Project Delivery Selection Matrix (PDSM)

Summary	
Project Name:	
Workshop Date:	
Workshop Location:	
Facilitator:	
Delivery Method Selected:	

Participants	
Name	**Email**

Project Delivery Selection Matrix (PDSM)

Overview

This document provides a formal approach for selecting project delivery methods for highway projects. The information below lists the project delivery methods followed by an outline of the process, instructions, and evaluation worksheets for use by the project owner's 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 tool are:

- Present a structured approach to assist the project owner in making project delivery decisions;
- Assist the project owner in determining if there is a dominant or optimal choice of a delivery method; and
- Provide documentation of the selection decision.

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 way contracts between the project owner, 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 (CMGC). 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.

Primary delivery methods

Design-Bid-Build is the traditional project delivery method in which the project owner 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 project owner "owns" the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction.

Design-Build is a project delivery method in which the project owner 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.

Construction Manager / General Contractor is a project delivery method in which the project owner contracts separately with a designer and a construction manager. The project owner can perform design or contract with an engineering firm to provide a facility design. The project owner selects a construction manager to perform construction management services and construction works. The significant characteristic of this delivery method is a contract between the project owner 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 the project owner would select the CMGC method. Unlike DBB, CMGC brings the builder into the design process at a stage where definitive input can have a positive impact on the project. CMGC is particularly valuable for new non-standard types of designs where it is difficult for the project owner to develop the technical requirements that would be necessary for DB procurement without industry input.

Facilitation of the tool

When embarking on using the project delivery selection tool for the first time, it is recommended that a facilitator is brought in for the workshop. The facilitator will assist with working through the tool and provide guidance for discussing the project and selection of a delivery method. This individual should be knowledgeable about the process and should be consistently used. The facilitator also helps to answer questions and make sure the process stays on track and the team moves towards a formal selection.

Participation

Using the project delivery selection matrix is only as good as the people who are involved in the selection workshop. Therefore, it is necessary to have a collection of individuals to participate in the selection of the delivery method. The selection team needs to include the project manager, the project engineer, a representative of the procurement/contracting office, and any other project owner's staff that is crucial to the project. In addition, the selection team might want to consider including representatives from specialty units and from the local jurisdictions where the project is located. However, it is important to keep the selection team to a minimum number of participants. Otherwise, the selection process can take a long time to complete. Normally, 3-7 people represent a selection team, but this number should be based on the specific project being analyzed.

Potential bias

The best approach for the participants of the workshop is to keep an open mind about the delivery method to choose. However, there might be participants that have a preconceived notion about the delivery method to use on a project. When this occurs, it is best to discuss that person's ideas with the entire selection team at the beginning of the workshop. Putting that person's ideas on the table helps others to understand the choice that person has in mind. Then, it is important to acknowledge this person's ideas, but to remind that person to keep an open mind as the team works through the selection process.

Pre-workshop Tasks

Before conducting the selection workshop, a few tasks can be completed by the workshop participants. Preparing for the workshop prior to conducting it will result in a much more concise and informative session. It is advised that participants review all known project information, goals, risks, and constraints prior to the workshop. The best approach is to complete the *Project Delivery Description*, the *Project Delivery Goals*, and the *Project Delivery Constraints* worksheets before conducting the workshop. Completing the three worksheets will shorten the time needed to review the project and allows the workshop team to move right into the selection process.

PDSM Process

The process is shown in the outline below and a flowchart on the next page. It consists of individual steps to complete the entire process. The steps should be followed in sequential order.

STAGE I - Project Attributes, Goals, and Constraints

A. Delivery methods to consider
   1. Design-Bid-Build
   2. Design-Build
   3. Construction Manager / General Contractor

B. Project Description/Goals/Constraints
   1. Project attributes
   2. Set project goals
   3. Identify project dependent constraints
   4. Discuss project risks

STAGE II – Primary Factor Evaluation

A. Assess the primary factors (these factors most often determine the selection)
   1. Complexity and Innovation
   2. Delivery Schedule
   3. Project Cost Considerations
   4. Level of Design

B. If the primary factors indicate there is a clear choice of a delivery method, then:
   - 5i. Perform a risk assessment for the desired delivery method to ensure that risks can be properly allocated and managed, and then move on to Stage III Part A

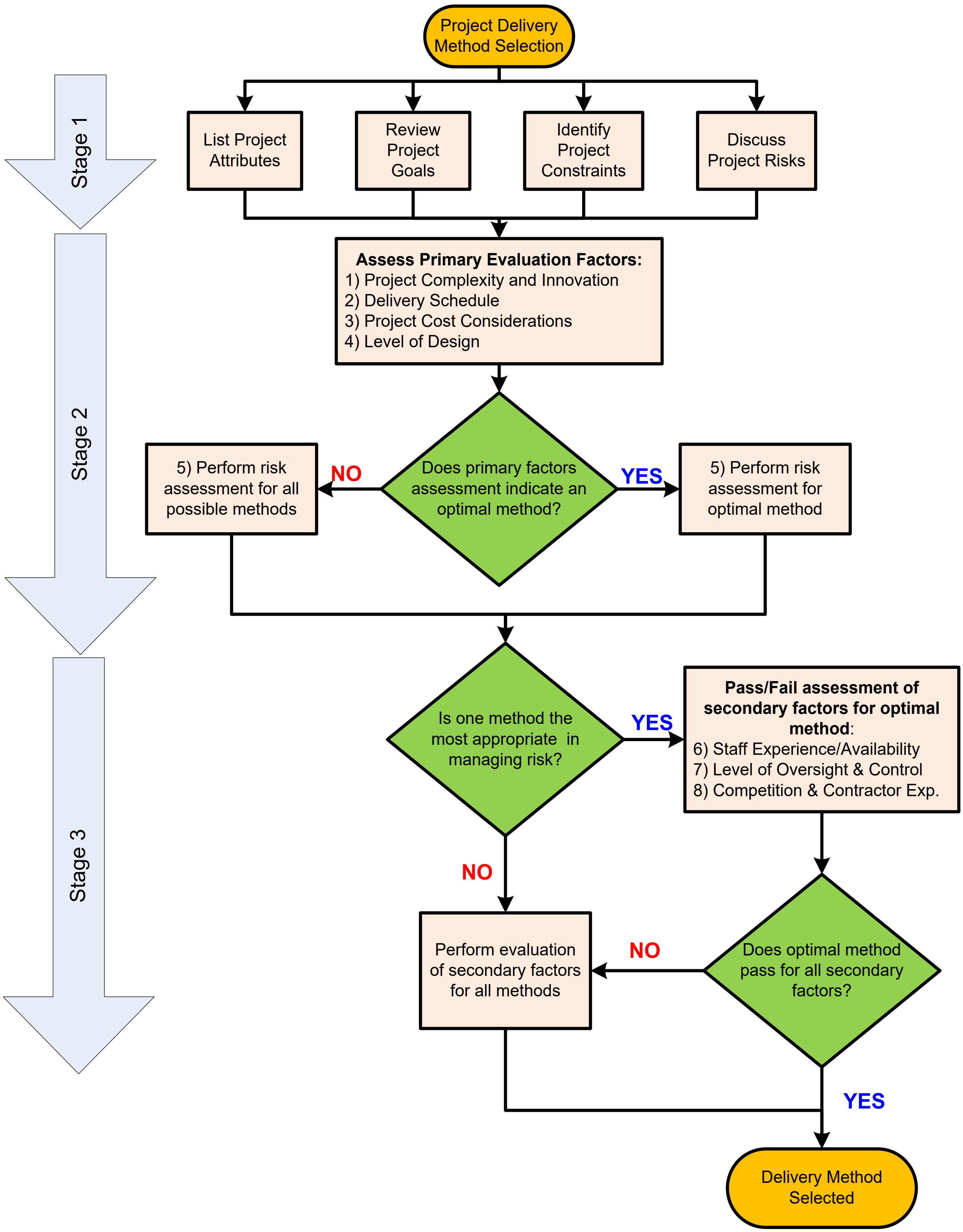
C. If the primary factors do not indicate a clear choice of a delivery method, then:
   - 5ii. Perform a risk assessment for all delivery methods to determine which method can properly allocate and manage risks, and then move on to Stage III Part B

STAGE III – Secondary Factor Evaluation

A. Perform a pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
   6. Staff Experience/Availability (project owner)
   7. Level of Oversight and Control
   8. Competition and Contractor Experience

B. If pass/fail analysis does not result in clear determination of the method of delivery, then perform a more rigorous evaluation of the secondary factors against all potential methods of delivery

NOTE: Typically, the entire selection process can be completed by the project team in a 3-hour workshop session, if each team member has individually reviewed and performed the assessment prior to the workshop.



Flowchart of the PSDM Process

PDSM Worksheets and Forms

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

Project delivery description worksheet

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

Project delivery 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 for the project.

Project delivery constraints worksheet - including example project constraints

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

Project risks worksheet

In addition to project goals and constraints, a detailed discussion of project risks is a critical step that helps with evaluation of the selection factors.

Project delivery selection summary form

The Project Delivery Selection Summary summarizes the assessment of the eight selection factors for the three delivery methods. The form is qualitatively scored using the rating provided in the table below. The form also includes a section for comments and conclusions. The completed Project Delivery Selection Summary should provide an executive summary of the key reasons for the selection of the method of delivery.

Rating 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

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 the evaluation of the *Assessment of Risk* factor.

Project delivery methods selection factor opportunities / obstacles form

These forms are used to summarize the assessments by the project team of the opportunities and obstacles associated with each delivery method relative to each of the eight Selection 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 Summary Form***.**

Project delivery methods opportunities / obstacles checklists

These forms provide the project team with direction concerning typical delivery method opportunities and obstacles associated with each of the eight Selection 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 obstacles.

Risk assessment guidance form

Because of the unique nature of Selection Factor 5, *Assessment of Risk*, 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/Obstacles Checklist.

Project Delivery Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the project delivery decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
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 General Obstacles:
Major Obstacles with Right of Way, Utilities, and/or Environmental Approvals:
Major Obstacles during Construction Phase:
Safety Issues:
Sustainable Design and Construction Requirements:

Project Delivery Goals

An understanding of project goals is essential to selecting an appropriate project delivery method. Therefore, project goals should be set prior to using the project delivery selection matrix. Typically, the project goals can be defined in three to five items and need to be reviewed here. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1:
Goal #2:
Goal #3:
Goal #4:
Goal #5:

General Project Goals (For reference)

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 Delivery Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible delivery methods. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to project delivery selection.

General Constraints
Source of Funding:
Schedule constraints:
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc.:
Project Financing
Does your project have any funding gaps that would require Financing*?
Project Delivery Specific Constraints
Project delivery constraint #1:
Project delivery constraint #2:
Project delivery constraint #3:
Project delivery constraint #4:
Project delivery constraint #5:

General Project Constraints

Schedule

- Utilize federal funding by a certain date
- Complete the project on schedule
- Weather and/or environmental impact

Cost

- Project must not exceed a specific amount
- Minimal changes will be accepted
- Some funding may be utilized for specific type of work (bridges, drainage, etc.)

Quality

- Must adhere to standards proposed by the project owner
- High quality design and construction constraints
- Adhere to local and federal codes

Functional

- Traveling public must not be disrupted during construction
- Hazardous site where safety is a concern
- Return area surrounding project to existing conditions

Project Risks

Identified Project Risks
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:
Project Risk:

General Risk Categories to Consider

1. Site Conditions and Investigations
2. Utilities
3. Railroads
4. Drainage/Water Quality
5. Environmental
6. Third-party Involvement
7. Organizational
8. Design
9. Construction
10. Right-of-Way

Project Delivery Selection Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles 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**	**CMGC**
Primary Selection Factors			
1. Project Complexity & Innovation			
2. Project Delivery Schedule			
3. Project Cost Considerations			
4. Level of Design			
5. Risk Assessment			
Secondary Selection Factors			
6. Staff Experience/Availability (project owner)			
7.Level of Oversight and Control			
8. Competition and Contractor Experience			

Rating 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

PDSM Conclusions and Comments

PDSM Primary Factors

1) Project Complexity and Innovation

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

DESIGN-BID-BUILD - Allows project owner to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by project owner/Consultant expertise and through traditional project owner directed processes such as VE studies and contractor bid alternatives.		
Opportunities	**Obstacles**	**Rating**

CMGC - Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of the project owner, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on CAP.		
Opportunities	**Obstacles**	**Rating**

DESIGN-BUILD - 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	**Obstacles**	**Rating**

2) Delivery Schedule

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

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

Opportunities	Obstacles	Rating

CMGC - 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 CAP.

Opportunities	Obstacles	Rating

DESIGN-BUILD - 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	Obstacles	Rating

3) Level of Design

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

DESIGN-BID-BUILD - 100% design by the project owner or contracted design team, with project owner having complete control over the design.

Opportunities	Obstacles	Rating

CMGC - Can utilize a lower level of design prior to procurement of the CMGC and then collaboration of the project owner, designer, and CMGC in the further development of the design. Iterative nature of design process risks extending the project schedule.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Design advanced by the project owner to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).

Opportunities	Obstacles	Rating

4) Project Cost Considerations

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

DESIGN-BID-BUILD - 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	**Obstacles**	**Rating**

CMGC - Project owner/designer/contractor collaboration to reduce risk pricing can provide a low-cost project however non-competitive negotiated CAP introduces price risk. Good flexibility to design to a budget.		
Opportunities	**Obstacles**	**Rating**

DESIGN-BUILD - 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	**Obstacles**	**Rating**

5) Risk Assessment of Delivery Methods

Risk is an uncertain event or condition that, if it occurs, has an 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, change orders, and potential claims.

Opportunities	Obstacles	Rating

CMGC - Provides opportunity for the project owner, 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	Obstacles	Rating

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	Obstacles	Rating

PDSM Secondary Factors

6) Staff Experience and Availability

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

DESIGN-BID-BUILD - Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out.

Opportunities	Obstacles	Rating

CMGC - Strong, committed project management resources of the project owner are important for success of the CMGC process. Resource needs are similar to DBB except project owner must coordinate CM's input with the project designer and be prepared for CAP negotiations.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Technical and management resources and expertise necessary to develop the RFQ and RFP and administer the procurement. Concurrent need for both design and construction resources to oversee implementation.

Opportunities	Obstacles	Rating

7) Level of Oversight and Control

Level of oversight involves the amount of project owner's staff required to monitor the design or construction, and amount of project owner control over the delivery process

DESIGN-BID-BUILD - Full control over a linear design and construction process.		
Opportunities	**Obstacles**	**Rating**

CMGC - Most control by the project owner over both the design, and construction, and control over a collaborative project owner/designer/contractor project team		
Opportunities	**Obstacles**	**Rating**

DESIGN-BUILD - 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	**Obstacles**	**Rating**

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 - High level of competition, but GC selection is based solely on low price. High level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**

CMGC - Allows for the selection of the single most qualified contractor, but CAP can limit price competition. Low level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**

DESIGN-BUILD - Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**

Project Delivery Selection Factors - Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD
Complexity and Innovation Considerations
• Agencies control of design of complex projects • The project owner and consultant expertise can select innovation independently of contractor abilities • Opportunities for value engineering studies during design, more time for design solutions • Aids in consistency and maintainability • Full control in selection of design expertise • Complex design can be resolved and competitively bid • Innovations can add cost or time and restrain contractor's benefits • No contractor input to optimize costs • Limited flexibility for integrated design and construction solutions (limited to constructability) • Difficult to assess construction time and cost due to innovation

CMGC
Complexity and Innovation Considerations
• Highly innovative process through 3 party collaboration • Allows for the project owner control of a designer/contractor process for developing innovative solutions • Allows for an independent selection of the best qualified designer and best qualified contractor • VE inherent in process and enhanced constructability • Risk of innovation can be better defined and minimized and allocated • Can take to market for bidding as contingency • Can develop means and methods to the strengths of a single contractor partner throughout preconstruction • Process depends on designer/CM relationship • No contractual relationship between designer/CM • Innovations can add or reduce cost or time • Management of scope additions •

DESIGN-BUILD
Complexity and Innovation Considerations
• Designer and contractor collaborate to optimize means and methods and enhance innovation • Opportunity for innovation through competiveness of ATC process • Can use best-value procurement to select design-builder with best qualifications • Constructability and VE inherent in process • Early team integration • Requires desired solutions to complex designs to be well defined through technical requirements • Qualitative designs can be difficult to define if not done early in design (example. aesthetics) • time or cost constraints on designer • Quality assurance for innovative processes can be difficult to define in RFP • Ability to obtain intellectual property through the use of stipends

2) Delivery Schedule Project Delivery Selection Checklist

DESIGN-BID-BUILD
Schedule Considerations
• Schedule is more predictable and more manageable • Milestones can be easier to define • Projects can more easily be "shelved" • Shortest procurement period • Elements of design can be advanced prior to permitting, construction, etc. • Time to communicate/discuss design with stakeholders • Time to perform a linear Design-Bid-Build delivery process • Design and construction schedules can be unrealistic due to lack of industry input • Errors in design lead to change orders and schedule delays • Low bid selection may lead to potential delays and other adverse outcomes.
CMGC
Schedule Considerations
• Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) • More efficient procurement of long-lead items • Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) • Can provide a shorter procurement schedule than DB • Team involvement for schedule optimization • Continuous constructability review and VE • Maintenance of Traffic improves with contractor inputs • Contractor input for phasing, constructability and traffic control may reduce overall schedule • Potential for not reaching CAP and substantially delaying schedule • CAP negotiation can delay the schedule • Designer-contractor-project owner disagreements can add delays • Strong project owner management is required to control schedule
DESIGN-BUILD
Schedule Considerations
• Potential to accelerate schedule through parallel design-build process • Shifting of schedule risk • Industry input into design and schedule • Fewer chances for disputes between project owner and the Design-Build team • More efficient procurement of long-lead items • Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) • Allows innovation in resource loading and scheduling by DB team • Request for proposal development and procurement can be intensive • Undefined events or conditions found after procurement, but during design can impact schedule and cost • Time required to define and develop RFP technical requirements and expectations • Requires project owner and stakeholder commitments to an expeditious review of design

3) Project Cost Considerations Project Delivery Selection Checklist

DESIGN-BID-BUILD
Project Cost Considerations
• Competitive bidding provides a low-cost construction to a fully defined scope of work • Increased certainty about cost estimates • Construction costs are contractually set before construction begins • Cost accuracy is limited until design is completed • Construction costs are not locked in until design is 100% complete • Cost reductions due to contractor innovation and constructability is difficult to obtain • More potential of cost change orders due to project owner design responsibility
CMGC
Project Cost Considerations
• Project owner/designer/contractor collaboration to reduce project risk can result in lowest project costs • Early contractor involvement can result in cost savings through VE and constructability • Cost will be known earlier when compared to DBB • Integrated design/construction process can provide a cost-efficient strategy to project goals • Can provide a cost-efficient response to meet project goals • Non-competitive negotiated CAP introduces price risk • Difficulty in CAP negotiation introduces some risk that CAP will not be successfully executed requiring aborting the CMGC process • Paying for contractor's involvement in the design phase could potentially increase total cost • Use of Independent Cost Estimating (ICE) expertise to obtain competitive pricing during CAP negotiations
DESIGN-BUILD
Project Cost Considerations
• Contractor input into design should moderate cost • Design-builder collaboration and ATCs can provide a cost-efficient response to project goals • Costs are contractually set early in design process with design-build proposal • Allows a variable scope bid to match a fixed budget • Potential lower average cost growth • Funding can be obligated in a very short timeframe • Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project

4) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD

Level of Design Considerations

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

CMGC

Level of Design Considerations

- Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with project owner, designer and contractor
- Contractor involvement in early design improves constructability
- Project owner controls design
- Design can be used for DBB if the price is not successfully negotiated
- Design can be responsive to risk minimization
- Teaming and communicating concerning design can cause disputes
- Three party process can slow progression of design
- Advanced design can limit the advantages of CMGC or could require re-design

DESIGN-BUILD

Level of Design Considerations

- Design advanced by the project owner to level necessary to precisely define the contract requirements and properly allocate risk
- Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete)
- Contractor involvement in early design, which improves constructability and innovation
- 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
- Clearly define requirements in the RFP because it is the basis for the contract
- If design is too far advanced it will limit the advantages of design-build
- Carefully develop the RFP so that scope is fully defined
- Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements
- Less project owner control over the design
- Can create project less standardized designs across project owner as a whole

5a) Initial Risk Assessment Guidance

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

- Typical Transportation Project Risks
- General Project Risks Checklist
- Opportunities/Obstacles 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.

The 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.

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/

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.
CMGC
The project owner, 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 CAP.
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 project owner should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the project owner 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

2) Utilities

DESIGN-BID-BUILD
Utility risks are best allocated to the project owner, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.
CMGC
Can utilize a lower level of design prior to contracting and collaboration of project owner, designer, and contractor in the further development of the design.
DESIGN-BUILD
Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and the project owner: *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.

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.
CMGC
Railroad impacts and processes can be resolved collaboratively by project owner, designer, and contractor. A lengthy resolution process can delay the CAP negotiations.
DESIGN-BUILD
Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by the project owner. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

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 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.
CMGC
The project owner, 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 CAP.
DESIGN-BUILD
Generally, the project owner 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.

5) Environmental

Meeting environmental document commitments and requirements, 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.
CMGC
Environmental risks and responsibilities can be collectively identified, minimized, and allocated by the project owner, the designer, and the contractor prior to CAP
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.

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.
CMGC
Third party approvals can be resolved collaboratively by the project owner, designer, and contractor.
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.

5b) General Project Risk Checklist (Items to consider when assessing risk)

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

5c) Assessment of Risk Project Delivery Selection Opportunities/Obstacles Checklist

DESIGN-BID-BUILD
Risk Considerations
• Risks managed separately through design, bid, build is expected to be easier • Risk allocation is most widely understood/used • Opportunity to avoid or mitigate risk through complete design • Risks related to environmental, railroads, & third-party involvement are best resolved before procurement • Utilities and ROW best allocated to the project owner and mostly addressed prior to procurement to minimize potential for claim • Project can be shelved while resolving risks • Project owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns • Low-bid related risks • Potential for misplaced risk through prescriptive specifications • Innovative risk allocation is difficult to obtain • Limited industry input in contract risk allocation • Change order risks can be greater
CMGC
Risk Considerations
• Contractor can have a better understanding of the unknown conditions as design progresses • Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) • Opportunities to manage costs risks through CMGC involvement • Contractor will help identify and manage risk • Project owner still has considerable involvement with third parties to deal with risks • Avoids low-bidding risk in procurement • More flexibility and innovation available to deal with unknowns early in the design process • Lack of motivation to manage small quantity costs • Increase costs for non-proposal items • Disagreement among Designer-Contractor-Project owner can put the process at risk • If CAP cannot be reached, additional low-bid risks appear • Limited to risk capabilities of CMGC • • Strong project owner management is required to negotiate/optimize risks • Discovery of unknown conditions can drive up CAP, which can be compounded in phased construction
DESIGN-BUILD
Risk Considerations
• Performance specifications can allow for alternative risk allocations to the design builder • Risk-reward structure can be better defined • Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) • Opportunity for industry review of risk allocation (draft RFP, ATC processes) • Avoid low-bidding risk in procurement • Contractor will help identify risks related to environmental, railroads, ROW, and utilities • 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) • Limited time to resolve risks • Additional risks allocated to designers for errors and omissions, claims for change orders • Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract • Risks associated with agreements when design is not completed • Poorly defined risks are expensive • Contractor may avoid risks or drive consultant to decrease cost at risk to quality

6) Staff Experience and Availability Project Delivery Selection Checklist

DESIGN-BID-BUILD

Staff Experience and Availability Considerations

- Project owner, contractors and consultants have high level of experience with the traditional system
- Designers can be more interchangeable between projects
- Can require a high level of project owner staffing of technical resources
- Staff's responsibilities are spread out over a longer design period
- Can require staff to have full breadth of technical expertise

CMGC

Staff Experience and Availability Considerations

- Project owner can improve efficiencies by having more project managers on staff rather than specialized experts
- Smaller number of technical staff required through use of consultant designer
- Strong committed project owner project management is important to success
- Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects
- Existing staff may need additional training to address their changing roles
- Project owner must learn how to negotiate CAP projects

DESIGN-BUILD

Staff Experience and Availability Considerations

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

7) Level of Oversight and Control Project Delivery Selection Checklist

DESIGN-BID-BUILD

Level of Oversight and Control Considerations

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

CMGC

Level of Oversight and Control Considerations

- Preconstruction services are provided by the construction manager
- Obtaining input from the CMGC to enhance constructability and innovation
- Provides project owner control over an integrated design/construction process
- Project owner must have experienced staff to oversee the CMGC
- Higher level of cost oversight required

DESIGN-BUILD

Level of Oversight and Control Considerations

- A single entity responsibility during project design and construction
- Obtaining input from the Design-Builder to enhance constructability and innovation
- Overall project planning and scheduling is established by one entity
- Can require a high level of design oversight
- Can require a high level of quality assurance oversight
- Limitation on staff with DB oversight experience
- Less project owner control over design
- Control over design relies on proper development of technical requirements

8) Competition and Contractor Experience Project Delivery Selection Checklist

DESIGN-BID-BUILD
Competition and Contractor Experience Considerations
• Promotes high level of competition in the marketplace • Opens construction to all reasonably qualified bidders • Transparency and fairness • Reduced chance of corruption and collusion • Contractors are familiar with the DBB process • Risks associated with selecting the low bid (the best contractor is not necessary selected) • No contractor input into the process • Limited ability to select contractor based on qualifications
CMGC
Competition and Contractor Experience Considerations
• Allows for qualifications based contractor procurement • Project owner has control over an independent selection of best qualified designer and contractor • Contractor is part of the project team early on, creating a project "team" • 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 • Working with only one contractor to develop the CAP can limit price competition • Requires a strong project manager from the project owner • Teamwork and communication among the project team
DESIGN-BUILD
Competition and Contractor Experience Considerations
• Allows for a balance of qualifications and cost in design-builder procurement • Two-phase process can promote strong teaming to obtain "Best Value" • Increased opportunity for innovation possibilities due to the diverse project team • Need for DB qualifications can limit competition • Lack of competition with past experience with the project delivery method • Reliant on DB team selected for the project • The gap between project owner experience and contractor experience with delivery method can create conflict