# Guidebook for Selecting Project Delivery Methods and Alternative Contracting Strategies

*Technical Memorandum #1*

Prepared for:

Next-Generation Transportation Construction Management
Transportation Pooled Fund Program Study TPF-5(260)

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**DISCLAIMER**

The opinions and conclusions expressed or implied are those of the research agency that performed the research and are not necessarily those of the Transportation Pooled-Fund Program or its sponsors.

# 1.0 Overview

## 1.1 Project Objective

The Transportation Construction Management (TCM) Pooled-Fund Study focuses on the concept of advancing construction management practices and enhancing innovation. The first project under this pooled-fund program study is the guidebook for selecting project delivery methods and alternative contracting strategies for highway construction projects. The overarching objective of this guidebook is to:

- Develop a guidebook to aid state transportation agencies (STAs) in the selection of project delivery methods, and alternative contracting, particularly procurement procedures and contract payment provisions based on project attributes, opportunities and risks.

## 1.2 Project Scope of Work

The project involves seven major work tasks that will lead to the completion of a final guidebook by June 2014.

**Task 1. Define the state-of-practice**

- Collect and review relevant literature, research findings, and other appropriate material, inside and outside of the transit and highway industry. The primary focus of this task is to develop a framework of what is currently in practice for project delivery.

**Task 2. Select delivery methods, procurement procedures, and contract payment provisions**

- Create a list of applicable delivery methods, procurement procedures, and payment provisions based on the findings in task 1. Provide definitions of the different methods.

**Task 3. Develop selection methodology**

- Develop specific information around each selected contracting methodology from task 2 by describing and analyzing pertinent issues related to each project delivery method and alternative contracting strategy in terms of its application to transit in the United States.

**Task 4. Prepare interim report**

- Prepare an interim report documenting the results of Tasks 1 through 3. The interim report shall also contain a **detailed annotated outline of the Guidebook** expanding upon the current annotated outline.

**Task 5. Develop decision support tool**

- Based on the results of tasks 1 through 4 and feedback from the Pool Fund Committee, develop a decision matrix at the macro level to guide decision makers on selecting the most appropriate project delivery method, procurement procedure and contract payment provision.

**Task 6. Validate and calibrate the decision support tool**

- Vet with current Pooled Fund Committee, CDOT employees and industry members to verify, validate, and calibrate a preliminary version of the Guidebook through workshops and interviews to verify Guidebook effectiveness.

**Task 7. Prepare final guidebook**

- Prepare the Guidebook, a stand-alone executive summary, and a final report documenting the entire research effort.

# 2.0 Project Status

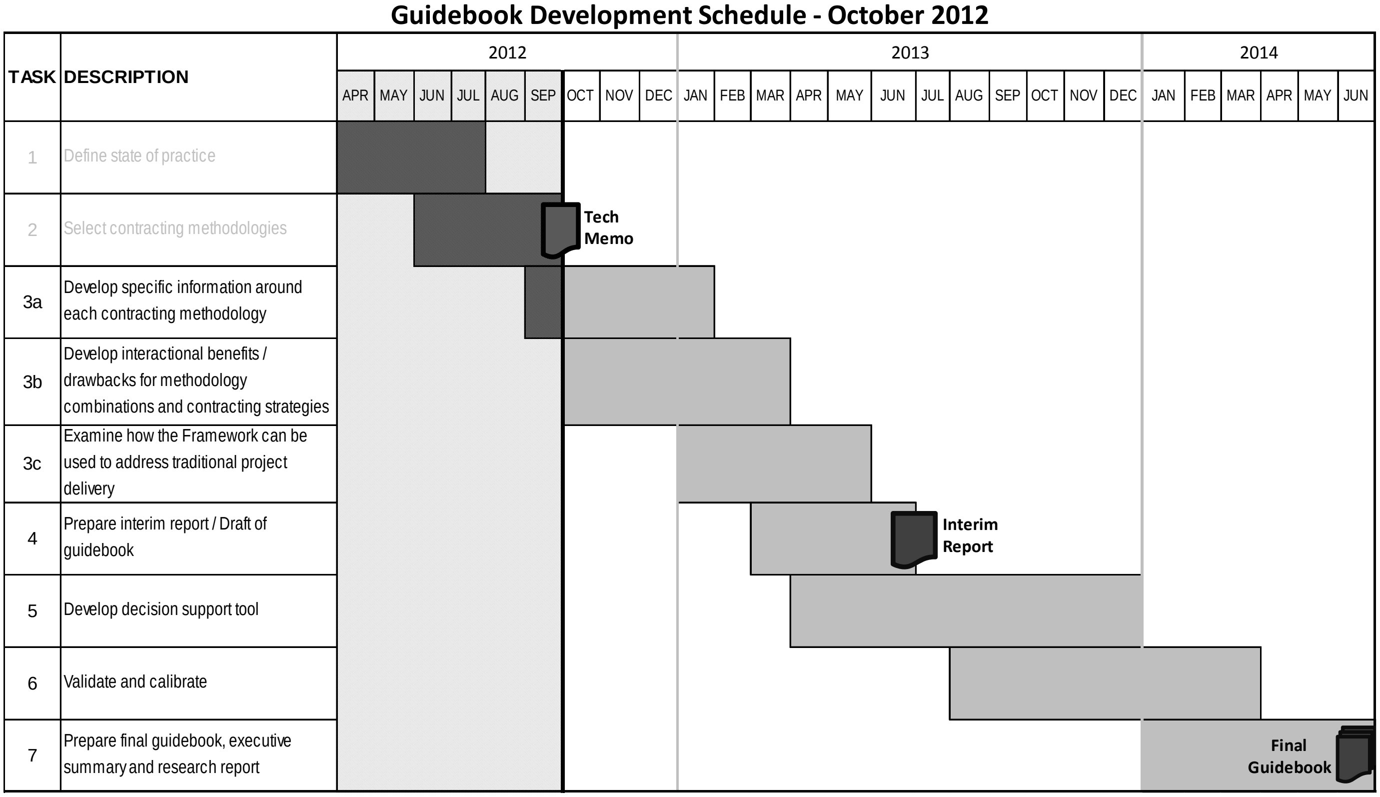
## 2.1 Project Cost

The project is on budget. The total project cost is $261,840 and approximately $63,000 has been spent as of October 1, 2012. The project team is fully staffed. We do not anticipate any cost overruns.

## 2.2 Schedule

Tasks 1 and 2 were completed on schedule in accordance with the baseline schedule provided in June 2012. The remaining tasks are progressing as planned. The project team is working on Task 3 and does not anticipate any schedule changes. An updated schedule is shown below.

**Guidebook Development Schedule - October 2012**



# 3.0 Work Completed to Date

## 3.1 Literature Review

The research team completed the initial literature review, but we will continue to look for additional sources of information throughout the project. Appendix A contains a bibliography of references relating to project delivery, procurement and contract payment methods. This literature has formed the basis for the project delivery selection matrix. These references have also been synthesized to develop an initial set of definitions provided in Appendix B.

## 3.2 Definitions and Compatibilities

The first two tasks included discovering and defining applicable project delivery methods, procurement procedures, and payment provisions for highway projects. Along with developing common definitions, compatibility was addressed for procurement procedures and payment provisions to applicable project delivery methods. The draft compatibility of each procurement procedure and payment provision is summarized, along with the definitions, in Appendices B and C.

## 3.3 Project Delivery Selection Matrix

The overall goal of the guidebook is to create a decision support tool that assist agencies in selecting a project delivery method, then a procurement procedure, and finally contract payment provisions. As an early deliverable of the project, the University of Colorado in conjunction with the Colorado Department of Transportation's Innovative Contracting Advisory Committee (FHWA, the American Consulting Engineering Companies and the Colorado Contractors Association) has been testing and validating the decision support tool. This tool addresses only the project delivery methods at this point. The format will be expanded to include procurement methods and payments in the next phase of the research.

The tool, called the Project Delivery Selection Matrix (PDSM), provides a risk-based, objective, selection approach to choosing a project delivery method from three choices: Design-Bid-Build, Design-Build, and Construction Manager/General Contractor. It also provides support and justification for the delivery method chosen. The evaluation uses specific project attributes and characteristics and compares these to five primary evaluation factors, an initial risk assessment, and three secondary evaluation factors. A rating system is used for each factor, and the overall highest ranked method becomes the optimal delivery method. The PDSM can be found in full in Appendix D. It is in a format that any agency can use.

The tool has been tested on more than 10 projects in Colorado. It has also been adopted by other STAs and the FHWA. In October, November and December 2012, the project delivery matrix will be presented at the Every Day Counts II summits in 10 locations across the U.S. The research team believes that the PDSM is validated and ready for use by all TCM advisory members.

# 4.0 Decisions Needed from the Panel

The research team appreciates the active participation of the TCM advisory panel. As we proceed to the next phases of the research, the panel's input is needed in the following areas:

1. **Continued application and testing of the PDSM**. The research team would ask that all TCM members use the PDSM in their agency. The research team stands ready to facilitate its implementation if requested, but we believe that it can be applied independently. A downloadable MS Word version of the document is available from the project website:

   http://www.colorado.edu/ceae/TCM

2. **Review of the procurement and payment provision compatibility matrices**. In our next advisory board meeting, we will be reviewing the procurement and payment provision compatibility matrices. A phone conference announcement will be forthcoming. The advisory committee is encouraged to review these matrices prior to the phone conference.

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# Appendix B - Definitions

# Project Delivery Methods

## Design – Bid – Build (DBB)

Traditional delivery method where the design is completed in-house or the agency contracts with a designer to complete 100% of the design before contracting with a general contractor to build the project based on the completed drawings (Caltrans 2008). Under the DBB project delivery, the public sector is responsible for funding the project (US DOT 2008).

## Design-Build (DB)

Owner contracts with one single entity to design and construct the project based on very limited design details and selection criteria developed by the owner (Caltrans 2008; Beard et al 2001). This delivery method combines the design and construction phases of a project into a single contract for the agency to manage (AASHTO 2008; Beard et al 2001). Allows for greater private sector involvement, but does not transfer any of the risks of financing, operating and/or maintaining a facility to the private sector (US DOT 2008).

## Construction Manager/General Contractor (CM/GC)

The owner contracts with a design team and contracts with a separate construction manager to act as a construction advisor during design of the project. Then, the construction manager acts as the general contractor and performs the actual construction of the project (Gransberg and Shane 2010; Caltrans 2008).

## Design-Build-Operate-Maintain (DBOM)

Owner contracts with one single entity to design and construct the project based on very limited design details and selection criteria developed by the owner. The contract also entails that the entity operate and maintain the project for a set period of time (US DOT 2008; Dahl et al 2005).

## Public-Private Partnership (PPP, DBFOM)

A delivery method where an agency contracts with a private firm or consortium in a development agreement to design, build, finance, operate, and maintain a project over a long period of time (Levy 2008; AASHTO 2006). PPP allows for project risks to be shared or transferred to the party best equipped to handle them (Levy 2008). At the end of the contract, the project is then turned back over to the owner.

## Integrated Project Delivery (IPD)

A collaboration-based delivery model in which the owner, constructor, designer, and potentially other consultants, subcontractors, and suppliers enter into a single, multi-party agreement. All the signing parties are involved at an early stage during planning of a project, share in the project risks rather than allocate the risks, and participate in gainshare / painshare depending on the success of the project (AIA 2007).

# Procurement Procedures

## Low Bid (Lump sum bidding, unit price bidding, lowest total bid)

Competitive, closed bid system where selection is based only on the price presented to the owner. This is the traditional procurement method in use with traditional delivery methods, where design documents are at or near 100% complete (Molenaar and Gransberg 2001). The price presented by the selected firm is the basis for the contract price of the project.

## Qualifications-Based

A procurement method that focuses on qualitative criteria such as qualifications, experience, and past performance as the basis for selection. Price is not considered a part of the selection process (AASHTO 2006; El Wardani et al 2006).

## A+B (Cost + Time)

Called "Cost plus Time" bidding where bidders submit a cost and schedule to complete the project based on boundary criteria established by the agency (Strong et al 2007). The agency then selects a firm based on the direct construction costs, "A", and the duration in calendar days to complete the project, "B" (AASHTO 2006; MnDOT 2005). The agency determines the value of a time unit called the road user's cost (RUC) that is then used as a multiplier of the time portion of the bid (AASHTO 2006; Herbsman 1995).

## Best Value (Multi-parameter)

A procurement process where price and other key factors are considered in the evaluation and selection process to minimize impacts and to enhance the long-term performance and value of construction (Scott et al 2006; Anderson and Russell 2001).

## Job order contracting (Indefinite delivery/indefinite quantity)

A competitively bid, firm fixed price and indefinite quantity procurement contract that lasts for a specified duration of time (Rizk and Fouad 2007). Firms bid per unit of specific work where the owner guarantees a minimum amount of work over the life of the contract (AASHTO 2006).

## Sole Source

Procurement procedure used on projects with a single bidder for specialty work or in emergency situations (FAR 2005) where the owner can select any firm based on any selection factor (El Wardani et al 2006; Beard et al 2001). Selection factors range from qualification-based to relationship-based (Beard et al 2001). Sole source does not include a competitive price factor (FAR 2005; Molenaar and Gransberg 2001) and limits full and open competition, which is required on most public transportation projects (FAR 2005).

## Negotiated

A procurement process where an agency chooses a contractor based on experience with a similar type of project and an established, quantifiable record of accomplishment. The chosen contractor then submits a bid that should encompass all technical requirements, schedule of the project, price of the contract, and any other pertinent items to the specific project. The agency then reviews the bid and can either accept as is or request the contractor to revise and resubmit. This revise and resubmit process continues until the agency accepts the bid (FAR 2005; Zelasko and Schexnayder 2003).

## Guaranteed maximum price (GMP)

A contracting arrangement in which an owner contracts with a firm to perform a fixed scope of work in exchange for a price that is guaranteed not to exceed the stated maximum price (CMAA 2012). A GMP contract includes a base cost along with several allowances and contingencies that can result in a final cost that is below the stated GMP. Savings are then provided to the owner or shared between the owner and contracted firm. Any cost overruns above the GMP are solely the responsibility of the owner (CMAA 2012; Gransberg and Shane 2010).

## Alternate Design

Procurement process when two or more designs are presented for the same project in the bid documents or when the owner allows bidders to submit alternate designs that is equivalent in function to the design specifications/criteria presented in the bid documents. Bidders usually provide a price for the initial design as well as the second design even though only one of the designs will be used in the construction of the project (Caltrans 2008; Scott et al 2006).

## Additive Alternates

A bidding technique used when it is necessary to keep the contract amount within a budget and let the industry compete on the largest scope that fits within the budget. The owner provides the base bid package that includes most of the required scope for the project. The owner also provides a list of possible alternates for the project that could be incorporated based on the owner’s decision and budgetary constraints. Bidders are typically required to submit prices for all bid items. However, the owner may prioritize the alternates so the bidders know what alternates carry more weight (Caltrans 2008).

## Lowest Life-Cycle Cost

A technique for procurement where the owner determines the lifecycle of the project and provides general parameters in the bid documents to calculate the life cycle cost of the project. Costs that are considered include direct construction cost, operational cost, and maintenance cost. The owner then selects a firm based on the overall lowest cost over the lifecycle of the project (Gransberg and Molenaar 2004).

## Upset Pricing

The owner develops an initial maximum value that is acceptable for a project. Then, if all received bids are higher than the upset price, the owner does not have to award the project and can rebid or negotiate the project (Beard et al 2001).

# Types of Best Value Algorithms

## Adjusted Score

A two-part procurement procedure in which the owner analyzes a bid based on technical merit and then creates a technical score based on pre-defined technical criteria. Then, the owner analyzes the price component of the bid. The technical score is multiplied by the engineer's estimate and then divided by the price of the bid to create the adjusted score. The highest adjusted score is then the selected firm (Jones 2010).

## Adjusted Bid

Procurement procedure in which a bid is first analyzed based on technical merit and is scored using pre-defined technical criteria. After he technical score is determined, the price component of the bid is opened and analyzed. The price component is then divided by the technical score, and the lowest adjusted cost is the winning bid. The price component presented is used for the contract price, not the lowest adjusted cost (Jones 2010).

## Fixed Budget/Best Design

The owner stipulates the contract price in the proposal request as well as the qualitative and design evaluation factors for project elements upon which the selection will be determined. Bidders then submit qualitative design offers at the stipulated price. Proposals are then evaluated and rated based on the non-cost factors since the price is fixed, and the highest rate proposal is selected for award at the stipulated price (DBIA 2012; Jones 2010).

## Weighted Criteria

A two-part procurement procedure that includes a technical section and price proposal. The owner pre-determines point ratings for qualitative factors and for price, which is provided to the bidders. The owner then evaluates proposals and assigns points according to the rating system. Price points are assigned inversely proportional to bid amount. The highest total points (price plus qualitative factors) determine the award (DBIA 2012; Jones 2010).

## Quantitative Cost – Technical Tradeoff

The owner implements a scoring system that examines the incremental opportunities of price and technical benefit. The technical score increment is determined by identifying the highest technical score then dividing that highest score by the next highest score. Price score is determined in the same manner. Then, the contract is awarded to the lowest cost unless the technical benefits of a higher cost bid offer justifiable benefits to the project (Jones 2010).

## Qualitative Cost – Technical Tradeoff

The owner evaluates all non-cost criteria using an adjectival or modified pre-determined scoring system. All proposals evaluated and found to contain no fatal flaws make up the competitive range. The price component is then opened and the project is then awarded to the best value, without any mathematical manipulation or combination of price and non-price factors (Scott et al 2006).

## Meets Technical Criteria – Low Bid

All non-cost criteria are evaluated using a pre-determined rating system. Direct point scoring may be used to determine if the technical proposal meets the minimum technical score. The evaluated proposals that are considered fully responsive then make up the competitive range. The price component of the proposal is then opened, and the bidder with the lowest price proposal that is a part of the competitive range is selected (Scott et al 2006).

# Primary Contract Payment Provisions

## Unit price

A common payment method that establishes a set monetary price for construction items in which the owner pays the unit price multiplied by the quantity installed (Knutson et al 2009).

## Fixed price

A common payment method where a price is set for the total cost of the project based on a set amount of work. The owner pays the set amount to the firm regardless of the actual costs that the firm incurs for the project (FAR 2005; Knutson et al 2009).

## Cost reimbursable

Payment method where the owner contracts with an entity to perform a fixed or variable scope of work in exchange for a payment based on the agreed calculated method (CMAA 2012; FAR 2005).

## Supplementary Contract Payment Provisions

These payment provisions are commonly used, but are not stand alone payment techniques. To use any of the following payment provisions, one of the three primary provisions must be in place with the supplementary provision in addition to the primary provision.

### Lane Rental

Provision that assess the contractor daily or hourly rental fees for each lane, shoulder, or combination thereof that are taken out of service during construction. Lane rental fees help to minimize the road user impact time (AASHTO 2006).

### Incentives/Disincentives

A type of contract provision which compensates the contractor a specific amount of money for each day that critical work is completed ahead of schedule and can assess a fee for each day identified that the contractor overruns the specified time (Sillars and Leray 2007; AASHTO 2006; MnDOT 2005). The agency provides an incentive or incentives to a firm for exceed performance goals. The agency assesses a disincentive or disincentives if a firm fails to meet goals set at the outset of the project.

### Warranty

A warranty is a guarantee of the integrity of a product and the contractor's responsibility to repair or replace defects during a defined period of time and conditions (Caltrans 2008). A contractor is held responsible for all maintenance and repair work that occurs during the specified warranty period. Warranties provide freedom to the selected contractor as to the materials and techniques to use that is considered the best approach and still meets the owner's requirements. The contractor then warrants the project and performs work on any defects due to materials or performance during the warranty period (Bayraktar et al 2004; Anderson and Russell 2001).

### Award-fee

A contract provision that modifies the contractor fee in fee-based contracts. The payment is a combination of fixed fees and a subjective incentive based on the contractor's quality and performance (Jones 2010). A base fee is established, which is guaranteed to the contractor for completion of the contract. Then, there is an added award fee to the base fee that ranges from zero to a maximum set value, dependent upon the contractor's performance based on the owner's evaluation. The amount of the award fee can be based on a variety of factors such as quality, safety, schedule, cost, productivity, and innovations (Clough et al 2005).

## No excuse incentives

A monetary bonus provision used to motivate contractors to complete the contract work on time ("drop dead date") or sooner than stipulated in the contract (Caltrans 2008). The contractor will receive an incentive payment for completing a phase or the entire project by a specific milestone date, regardless of any problems or unforeseen conditions that may arise (AASHTO 2006).

## Payment by plan

An alternative payment method where the payment to the contracted firm is based solely on measurement derived from plans and schedule of values instead of field measurements (Scott and Mitchell 2007.)

## Payment by availability

A periodic payment made to a developer by a public agency for providing an available facility. Payments can be reduced if the facility is not available to the public for a period of time, or for not maintaining the facility in a satisfactory condition. This eliminates the need for a developer to assume any traffic risk and protects the interests of the public by providing a financial incentive to keep the facility at a satisfactory condition and to operate the facility at a specific level of performance (US DOT 2008).

## Economic price adjustment

A contract provision where the prices of labor, materials, or both are adjusted depending on the market prices. This allows for improved contract flexibility where changes in contract price are allowed if there is a large swing in market costs of labor and/or materials (FAR 2005).

## Contingency fund management

An innovative payment technique to manage possible project risks that have the potential to result in unrealistic estimates, cost overruns, and scope and schedule growth and as a tool for assuring cost certainty. The owner sets aside a specific amount of the budget as a contingency to provide a fund for cost increase situations. The use of contingency fund management reduces the amount of contingency included in bids and contract prices. It also provides assurance to the owner and contractor that funds are available for costs not covered by the contract sum (Scott and Mitchell 2007; Caltrans 2008).

## Performance ratings and contract retainage

Contractors have the ability to be rated based on performance of work that has been completed over a specified period of time. This rating is then used to adjust the amount of retainage that the owner holds from the contractor where the higher the performance rating, the lower the retainage. A baseline of a no record rating results in the standard defined retainage per the contract (Jones 2010).

## Milestone Payments / Incentives

Payments made to the contractor for completing a pre-determined milestone either on or ahead of schedule. Conversely, a disincentive can be incurred for failure to complete by a milestone or target date. The total payment is then the lump sum payment plus the incentive or minus the disincentive. This incentive/disincentive encourages contractors to finish early so to minimize the impact to the traveling public (Scott and Mitchell 2007)

# Appendix C – Draft Compatibility Matrices

## Design – Bid – Build

Key:
C = Compatible
N = Not compatible

| | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | C | C | C | C | C | C | C | N | C | N | N |
| | Fixed Price | C | C | C | C | C | C | C | N | C | N | N |
| | Cost Reimbursable | C | C | C | C | N | C | C | N | C | N | N |

## Design – Build

Key:
C = Compatible
N = Not compatible

| | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | C | C | C | C | C | C | C | N | C | N | C |
| | Fixed Price | C | C | C | C | C | C | C | C | C | N | C |
| | Cost Reimbursable | C | C | C | C | N | C | C | C | C | N | C |

## Construction Manager / General Contractor

Key:
C = Compatible
N = Not compatible

| | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | C | C | C | C | N | C | C | N | C | N | N |
| | Fixed Price | C | C | C | C | N | C | C | C | C | N | N |
| | Cost Reimbursable | C | C | C | C | N | C | C | C | C | N | N |

## Design – Build – Operate – Maintain

| Key: C = Compatible, N = Not compatible | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | N | N | C | C | N | C | C | N | C | C | C |
| | Fixed Price | C | C | C | C | N | C | C | C | C | C | C |
| | Cost Reimbursable | C | C | C | C | N | C | C | C | C | C | C |

## Public – Private – Partnership

| Key: C = Compatible, N = Not compatible | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | N | N | N | N | N | N | N | N | N | N | N |
| | Fixed Price | N | C | C | C | N | C | C | C | C | C | N |
| | Cost Reimbursable | N | C | C | C | N | C | C | C | C | C | N |

## Integrated Project Delivery

| Key: C = Compatible, N = Not compatible | | Procurement Procedures | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Bid | Quals Based | A+B | Best Value | JOC | Sole Source | Negotiate w/ GMP | Alt Design | Add Alts | Lowest Lifecycle Cost | Upset Pricing |
| Payment Provisions | Unit Price | N | N | N | N | N | N | N | N | N | N | N |
| | Fixed Price | N | C | C | C | N | C | C | C | N | N | N |
| | Cost Reimbursable | N | C | C | C | N | C | C | C | N | N | N |

# Appendix D - Project Delivery Selection Matrix (PDSM)

# Project Delivery Selection Matrix

## Overview

This document provides a formal approach for highway project delivery selection. The document provides generic forms for use by state transportation agency (STA) staff and project team members. By using these forms, a brief project delivery selection report can be generated for each individual project. The primary objectives of this document are:

- Present a structured approach to assist STAs in making project delivery decisions;
- Assist STAs in determining if there is a dominant or obvious choice of project delivery methods; and
- Provide documentation of the project delivery decision in the form of a Project Delivery Decision Report.

## Background

The project delivery method is the process by which a construction project is comprehensively designed and constructed including project scope definition, organization of designers, constructors and various consultants, sequencing of design and construction operations, execution of design and construction, and closeout and start-up. Thus, the different project delivery methods are distinguished by the manner in which contracts between the agency, designers and builders are formed and the technical relationships that evolve between each party inside those contracts. Currently, there are several types of project delivery systems available for publicly funded transportation projects. The most common systems are Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager/General Contractor (CM/GC). No single project delivery method is appropriate for every project. Each project must be examined individually to determine how it aligns with the attributes of each available delivery method.

**DBB** is the traditional project delivery method in which an agency designs, or retains a designer to furnish complete design services, and then advertises and awards a separate construction contract based on the designer's completed construction documents. In DBB, the agency "owns" the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction.

**DB** is a project delivery method in which the agency procures both design and construction services in the same contract from a single, legal entity referred to as the design-builder. The method typically uses Request for Qualifications (RFQ)/Request for Proposals (RFP) procedures rather than the DBB Invitation for Bids procedures. The design-builder controls the details of design and is responsible for the cost of any errors or omissions encountered in construction.

**CM/GC** is a project delivery method in which the agency contracts separately with a designer and a construction manager. The agency can perform design or contract with an engineering firm to provide a facility design. The agency selects a construction manager to perform construction management services and construction works. The significant characteristic of this delivery method is a contract between an agency and a construction manager who will be at risk for the final cost and time of construction. Construction industry/Contractor input into the design development and constructability of complex and innovative projects are the major reasons an agency would select the CM/GC method. Unlike DBB, CM/GC brings the builder into the design process at a stage where definitive input can have a positive impact on the project. CM/GC is particularly valuable for new non-standard types of designs where it is difficult for the owner to develop the technical requirements that would be necessary for DB procurement without industry input.

# Overview of the Project Delivery Selection Process

The process is shown in the form of a flow chart below (Figure 1). It consists of the following activities:

A. Describe the project and set the project goals
B. Determine and review project dependent constraints
C. Assess the primary factors (these factors most often determine the selection).
   1. Delivery Schedule
   2. Complexity & Innovation
   3. Level of Design (at the time of the project delivery procurement)
   4. Cost
D. If the primary factors indicate there is a clear choice of the delivery method, then:
   5. Perform an initial risk assessment for the desired delivery method to ensure that risks can be properly allocated and managed, and
E. Perform a brief pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
   6. Staff Experience/Availability (Owner)
   7. Level of Oversight and Control
   8. Competition and Contractor Experience

F. If steps B, C & D do not result in clear determination of the method of delivery then perform a more rigorous evaluation of all eight factors against the three potential methods of delivery (DBB, DB and CM/GC).

<u>NOTE</u>: Typically the entire selection process can be completed by the project team in a 4 hour workshop session, if team member have individually performed assessments before the workshop.

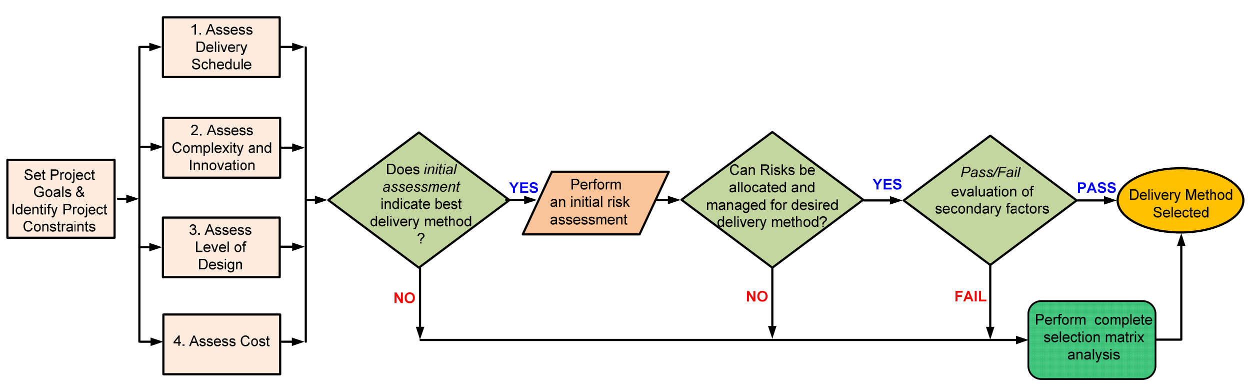


Figure 1. Project Delivery Selection Flowchart

# Worksheets & Forms

The following forms and appendices are included to facilitate this process.

## Project description checklist

Provide information on the project that is using this tool. This includes size, type, funding, risks, complexities, etc. All information should be developed for the specific project.

## Project Goals worksheet – including example project goals

A careful determination of the project goals is an instrumental first step of the process that will guide both the selection of the appropriate method of delivery as well as the specific delivery procurement process and implementation of the project.

## Project Constraints worksheet (Go / No-Go Decisions)

Carefully review all possible constraints to the project. These constraints can potentially eliminate a project delivery method before the evaluation process begins.

## Project Delivery Selection Matrix Summary

The Project Delivery Selection Matrix Summary summarizes the assessment of the eight Evaluation Factors for the three delivery methods. The form is qualitatively scored using the scoring provided in table 1 below.

Table 1 - Factor Evaluation Scoring Key

| | |
|---|---|
| + + | Most appropriate delivery method |
| **+** | Appropriate delivery method |
| **–** | Least appropriate delivery method |
| X | Fatal Flaw (discontinue evaluation of this method) |
| NA | Factor not applicable or not relevant to the selection |

The form also includes a section for comments and conclusions. The completed Project Delivery Selection Matrix Summary should provide an executive summary of the key reasons for the selection of the method of delivery.

## Workshop Blank Form

This form can be used by the project team for additional documentation of the process. In particular it can be used to elaborate on Evaluation Factor 5, “Initial Project Risk Assessment”.

## Evaluation Factor Project Delivery Method Opportunity/Obstacle Summary

These forms are used to summarize the assessments by the project team of the opportunities and challenges associated with each delivery method relative to each of the eight Evaluation Factors. The bottom of each form allows for a qualitative conclusion using the same notation as described above. Those conclusions then are transferred to the **Project Delivery Selection Matrix Summary.**

## Opportunity/Challenges Checklists

These forms provide the project team with direction concerning typical delivery method opportunities and challenges associated with each of the eight Evaluation Factors. However, these checklists include general information and are not an all-inclusive checklist. Use the checklists as a supplement to developing project specific opportunities and challenges.

## Initial Risk Assessment Guidance

Because of the unique nature of Evaluation Factor 5, "Initial Project Risk Assessment", this guidance section provides the project team with additional assistance for evaluation of the risk factor including: Typical Transportation Project Risks; a General Project Risks Checklist; and a Risk Opportunities/Challenges Checklist.

## Project Description Checklist

The following items should be considered in the project description as applicable. Other items can be added if they influence the project delivery decision. Relevant documents can be added as appendices.

- ❒ Project Name:
- ❒ Location:
- ❒ Estimated Budget:
- ❒ Estimated Project Delivery Period:
- ❒ Required Delivery Date (if applicable):
- ❒ Source(s) of Project Funding:
- ❒ Project Corridor:
- ❒ Major Features of Work – pavement, bridge, sound barriers, etc.:
- ❒ Major Schedule Milestones:
- ❒ Major Project Stakeholders:
- ❒ Major Challenges (as applicable)
    - o With Right of Way, Utilities, and/or Environmental Approvals:
    - o During Construction Phase:
- ❒ Main Identified Sources of Risk:
- ❒ Safety Issues:
- ❒ Sustainable Design and Construction Requirements:

# Project Goals

An understanding of project goals is essential to appropriate project delivery selection. Typically, the project goals can be defined in three to five items. Examples are provided below,[1] but the report should include project-specific goals. These goals should remain consistent over the life of the project.

**Project-Specific Goals**

1. Goal #1:
2. Goal #2:
3. Goal #3:
4. Goal #4:

[1] Generic Project Goals

Schedule

- Minimize project delivery time
- Complete the project on schedule
- Accelerate start of project revenue

Cost

- Minimize project cost
- Maximize project budget
- Complete the project on budget
- Maximize the project scope and improvements within the project budget

Quality

- Meet or exceed project requirements
- Select the best team
- Provide a high quality design and construction constraints
- Provide an aesthetically pleasing project

Functional

- Maximize the life cycle performance of the project
- Maximize capacity and mobility improvements
- Minimize inconvenience to the traveling public during construction
- Maximize safety of workers and traveling public during construction

## Project Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible project delivery methods. General constraints are provided, but it is critical to identify constraints that are project specific.

**General Constraints**

- Source of Funding:
- Schedule constraints:
- Federal, state, and local laws:
- Third party agreements with railroads, ROW, etc:
- Project specific constraint:
- Project specific constraint:
- Project specific constraint:

## Project Delivery Selection Matrix Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and challenges related to each factor, and document the discussion on the following pages. Then complete the summary below.

| PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY | | | |
|---|---|---|---|
| | DBB | DB | CM/GC |
| Primary Evaluation Factors | | | |
| 1. Delivery Schedule | | | |
| 2. Project Complexity & Innovation | | | |
| 3. Level of Design | | | |
| 4. Cost | | | |
| 5. Perform Initial Risk Assessment | | | |
| Secondary Evaluation Factors | | | |
| 6. Staff Experience/Availability (Owner) | | | |
| 7.Level of Oversight and Control | | | |
| 8. Competition and Contractor Experience | | | |

| | |
|---|---|
| **+ +** | Most appropriate delivery method |
| **+** | Appropriate delivery method |
| **–** | Least appropriate delivery method |
| **X** | Fatal Flaw (discontinue evaluation of this method) |
| **NA** | Factor not applicable or not relevant to the selection |

# Project Delivery Selection Matrix Summary Conclusions and Comments:

# Workshop Blank Form

## 1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assess time considerations in getting the project started or funding dedicated and assess project completion importance.

| **DESIGN-BID-BUILD**<br>Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete. | |
|---|---|
| Opportunities | Challenges |
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| **DESIGN-BUILD**<br>Ability to get project under construction before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the time necessary to develop an adequate RFP, evaluate proposals and provide for a fair, transparent selection process. | |
|---|---|
| Opportunities | Challenges |
| | |
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| **CM/GC**<br>Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. However, schedule can be slowed down by coordinating design-related issues between the CM and designer and by the process of reaching a reasonable Guaranteed Maximum Price (GMP). | |
|---|---|
| Opportunities | Challenges |
| | |
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| | |

## Delivery Schedule Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 1. Delivery Schedule | | | |

Notes and Comments:

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| |

## 2) Project Complexity & Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

| DESIGN-BID-BUILD<br>Allows STA to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by STA/Consultant expertise and through traditional owner directed processes such as VE studies and contractor bid alternatives. | |
|---|---|
| Opportunities | Challenges |
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| DESIGN-BUILD<br>Incorporates design-builder input into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providing complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements. | |
|---|---|
| Opportunities | Challenges |
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| CM/GC<br>Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of STA, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on GMP. | |
|---|---|
| Opportunities | Challenges |
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### Project Complexity & Innovation Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 2. Project Complexity & Innovation | | | |

Notes and Comments:

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## 3) Level of Design

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

| **DESIGN-BID-BUILD**<br>100% design by STA or contracted design team, with STA having complete control over the design. | |
|---|---|
| Opportunities | Challenges |
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| **DESIGN-BUILD**<br>Design advanced by STA to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less). | |
|---|---|
| Opportunities | Challenges |
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| **CM/GC**<br>Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of STA, designer, and CM/GC in the further development of the design. Iterative nature of design process risks extending the project schedule. | |
|---|---|
| Opportunities | Challenges |
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| | |

### Level of Design Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 3. Level of Design | | | |

Notes and Comments:

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| |

## 4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

| **DESIGN-BID-BUILD**<br>Competitive bidding provides a low cost construction for a fully defined scope of work. Costs accuracy limited until design is completed. More likelihood of cost change orders due to contractor having no design responsibility. | |
|---|---|
| Opportunities | Challenges |
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| **DESIGN-BUILD**<br>Designer-builder collaboration and ATCs can provide a cost-efficient response to project goals. Costs are determined with design-build proposal, early in design process. Allows a variable scope bid to match a fixed budget. Poor risk allocation can result in high contingencies. | |
|---|---|
| Opportunities | Challenges |
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| **CM/GC**<br>STA/designer/contractor collaboration to reduce risk pricing can provide a low cost project however non-competitive negotiated GMP introduces price risk. Good flexibility to design to a budget. | |
|---|---|
| Opportunities | Challenges |
| | |
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| | |

## Cost Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 4. Cost | | | |

Notes and Comments:

| |
|---|
| |

## 5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has a negative effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An initial assessment of project risks is important to ensure the selection of the delivery method that can properly address them. An approach that focuses on a fair allocation of risk will be most successful.

**DESIGN-BID-BUILD**

Risk allocation for design-bid-build best is understood by the industry, but requires that most design-related risks and third party risks be resolved prior to procurement to avoid costly contractor contingency pricing and change orders and claims.

| Opportunities | Challenges |
|---|---|
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**DESIGN-BUILD**

Provides opportunity to properly allocate risks to the party best able to manage them, but requires risks allocated to design-builder to be well defined to minimize contractor contingency pricing of risks.

| Opportunities | Challenges |
|---|---|
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**CM/GC**

Provides opportunity for STA, designer, and contractor to collectively identify and minimize project risks, and allocate risk to appropriate party. Has potential to minimize contractor contingency pricing of risk, but can lose the element of competition in pricing.

| Opportunities | Challenges |
|---|---|
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### Initial Risk Assessment Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 5. Initial Risk Assessment | | | |

Notes and Comments:

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## 6) Staff Experience/Availability

Owner staff experience and availability as it relates to the project delivery methods in question.

| **DESIGN-BID-BUILD**<br>Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out. | |
|---|---|
| Opportunities | Challenges |
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| **DESIGN-BUILD**<br>Technical and management resources and expertise necessary to develop the RFQ and RFP and administrate the procurement. Concurrent need for both design and construction resources to oversee the implementation. | |
|---|---|
| Opportunities | Challenges |
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| **CM/GC**<br>Strong, committed STA project management resources are important for success of the CM/GC process. Resource needs are similar to DBB except STA must coordinate CM's input with the project designer and be prepared for GMP negotiations. | |
|---|---|
| Opportunities | Challenges |
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### Staff Experience/Availability Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 6. Staff Experience/ Availability | | | |

Notes and Comments:

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## 7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process

| DESIGN-BID-BUILD<br>Full control over a linear design and construction process. | |
|---|---|
| Opportunities | Challenges |
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| DESIGN-BUILD<br>Less control over the design (design desires must be written into the RFP contract requirements). Generally less control over the construction process (design-builder often has QA responsibilities). | |
|---|---|
| Opportunities | Challenges |
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| CM/GC<br>Most control by STA over both the design, and construction, and control over a collaborative owner/designer/contractor project team | |
|---|---|
| Opportunities | Challenges |
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## Level of Oversight and Control Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 7. Level of Oversight and Control | | | |

Notes and Comments:

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## 8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project.

| DESIGN-BID-BUILD<br>High level of competition, but GC selection is based solely on low price. High level of marketplace experience. | |
|---|---|
| Opportunities | Challenges |
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| DESIGN-BUILD<br>Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience. | |
|---|---|
| Opportunities | Challenges |
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| CM/GC<br>Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience. | |
|---|---|
| Opportunities | Challenges |
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## Competition and Contractor Experience Summary

| | DBB | DB | CM/GC |
|---|---|---|---|
| 8. Competition and Contractor Experience | | | |

Notes and Comments:

| |
|---|
| |

# PDSM Opportunity and Obstacle Checklists

(With Project Risk Assessment Discussion and Checklists)

## 1) Delivery Schedule Checklist

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

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

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

## 2) Project Complexity & Innovation Checklist

| DESIGN-BID-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ STA can have more control of design of complex projects<br>❒ STA& consultant expertise can select innovation independently of contractor abilities<br>❒ Opportunities for value engineering studies during design, more time for design solutions<br>❒ Aids in consistency and maintainability<br>❒ Full control in selection of design expertise<br>❒ Complex design can be resolved and competitively bid | ❒ Innovations can add cost or time and restrain contractor's benefits<br>❒ No contractor input to optimize costs<br>❒ Limited flexibility for integrated design and construction solutions (limited to constructability)<br>❒ Difficult to assess construction time and cost due to innovation<br>❒ |

| DESIGN-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Designer and contractor collaborate to optimize means and methods and enhance innovation<br>❒ Opportunity for innovation through draft RFP, best value and ATC processes<br>❒ Can use best-value procurement to select design-builder with best qualifications<br>❒ Constructability and VE inherent in process<br>❒ Early team integration<br>❒ Sole point of responsibility<br>❒ | ❒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do)<br>❒ Qualitative designs are difficult to define (example. aesthetics)<br>❒ Risk of time or cost constraints on designer inhibiting innovation<br>❒ Some design solutions might be too innovative or unacceptable<br>❒ Quality assurance for innovative processes are difficult to define in RFP |

| CM/GC | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Highly innovative process through 3 party collaboration<br>❒ Allows for owner control of a designer/contractor process for developing innovative solutions<br>❒ Allows for an independent selection of the best qualified designer and best qualified contractor<br>❒ VE inherent in process and enhanced constructability<br>❒ Risk of innovation can be better defined and minimized and allocated<br>❒ Can take to market for bidding as contingency | ❒ Process depends on designer/CM relationship<br>❒ No contractual relationship between designer/CM<br>❒ Innovations can add cost or time<br>❒ Scope additions can be difficult to manage<br>❒ Preconstruction services fees for contractor involvement<br>❒ Cost competitiveness – single source negotiated GMP<br>❒ |

## 3) Level of Design Checklist

| DESIGN-BID-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ 100% design by owner<br>❒ Agency has complete control over the design (can be beneficial when there is one specific solution for a project)<br>❒ Project/scope can be developed through design<br>❒ The scope of the project is well defined through complete plans and contract documents<br>❒ Well-known process to the industry | ❒ Owner design errors can result in a higher number of change orders, claims, etc.<br>❒ Minimizes competitive innovation opportunities<br>❒ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete |

| DESIGN-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk<br>❒ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete)<br>❒ Contractor involvement in early design, which improves constructability and innovation<br>❒ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility | ❒ Must have very clear definitions and requirements in the RFP because it is the basis for the contract<br>❒ If design is too far advanced it will limit the advantages of design-build<br>❒ Potential for lacking or missing scope definition if RFP not carefully developed<br>❒ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements<br>❒ Less agency control over the design<br>❒ Can create project less standardized designs across agency as a whole |

| CM/GC | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor<br>❒ Contractor involvement in early design improves constructability<br>❒ STA controls design<br>❒ Design can be used for DBB if the price is not successfully negotiated.<br>❒ Design can be responsive to risk minimization | ❒ Teaming and communicating concerning design can cause disputes<br>❒ Three party process can slow progression of design<br>❒ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking<br>❒<br>❒<br>❒ |

## 4) Cost Checklist

| DESIGN-BID-BUILD | |
|---|---|
| Opportunities | Challenges |
| ❐ Competitive bidding provides a low cost construction to a fully defined scope of work<br>❐ Increase certainty about cost estimates<br>❐ Construction costs are contractually set before construction begins | ❐ Cost accuracy is limited until design is completed<br>❐ Construction costs are not locked in until design is 100% complete.<br>❐ Cost reductions due to contractor innovation and constructability is difficult to obtain<br>❐ More potential of cost change orders due to owner design responsibility |

| DESIGN-BUILD | |
|---|---|
| Opportunities | Challenges |
| ❐ Contractor input into design should moderate cost<br>❐ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals<br>❐ Costs are contractually set early in design process with design-build proposal<br>❐ Allows a variable scope bid to match a fixed budget<br>❐ Potential lower average cost growth<br>❐ Funding can be obligated in a very short timeframe | ❐<br>❐ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project. |

| CM/GC | |
|---|---|
| Opportunities | Challenges |
| ❐ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs.<br>❐ Early contractor involvement can result in cost savings through VE and constructability<br>❐ Cost will be known earlier when compared to DBB<br>❐ Integrated design/construction process can provide a cost efficient strategies to project goals<br>❐ Can provide a cost efficient response to the project goals | ❐ Non-competitive negotiated GMP introduces price risk<br>❐ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process.<br>❐ Paying for contractors involvement in the design phase may increase total cost |

## 5) Initial Risk Assessment

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

A. Typical Transportation Project Risks

B. General Project Risks Checklist

C. Opportunities/Challenges Checklist (relative to each delivery method)

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

### *A. TYPICAL TRANSPORTATION PROJECT RISKS*

Following is a list of project risks that are frequently encountered on transportation projects and a discussion on how the risks are resolved through the different delivery methods.

#### A.1: Site Conditions and Investigations

How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link:

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=91468e48c87a547c3497a5c19d640172&rgn=div5&view=text&node=23:1.0.1.7.23&idno=23#23:1.0.1.7.23.1.1.9

**DESIGN-BID-BUILD**

Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.

**DESIGN-BUILD**

Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. The STA should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the STA should perform the following investigations:

1) Basic design surveys
2) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
3) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

**CM/GC**

The STA, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to GMP.

### A.2: Utilities

**DESIGN-BID-BUILD**
Utility risks are best allocated to the STA, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.

**DESIGN-BUILD**
Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and the STA:

*Private utilities (major electrical, gas, communication transmission facilities*): Need to define coordination and schedule risks as they are difficult for design-builder to price. Best to have utilities agreements before procurement. Note – by state regulation private utilities have schedule liability in design-build projects, but they need to be made aware of their responsibilities.

*Public Utilities*: Design and construction risks can be allocated to the design-builder, if properly incorporated into the contract requirements.

**CM/GC**
Can utilize a lower level of design prior to contracting and joint collaboration of STA, designer, and contractor in the further development of the design.

### A.3: Railroads (if applicable)

**DESIGN-BID-BUILD**
Railroad risks are best resolved prior to procurement and relocation designs included in the project requirements when the schedule allows.

**DESIGN-BUILD**
Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by the STA. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

**CM/GC**
Railroad impacts and processes can be resolved collaboratively by STA, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

### A.4: Drainage/Water Quality Best Management Practices (construction and permanent)

Both drainage and water quality often involve third party coordination that needs to be carefully assessed with regard to risk allocation. Water quality in particular is not currently well defined, complicating the development of technical requirements for projects.
Important questions to assess:

1) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?
2) Is there an existing cross-drainage undersized by design Criteria?
3) Can water quality requirements be precisely defined? Is right-of-way adequate?

**DESIGN-BID-BUILD**
Drainage and water quality risks are best designed prior to procurement to minimize potential for claims when the schedule allows.

**DESIGN-BUILD**
Generally, the STA is in the best position to manage the risks associated with third party approvals regarding compatibility with offsite systems, and should pursue agreements to define requirements for the design-builder.

**CM/GC**
The STA, the designer, and the contractor can collectively assess drainage risks and coordination and approval requirements, and minimize and define requirements and allocate risks prior to GMP.

### A.5: Environmental

Meeting environmental document commitments, (noise, 4(f) and historic, wetlands, endangered species, etc.)

**DESIGN-BID-BUILD**
Risk is best mitigated through design prior to procurement when the schedule allows.

**DESIGN-BUILD**
Certain environmental approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

**CM/GC**
Environmental risks and responsibilities can be collectively identified, minimized, and allocated by the STA, the designer, and the contractor prior to GMP

### A.6: Third Party Involvement

Timeliness and impact of third party involvement (funding partners, adjacent municipalities, adjacent property owners, project stakeholders, FHWA, PUC).

**DESIGN-BID-BUILD**
Third party risk is best mitigated through design process prior to procurement to minimize potential for change orders and claims when the schedule allows.

**DESIGN-BUILD**
Third party approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

**CM/GC**
Third party approvals can be resolved collaboratively by STA, designer, and contractor.

### *B. General Project Risk Checklist (items to consider when assessing risk)*

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

## C. Risk Opportunities/Challenges Checklist (relative to each delivery method)

| DESIGN-BID-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❐ Risks managed separately through design, bid, build is expected easier<br>❐ Risk allocation is most widely understood/used<br>❐ Opportunity to avoid or mitigate risk through complete design<br>❐ Risks related to environmental, railroads, and third party involvement are best resolved prior to procurement<br>❐ Utilities and ROW best allocated to the STA and mostly addressed prior to procurement to minimize potential for claim<br>❐ Project can be shelved while resolving risks | ❐ Owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns<br>❐ Low-bid related risks<br>❐ Potential for misplaced risk through prescriptive specifications<br>❐ Innovative risk allocation is difficult to obtain<br>❐ Limited industry input in contract risk allocation<br>❐ Change order risks can be greater<br>❐ Contractor may avoid risks |

| DESIGN-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❐ Performance specifications can allow for alternative risk allocations to the design builder<br>❐ Risk-reward structure can be better defined<br>❐ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)<br>❐ Opportunity for industry review of risk allocation (draft RFP, ATC processes)<br>❐ Avoid low-bid risk in procurement<br>❐ Contractor will help identify risks related to environmental, railroads, ROW, and utilities<br>❐ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns | ❐ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders)<br>❐ Limited time to resolve risks<br>❐ Additional risks allocated to designers for errors and omissions, claims for change orders<br>❐ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract<br>❐ Risks associated with agreements when design is not completed<br>❐ Poorly defined risks are expensive<br>❐ Contractor may avoid risks or drive consultant to decrease cost at risk to quality |

| CM/GC | |
|---|---|
| **Opportunities** | **Challenges** |
| ❐ Contractor can have a better understanding of the unknown conditions as design progresses<br>❐ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)<br>❐ Opportunities to manage costs risks through CM/GC involvement<br>❐ Contractor will help identify and manage risk<br>❐ Agency still has considerable involvement with third parties to deal with risks<br>❐ Avoids low-bid risk in procurement<br>❐ More flexibility and innovation available to deal with unknowns early in design process | ❐ Lack of motivation to manage small quantity costs<br>❐ Increase costs for non-proposal items<br>❐ Disagreement among Designer-Contractor-Owner can put the process at risk<br>❐ If GMP cannot be reached, additional low-bid risks appear<br>❐ Limited to risk capabilities of CM/GC<br>❐ Designer-contractor-agency disagreements can add delays<br>❐ Strong agency management is required to negotiate/optimize risks<br>❐ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction |

## 6) Staff Experience/Availability Checklist

| DESIGN-BID-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Agency, contractors and consultants have high level of experience with the traditional system<br>❒ Designers can be more interchangeable between projects<br>❒ | ❒ Can require a high level of agency staffing of technical resources<br>❒ Staff's responsibilities are spread out over a longer design period<br>❒ Can require staff to have full breadth of technical expertise |

| DESIGN-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Less agency staff required due to the sole source nature of DB<br>❒ Opportunity to grow agency staff by learning a new process | ❒ Limitation of availability of staff with skills, knowledge and personality to manage DB projects<br>❒ Existing staff may need additional training to address their changing roles<br>❒ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.) |

| CM/GC | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Agency can improve efficiencies by having more project managers on staff rather than specialized experts<br>❒ Smaller number of technical staff required through use of consultant designer<br>❒ | ❒ Strong committed owner project management is important to success<br>❒ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects<br>❒ Existing staff may need additional training to address their changing roles<br>❒ Agency must learn how to negotiate GMP projects |

## 7) Level of Oversight and Control Checklist

| DESIGN-BID-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Full owner control over a linear design and construction process<br>❒ Oversight roles are well understood<br>❒ Contract documents are typically completed in a single package before construction begins<br>❒ Multiple checking points through three linear phases: design-bid-build<br>❒ Maximum control over design | ❒ Requires a high-level of oversight<br>❒ Increased likelihood of claims due to owner design responsibility<br>❒ Limited control over an integrated design/construction process |

| DESIGN-BUILD | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ A single entity responsibility during project design and construction<br>❒ Continuous execution of design and build<br>❒ Getting input from construction to enhance constructability and innovation<br>❒ Overall project planning and scheduling is established by one entity | ❒ Can require high level of design oversight<br>❒ Can require high level of quality assurance oversight<br>❒ Limitation on staff with DB oversight experience<br>❒ Less owner control over design<br>❒ Control over design relies on proper development of technical requirements |

| CM/GC | |
|---|---|
| **Opportunities** | **Challenges** |
| ❒ Preconstruction services are provided by the construction manager<br>❒ Getting input from construction to enhance constructability and innovation<br>❒ Provides owner control over an integrated design/construction process | ❒ Agency must have experienced staff to oversee the CM/GC<br>❒ Higher level of cost oversight required |

## 8) Competition and Contractor Experience

| DESIGN-BID-BUILD | |
|---|---|
| Opportunities | Challenges |
| ❐ Promotes high level of competition in the marketplace<br>❐ Opens construction to all reasonably qualified bidders<br>❐ Transparency and fairness<br>❐ Reduced chance of corruption and collusion<br>❐ Contractors are familiar with DBB process | ❐ Risks associated with selecting the low bid (the best contractor is not necessary selected)<br>❐ No contractor input into the process<br>❐ Limited ability to select contractor based on qualifications |

| DESIGN-BUILD | |
|---|---|
| Opportunities | Challenges |
| ❐ Allows for a balance of qualifications and cost in design-builder procurement<br>❐ Two-phase process can promote strong teaming to obtain "Best Value"<br>❐ Increased opportunity for innovation possibilities due to the diverse project team | ❐ Need for DB qualifications can limit competition<br>❐ Lack of competition with past experience with the project delivery method<br>❐ Reliant on DB team selected for the project<br>❐ The gap between owner experience and contractor experience with delivery method can create conflict |

| CM/GC | |
|---|---|
| Opportunities | Challenges |
| ❐ Allows for qualifications based contractor procurement<br>❐ Agency has control over an independent selection of best qualified designer and contractor<br>❐ Contractor is part of the project team early on, creating a project "team"<br>❐ Increased opportunity for innovation due to the diversity of the project team | ❐ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability<br>❐ Working with only one contractor to develop GMP can limit price competition<br>❐ Requires a strong project manager from the agency<br>❐ Teamwork and communication among the project team |