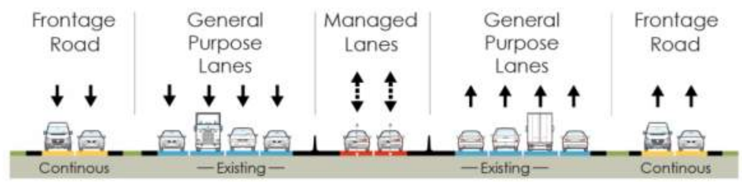
Project Description

Report Period	Apr-16
Stage	Design & Construction
Project Scope	The 28-mile Phase 1 project configuration of IH 35E from IH 635 to US 380 north of Dallas/Fort Worth will include reconstruction, rehabilitation, and widening of the existing IH 35E incorporating an additional general purpose lane in each direction in Denton County, two reversible managed lanes from Valley View Lane to Turbeville Rd, and a bridge over Lake Lewisville.

Existing Typical Sections



Proposed Typical Sections



On proposed typical section general purpose lanes vary from three to four lanes

Estimated Capital Cost[1]

Design/Construction	$1,004,072,051	
Utilities	$61,816,554	
Sub Total	**$1,065,888,605**	
Right of Way	$233,509,249	
Tolling/ITS	$44,100,000	
Environmental Commitments	$6,270,849	2
Contingencies	$13,147,693	3
Total Capital Costs	**$1,362,916,396**	4

Note 1: All costs are in nominal dollars

Note 2: Environmental Commitments include payment to the City of Highland Village and added trails in parks

Note 3: Includes Unidentified Utilities Contingency, Hazardous Materials Contingency and Construction Contingency

Note 4: Total Phase 1 Capital Costs, costs are based on Executed Contract scope, including options 1 and 4-9; and contingencies.

Estimated Funding Sources

Category 2 - Mobility Corridors 12	$90,876,056
Category 3 - Proposition 12	$44,000,000
Category 3 - RTR Funds	$325,476,841
Category 3 - Local	$4,064,567
Category 5 - CMAQ	$153,875,900
Category 6 - Highway Bridge CAT 10	$1,780,000
Category 7 - STP-MM	$15,506,105
Category 10 - HPS/DEMO/Earmarks	$18,046,046
Category 12	$296,390,000
State Highway Funds	$127,900,881
Pending TIFIA Loan	$285,000,000
Total Funding Sources	**$1,362,916,396**

Schedule

Finding of No Significant Impact (Re-eval)	April 9, 2012
Contract Execution	May 17, 2013
Notice to Proceed 1	May 30, 2013
Notice to Proceed 2	September 26, 2013
Substantial Completion	May 2017
Final Acceptance	September 2017

All future dates are anticipated

SH 183 Midtown Express

CDA-Design-Build

Kiewit Infrastructure and Kiewit Development (Southgate Mobility Partners)

TxDOT Major Transportation Project

Project Description

Report Period Apr-16

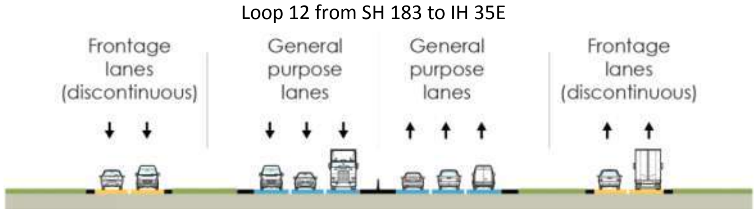
Stage Design & Construction

Project Scope The project includes the reconstruction/widening of existing general purpose lanes, the addition of one managed lane in each direction and improving portions of two discontinuous frontage road lanes in each direction along SH 183 from Industrial Boulevard to IH 35E near Dallas/Fort Worth International Airport. Improvements to Loop 12 include widening of the general purpose lanes to accommodate the addition of one managed lane in each direction from SH 183 to IH 35E. SH 114 improvements from SH 183 to International Parkway include widening of the general purpose lanes to accommodate one managed lane in each direction for a portion of the project and reduce to one westbound managed lane for the remainder of the project. Total project length is 27.8 centerline miles.

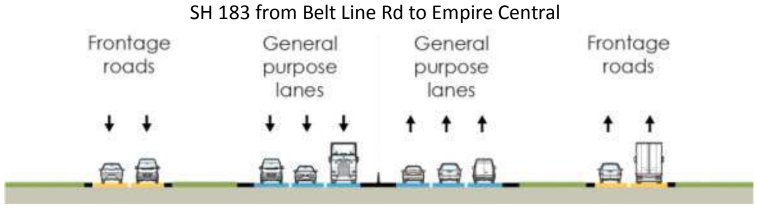
NOTE: Highlighted areas are not drawn to scale.

Existing Typical Sections

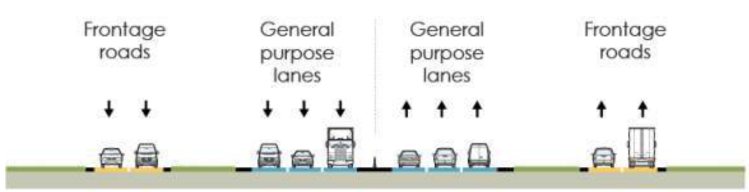
Loop 12 from SH 183 to IH 35E



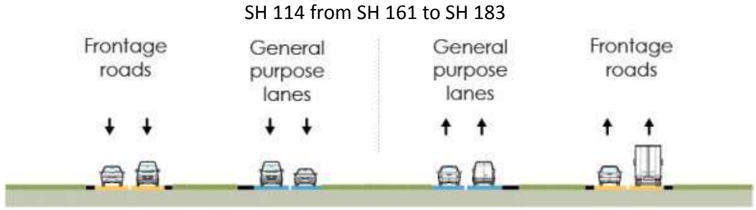
SH 183 from Belt Line Rd to Empire Central



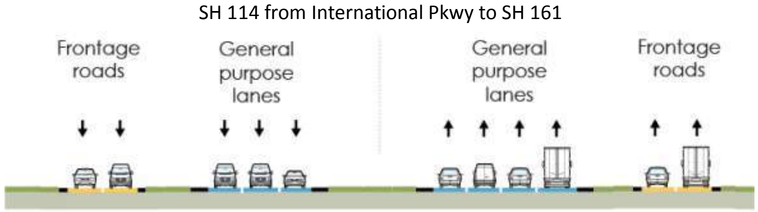
SH 183 from Industrial Blvd to Belt Line Rd



SH 114 from SH 161 to SH 183

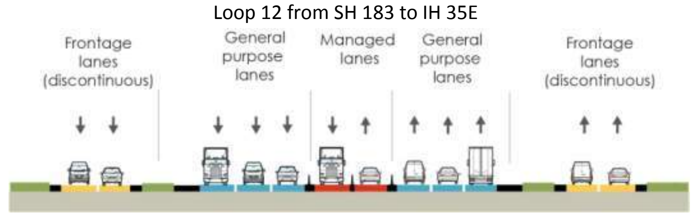


SH 114 from International Pkwy to SH 161

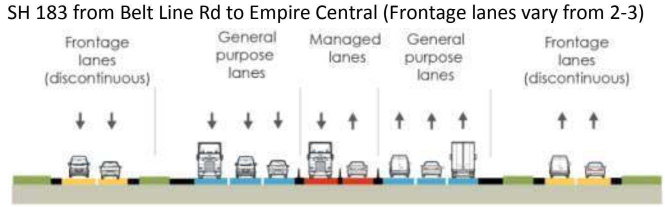


Proposed Typical Sections

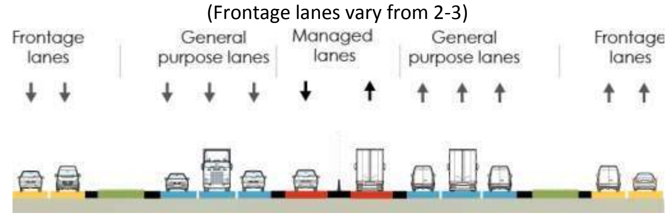
Loop 12 from SH 183 to IH 35E



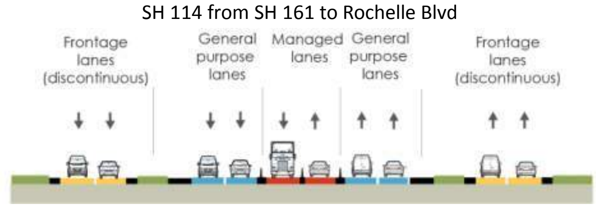
SH 183 from Belt Line Rd to Empire Central (Frontage lanes vary from 2-3)



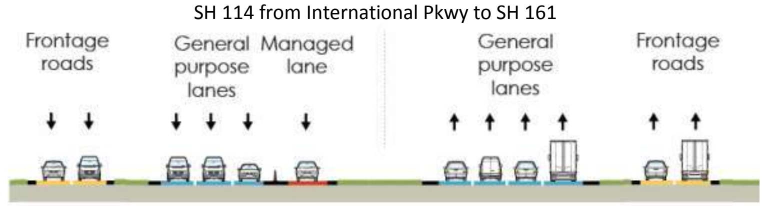
SH 183 from Industrial Blvd to Belt Line Rd
SH 183 from Belt Line Road to Empire Central
(Frontage lanes vary from 2-3)



SH 114 from Rochelle Blvd to SH 183
SH 114 from SH 161 to Rochelle Blvd



SH 114 from International Pkwy to SH 161



SH 183 Midtown Express

CDA-Design-Build

Kiewit Infrastructure and Kiewit Development (Southgate Mobility Partners)

TxDOT Major Transportation Project

Estimated Capital Cost[1]		
Design/Construction	$759,006,806	
Utilities	$97,000,000	
Sub Total	**$856,006,806**	
Right of Way	$150,000,000	
Tolling/ITS	$15,739,200	
Total Capital Costs	**$1,021,746,006**	[2]

Note 1: All costs are in nominal dollars

Note 2: Capital Costs do not include O&M, Lifecycle, or Tolling Operations Costs

Estimated Funding Sources		
CAT 2	$109,440,001	
CAT 7	$525,000	
CAT 10	$13,019,178	
CAT 12 (Commission Strategic)	$602,300,001	
Local	$10	
Total Funding Identified	**$725,284,190**	
Right of Way Funds	$177,587,569	
Sub Total	**$902,871,759**	
Funding To Be Determined	$119,107,950	[3]
Total Funding Sources	**$1,021,979,709**	

Note 3: TxDOT is pursuing TIFIA loan

Schedule	
Final RFQ	February 20, 2013
SOQ Date	July 19, 2013
Final RFP	November 7, 2013
Proposals Due	April 14, 2014
Environmental Approval	April 17, 2014
Conditional Award	May 29, 2014
Contract Execution	November 20, 2014
Notice to Proceed 1	December 2, 2014
Notice to Proceed 2	February 5, 2015
Substantial Completion	June 2018
Service Commencement	June 2018
Final Acceptance	October 2018

All future dates are anticipated

43 TAC §§16.106 and 16.202	
ROW Acquisition	90%
Utility Agreements	41%
PS&E	N/A

Project Contacts:

James Selman, P.E.
District Engineer
Dallas District
214-320-6110

Brian Barth, P.E.
District Engineer
Fort Worth District
817-370-6414

SH 360

Design-Build

The Lane Construction Company and J.D. Abrams (Lane-Abrams JV)

Project Description

Report Period Apr-16

Stage Design & Construction

Project Scope The Project located between Fort Worth and Dallas includes an approximately 9.7 mile four-lane controlled access facility with option work that includes the construction of two tolled main lanes in each direction from approximately two miles south of IH 20 near Sublett Road/Camp Wisdom Road to US 287, grade-separate 9 cross streets, grade separate the US 287 main lanes with the SH 360 frontage roads, construction of the northbound frontage road from Heritage Parkway to US 287 including continuous northbound and southbound frontage road at Union Pacific Railroad and the repair and resurfacing of existing frontage roads. Pursuant to a Comprehensive Maintenance Agreement (COMA), the selected developer may perform comprehensive maintenance services, including routine maintenance, capital maintenance and incident management, for up to three five-year terms.

Existing Typical Sections

E. Sublett/W. Camp Wisdom to Broad

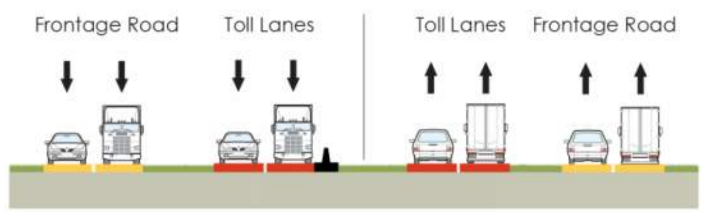
Broad to North of UP Railroad

At UP Railroad

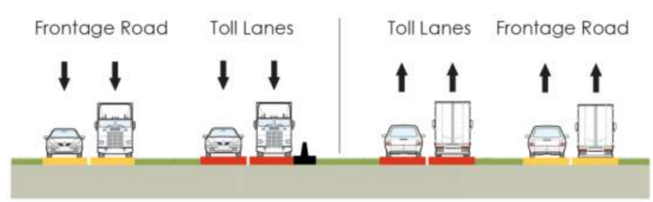
South of UP Railroad to US 287

Proposed Typical Sections

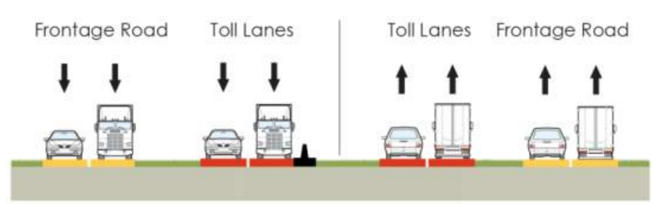
E. Sublett/W. Camp Wisdom to Broad



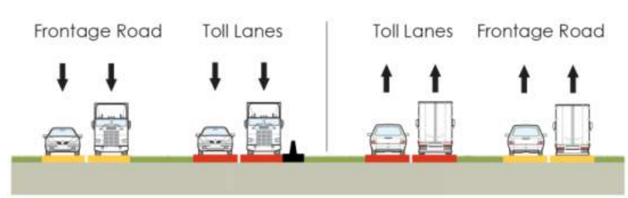
Broad to North of UP Railroad



At UP Railroad



South of UP Railroad to US 287



SH 360

Design-Build

The Lane Construction Company and J.D. Abrams (Lane-Abrams JV)

Estimated Capital Cost[1]		
Design/Construction	$221,686,000	
Utilities	$9,987,000	
Tolling/ITS	$15,841,000	
Option 1	$2	2
Option 2	$11,659,000	2
Option 3	$26,516,891	2
Sub Total	**$285,689,893**	
Right of Way	$6,737,800	3
Contingencies	$31,507,341	
Total Capital Costs	**$323,935,034**	

Note 1: All costs are in nominal dollars

Note 2: Costs include Design, Construction, ROW, NTTA Option Work, and Utilities for each respective option

Note 3: ROW estimate provided April 2015

Estimated Funding Sources		
Category 3	$300,000,000	
Category 11	$2	
TxDOT ROW	$3,053,200	
Sub Total	**$303,053,202**	
Regional/Local	$31,120,000	4
Total Funding Sources	**$334,173,202**	

Note 4: Executed agreement with regional and local entities, which include City of Arlington, City of Grand Prairie, City of Mansfield, Tarrant County, and NCTCOG.

Schedule	
Environmental Approval	January 16, 2014
NTTA/TxDOT Agreement	February 28, 2014
Final RFQ	March 10, 2014
SOQ Date	May 30, 2014
Shortlist Proposers	May 30, 2014
Final RFP	September 8, 2014
Proposals Due	January 13, 2015
Conditional Award	February 26, 2015
Contract Execution	May 15, 2015
Notice to Proceed 1	May 15, 2015
Notice to Proceed - Option 3	August 13, 2015
Notice to Proceed 2	August 28, 2015
Substantial Completion	August 2017
Final Acceptance	February 2018

All future dates are anticipated

SH 99 (Grand Parkway) Segment F1, F2, and G

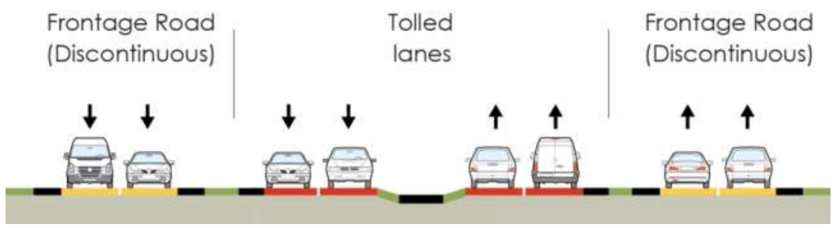
CDA-Design-Build

Odebrecht Construction & Zachry Construction (Zachry-Odebrecht Parkway Builders)

Project Description

Report Period	Apr-16
Stage	Design & Construction
Project Scope	SH 99 (Grand Parkway) Segments F-1, F-2 & G is a 38-mile new location toll road with discontinuous frontage roads from US 290 to US 59/IH 69 located northwest of Houston in Harris and Montgomery Counties.

Proposed Typical Sections



Estimated Capital Cost[1]

Design/Construction	$969,777,061	2
Right of Way	$417,000,000	3
Utilities	$75,866,066	2
Tolling	$34,600,000	4
Environmental Mitigation	$40,380,240	
Total Capital Costs	**$1,537,623,367**	

Note 1: All costs are in nominal dollars

Note 2: These total $1,045,643,127 which is the design/build contract value

Note 3: This is the cost that is paid directly from TxDOT to property owners for ROW acquisition

Note 4: This is the value of the TxDOT contract with TransCore for the toll integrator work

Estimated Funding Sources

Grand Parkway System Toll Revenue Bonds	$1,537,623,367
Total Funding Sources	**$1,537,623,367**

Schedule

ROD Issued by FHWA (Seg F1)	November 20, 2008
ROD Issued by FHWA (Seg F2)	December 31, 2009
ROD Issued by FHWA (Seg G)	December 29, 2010
Contract Execution	March 22, 2013
Notice to Proceed 1	March 22, 2013
Notice to Proceed 2	June 14, 2013
Substantial Completion (Seg F1)	February 2, 2016
Substantial Completion (Seg F2)	February 5, 2016
Substantial Completion (Seg G)	March 29, 2016
Final Acceptance	Summer 2016

All future dates are anticipated

US 77 (Kingsville to Driscoll)

Design-Build

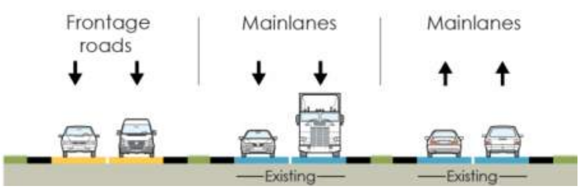
Austin Bridge & Road and Bay Limited (Austin-Bay, JV)

Project Description

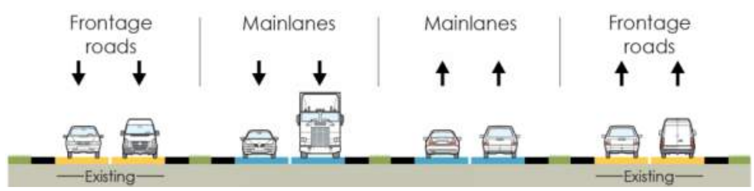
Report Period	Apr-16
Stage	Design & Construction
Project Scope	The 8 mile project will upgrade US 77 between Kingsville and Driscoll to Interstate highway standards to improve safety and mobility as well as foster economic development throughout South Texas. The project is part of the overall US 77 Upgrade in South Texas from Corpus Christi to Harlingen.

Proposed Typical Sections

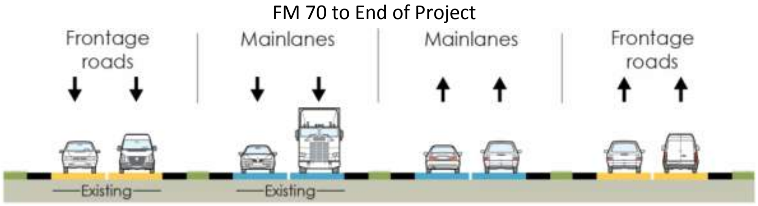
FM 1898 to Kleberg/Nueces County Line



Kleberg/Nueces County Line to FM 70



FM 70 to End of Project



Estimated Capital Cost[1]

Design/Construction	$78,840,780
Total Capital Costs	**$78,840,780**
ROW/Utility Costs	
Right of Way	$1,920,000
Utilities	$3,435,000
Sub Total	**$5,355,000**
Total Ultimate Project Cost	**$84,195,780**

Note 1: All costs are in nominal dollars

Estimated Funding Sources

NHS	$10,402,541
STP-Flex	$37,597,459
Category 12	$32,000,000
Total Capital Funding Sources	**$80,000,000**
ROW/Utility Funding	
District ROW/Utility Funds	$5,355,000
Total Funding Sources	**$85,355,000** [2]

Note 2: ROW/Utility funds are not transferable for any other costs

Schedule

Finding of No Significant Impact	July 10, 2012
Contract Execution	July 30, 2013
Notice to Proceed 1	July 30, 2013
Notice to Proceed 2	September 27, 2013
Construction Begins	April 1, 2014
Substantial Completion	June 23, 2016
Final Acceptance	October 26, 2016

All future dates are anticipated

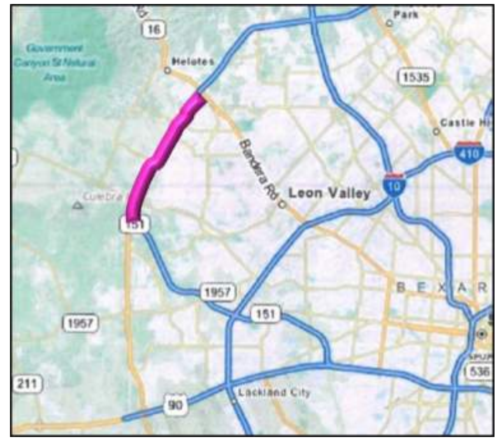
Loop 1604 Western Extension

Design-Build

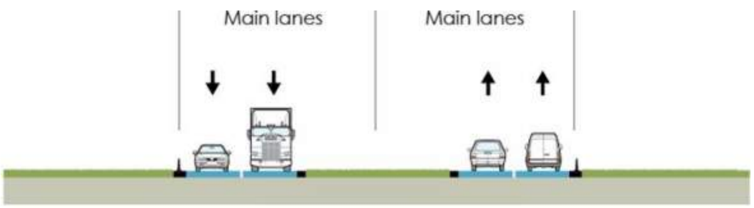
Williams Brothers Construction

Project Description

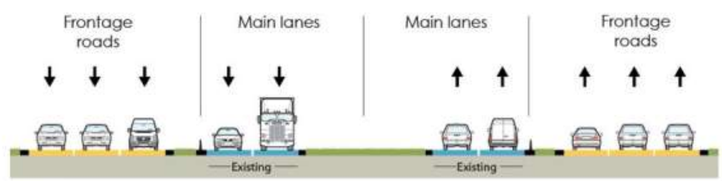
Report Period	Apr-16
Stage	Design & Construction
Project Scope	The Loop 1604 Western Extension Design/Build project in northwest San Antonio will expand 5 miles of Loop 1604 to a four-lane non-toll expressway from SH 16 (Bandera Road) to FM 471 and add grade separated interchanges at Shaenfield, New Guilbeau and Braun Rd, with an executed option through the SH 151 interchange.



Existing Typical Sections



Proposed Typical Sections



Grade separated interchanges will be added at Shaenfield, New Guilbeau and Braun Rd.

Estimated Capital Cost[1]

Design/Construction (Base)	$80,955,063
Design/Construction (Option)	$44,031,139
Right of Way	$0 [2]
Utilities (Reimbursable)	$0
ITS (non-tolled)	$600,000
Total Capital Costs	**$125,586,202**

Note 1: All costs are in nominal dollars

Note 2: No further ROW expenditures are expected

Estimated Funding Sources

Category 12	$18,000,000
Prop 14	$59,800,000
Prop 12 PE	$4,000,000
Prop 14 B	$15,000,000
Category 1	$1,500,000
Category 11	$500,000
Category 3 - ATD	$27,200,000
Total Funding Sources	**$126,000,000**

Schedule

Finding of No Significant Impact (Base)	July 22, 2013
Contract Execution	December 5, 2013
Notice to Proceed 1	December 20, 2013
Ground Breaking	March 3, 2014
Notice to Proceed 2	March 20, 2014
Final Biological Opinion (Option)	August 26, 2014
Notice to Proceed 3 (Option)	February 13, 2015
Notice to Proceed 4 (Option)	March 23, 2015
Substantial Completion (Base)	June 2016
Final Acceptance (Base)	October 2016
Substantial Completion (Option)	January 2017
Final Acceptance (Option)	May 2017

All future dates are anticipated.

Energy Sector Project

Design-Build

Austin Bridge & Road and Angel Brothers Enterprises (ESR2P Builders, LLC)

Project Description

Report Period	Apr-16
Stage	Operations & Maintenance
Project Scope	Provide for the reconstruction, rehabilitation, or repair of roadways and bridges at 31 project locations on the state highway system damaged by above normal usage of heavier vehicles involved in the development and production of energy sources.

Estimated Capital Cost[1]

Design/Construction	$189,328,347
Right of Way	$0
Utilities (Reimbursable)	$0
ITS	$0
Total Capital Costs	**$189,328,347**

Note 1: All costs are in nominal dollars

Estimated Funding Sources

Fund 6	$150,000,000	2
Category 1 (Statewide)	$32,870,500	
District's Category 1	$6,448,554	3
District's Category 11	$9,293	4
Total Funding Sources	**$189,328,347**	

Note 2: HB 1025

Note 3: Change Orders funded by the District's Category 1 funds

Note 4: Change Orders funded by the District's Category 11 funds

Schedule

Environmental Clearance	October 3, 2013
Conditional Award	December 19, 2013
Contract Execution	February 10, 2014
Notice to Proceed 1	March 27, 2014
Notice to Proceed 2	April 2, 2014
Substantial Completion	October 18, 2015
Final Acceptance	November 20, 2015

All future dates are anticipated

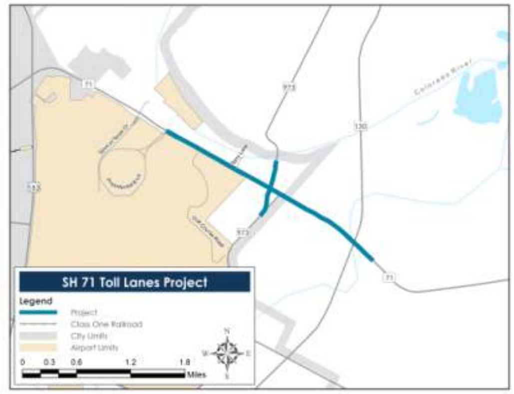
SH 71 Express Lanes

Design-Build

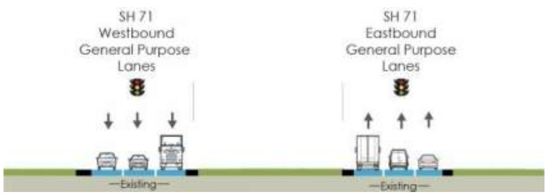
McCarthy Building Companies, Inc.

Project Description

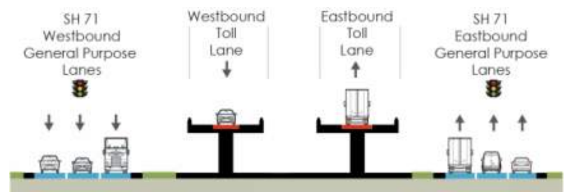
Report Period	Apr-16
Stage	Design & Construction
Project Scope	Adding two new toll lanes (one in each direction) from Presidential Blvd at the Austin-Bergstrom International Airport to east of SH 130. Reconstruction and realignment of FM 973 from south of Colorado River to 0.5 mile south of SH 71 and construction of a bridge on SH 71 over FM 973 at this location. Construction of a bridge over SH 130 and connecting ramps. Bicycles shall be accommodated. Pedestrian plan will be provided and implemented. Project length is 3.9 miles total.



Existing Typical Sections



Proposed Typical Sections



Estimated Capital Cost[1]

Design/Construction	$93,964,732	2
CTRMA Loan	$5,000,000	3
Other Costs	$15,000,000	4
Total Capital Costs	**$113,964,732**	
ROW/Utility Costs		
Right of Way	$24,000,000	
Utilities (Reimbursable)	$7,200,000	
ROW/Utility Costs Sub Total	**$31,200,000**	
Total Ultimate Project Cost	**$145,164,732**	

Note 1: All costs are in nominal dollars

Note 2: Cost includes tolling, ITS, and executed change orders (CO - $5,674,461)

Note 3: Tolling cost is the $5M loan to CTRMA per TxDOT/CTRMA PDA dated 12/11/2013

Note 4: Costs include contingency, unforseen utilities, hazmat, etc.

Estimated Funding Sources

TxDOT Design/Environmental Funds	$1,000,000	
SH 130 Concession Agreement	$59,000,000	
Category 12	$61,000,000	
Total Capital Funding Sources	**$121,000,000**	
ROW/Utility Funding		
Federal Funds (ROW)	$20,000,000	5
State Funds (Utility Reimbursement)	$7,705,000	5
Total Funding Sources	**$148,705,000**	

Note 5: ROW/Utility funds are not transferable for any other costs

Schedule

Contract Execution	August 29, 2014
Notice to Proceed 1	September 5, 2014
Notice to Proceed 2 (Design Only)	December 22, 2014
Environmental Approval (FONSI)	May 9, 2014
Substantial Completion	October 2016
Service Commencement	October 2016
Final Acceptance	December 2016

All future dates are anticipated

Loop 375 Border West Expressway

CDA-Design-Build

J.D. Abrams and Kiewit (Abrams - Kiewit Joint Venture)

TxDOT Major Transportation Project

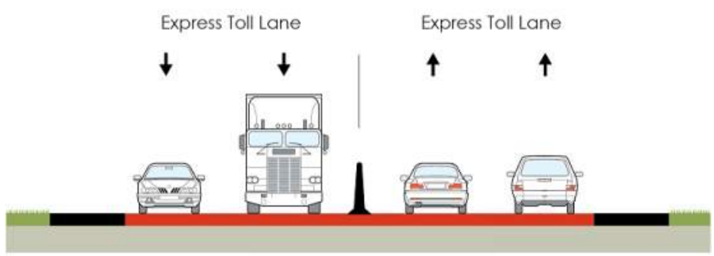
Project Description

Report Period Apr-16

Stage Design & Construction

Project Scope The Loop 375 Border West Expressway Project is a proposed 9 mile long facility along the US/Mexico Border in El Paso. Of those 9 miles, 5.6 miles will be tolled and the rest will be non-tolled. The project will provide a new four-lane, controlled access facility from Racetrack Drive near Doniphan Road and New Mexico 273, (west of downtown) El Paso, to approximately 1 mile east of Park Street. Furthermore, the project will improve safety and mobility, enhance system continuity, and accommodate projected growth throughout El Paso's southwest section.

Proposed Typical Sections



Estimated Capital Cost[1]

Design/Construction (Utilities Included)	$447,600,000
Right of Way	$102,000,000
Tolling/ITS	$22,000,000
Other Costs	$67,900,000 [2]
Total Capital Costs	**$639,500,000**

Note 1: All costs are in nominal dollars

Note 2: Other costs include 10% contingency, railroads and other direct design build agreement costs

Estimated Funding Sources

Category 3 - TMF	$639,500,000
Total Funding Sources	**$639,500,000**

Schedule

State Record of Decision (ROD)	June 7, 2013
Contract Execution	August 22, 2014
Notice to Proceed 1	October 6, 2014
Notice to Proceed 2	December 15, 2014
Substantial Completion	October 2017
Service Commencement	October 2017
Final Acceptance	February 2018

All future dates are anticipated

43 TAC §§16.106 and 16.202

ROW Acquisition	27%
Utility Agreements	6%
PS&E	N/A

Project Contacts:

Sergio Garcia, P.E.
Project Manager
El Paso District
915-790-4372

Robert Bielek, P.E.
District Engineer
El Paso District
915-790-4200

US 181 Harbor Bridge

CDA-Design-Build

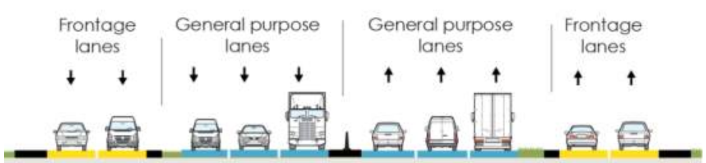
TxDOT Major Transportation Project

Project Description

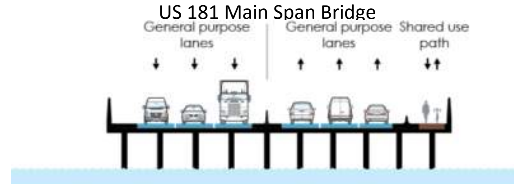
Report Period	Apr-16
Stage	Design & Construction
Project Scope	This project will improve US 181 at the existing Harbor Bridge between US 181 at Beach Avenue and IH 37 in the City of Corpus Christi, Nueces County, by improving the current 6-lane structure that has no shoulders with a 6-lane divided structure with 4-feet to 10-feet inside and 6-feet to 10-feet outside shoulders. The total project length, inclusive of the bridge and connecting roadways, is 6.44 miles.

Proposed Typical Sections

US 181 Typical Section



US 181 Main Span Bridge



Estimated Capital Cost[1]

Base Design/Construction + Option 2	$847,190,139	
ATC Savings	($26,729,189)	
Finance Cancellation Savings	($17,842,354)	
Base D/C + Option 2 (Subtotal)	**$802,978,595**	
Option 1	$7,394,266	2
Contingencies	$41,000,000	
Total Design/Construction	**$851,372,861**	3
ROW/Utility (TxDOT ROW)		
Right of Way	$109,880,000	4
Utilities (Reimbursable)	$8,698,000	
Sub Total	**$118,578,000**	
Total Capital Costs	**$969,950,861**	

Note 1: All costs are in current dollars

Note 2: To be exercised and paid for by the City of Corpus Christi

Note 3: EIS is ongoing with the recommended alternative identified in red

Note 4: ROW estimate provided December 2014

Estimated Funding Sources

Category 6	$291,000,000	
Category 7	$19,200,000	
Category 2	$12,600,000	
Category 12	$485,000,000	
Local Contribution	$46,394,266	5
Sub Total	**$854,194,266**	
ROW/Utility Funding		
Port of Corpus Christi	$36,538,000	
City of Corpus Christi	$16,539,000	
Strategy 102 (ROW)	$66,000,000	
ROW/Utility Sub Total	**$119,077,000**	
Total Funding Sources	**$973,271,266**	

Note 5: $12M - Nueces County, $12M - San Patrico County, $15M - Port of Corpus Christi, $7.4M - City of Corpus Christi payment for Option 1

Schedule

Contract Execution	September 28, 2015
ROD Issued by FHWA	January 8, 2016
Notice to Proceed 1	February 16, 2016
Notice to Proceed 2	May 16, 2016
Service Commencement	March 2020
Substantial Completion	April 2021
Final Acceptance	August 2021

All future dates are anticipated

43 TAC §§16.106 and 16.202

ROW Acquisition	13%
Utility Agreements	Utility Agreements Pending
PS&E	N/A

Project Contacts:

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District Engineer
Corpus Christi District
361-808-2300

Valente Olivarez Jr, P.E.
Deputy District Engineer
Corpus Christi District
361-808-2230

05-May-16

For more information please visit: www.txdot.gov