Guidebook for Selecting Alternative Contracting Methods for Roadway Projects:

Project Delivery Methods, Procurement Procedures, and Payment Provisions

Prepared for:

Next-Generation Transportation Construction Management
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Prepared by:

Keith Molenaar, Ph.D.
Christofer Harper, Ph.D.
Ivo Yugar-Arias

University of Colorado
Boulder, Colorado

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CHAPTER 1. PURPOSE AND CONTENT

1.1 Introduction

The highway/roadway construction sector develops and builds large and complex projects in order to repair, improve, and expand the road infrastructure throughout the United States. Yet as highway and road projects become more complex and more necessary, staffing and funding to design and build roadway projects continues to dwindle. To overcome the shortcomings of vital resources, state transportation agencies (STAs) are adapting by using alternative delivery methods and contracting strategies to design and build major road infrastructure projects.

A contracting strategy is the combination of three components: the delivery method, the procurement procedure, and the payment provision. Most roadway projects currently use the traditional contracting strategy of design-bid-build (D-B-B) delivery method, low bid procurement procedure, and unit price payment provision to contract a project. In most cases, this approach is still the most optimal choice among the different varieties that exist. Yet, recently completed research shows that alternative delivery methods and contracting strategies can provide better results for certain projects than the traditional contracting strategy (Love et al 2010; Gransberg and Shane 2010; Ibbs et al 2003).

The difficulty that STAs face then is how to choose between the more traditional approach and an alternative contracting strategy for a specific project. For example, most roadway projects use one of three delivery methods: Design-Bid-Build, Design-Build (D-B), and Construction Manager / General Contractor (CM/GC). Other delivery methods are also available such as multiple prime, design-sequencing, public-private partnerships as well as other variations of D-B and CM/GC. So, the question is which method is the best method for roadway and highway projects. In fact, no one method is optimal for all projects and determining an appropriate method needs to be done on a project-by-project basis. Yet most STAs lack a tool or even formal guidance on how to select contracting strategies from the various delivery methods, procurement procedure, and payment provision that are available. Therefore, the goal of this guidebook and the associated tools are to provide an objective approach to selecting a contracting strategy for a highway project from a compiled comprehensive list of contracting strategies.

1.2 Purpose of Guidebook

The purpose of this guidebook is two-fold. First, the guidebook provides an exhaustive and comprehensive list of the contracting strategies in use today by STAs across the United States and describes each strategy in an effort to educate STAs on strategies they have not used before. Secondly, the decision-support tools included in the guidebook provide STAs with an approach for selecting from the various contracting strategies available based on the known specifics of a highway or road project. The guidebook includes delivery methods, procurement procedures, and payment provisions that have been used extensively as well as other methods that have been used less frequently but provide exceptional results in specific cases. Some contracting strategies help to accelerate the time to complete a project, while others help to alleviate or better allocate the risks involved in a project. In general, this guidebook does not specify the "right" or "wrong" contracting strategy, rather a way to determine the most "optimal" contracting strategy based on a variety of factors including the attributes, goals, and constraints of a project.

1.3 Guidebook Contents

This comprehensive guidebook is organized into three main chapters and seven appendices. The three main chapters introduce and describe the guidebook and its purpose, provide a summary of the various contracting strategies that STAs use for highway projects, and discuss how each of the decisions-support tools works. The appendices include the various decision-support tools for selecting a delivery method, procurement procedure, and payment provisions for a roadway project along with examples of using the tools, as well as extensive details of each potential contracting strategy.

- Chapter 1 – *Purpose and content:* This current chapter describes that the guidebook is to be used by STAs to learn about the various contracting strategies that other STAs are using as well as a tool for determining the optimal contracting strategy for a roadway project. It includes an introduction that summarizes the objectives of the guidebook and the contents outline the information contained in this guidebook.
- Chapter 2 – *State of practice*: This chapter introduces the various project delivery methods, procurement procedures, and payment provisions for STAs to become more educated about alternative contracting methods. Definitions are provided along with dividing the methods by common, less-common, and supplementary approaches to project delivery, procurement, and payment contracting.
- Chapter 3 – *Decision support tools*: This chapter describes the developed decision-support tools that assist STAs with selecting an optimal project delivery method, a procurement procedure, and a payment provision for a roadway project. Details of how each of the tools works and how to incorporate alternative contracting strategies into a roadway construction project are provided.
- Appendix A – *Delivery methods support documents:* The support documents in this section provide comprehensive details about each common and less-common delivery method in use for constructing roadway projects.
- Appendix B – *Procurement procedures support documents*: The support documents in this section provide comprehensive details for each of the common and less-common procurement procedures used by STAs along with detailing the supplementary procurement procedures that can be used in conjunction with one of the primary procurement procedures. Also, seven best value algorithms are included to describe the variations of best value procurement available to STAs.

- Appendix C – *Payment provisions support documents*: The support documents in this section provide comprehensive details about the common and less-common payment provisions STAs use along with details for the supplementary payment provisions that can be used in conjunction with one of the payment provisions.
- Appendix D – *The Project Delivery Selection Matrix (PDSM)*: This appendix includes the full selection tool for determining a project delivery method from D-B-B, CM/GC, and D-B. The tool provides background information, instructions, and worksheets to complete the selection.
- Appendix E – *Example project using the Project Delivery Selection Matrix* (PDSM): This appendix includes an example roadway project that used the PDSM to select a delivery method. The complete document and final decision are detailed.
- Appendix F – *The Procurement Procedure Selection Matrix (PPSM)*: This appendix includes the full selection tool for determining between low bid, best value, and qualifications-based procurement. The tool provides background information, instructions, and worksheets to complete the selection.
- Appendix G – *Example project using the Procurement Procedure Selection Matrix (PPSM):* This appendix outlines a roadway project that used the PPSM to select a procurement procedure. The complete document and final decision are detailed.

1.4 Chapter 1 Summary

Chapter one introduces the guidebook and provides the purpose of the guidebook. The purpose of the guidebook is 1) to provide knowledge to STAs about the many various options that exist for contracting a highway project and 2) to provide assistance with selecting an optimal contracting strategy from the many various options. Also, an outline details the contents of the guidebook. The next chapter introduces the various contracting strategies for roadway design and construction projects.

1.5 Chapter 1 References

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CHAPTER 2. STATE OF PRACTICE

2.1 Project Delivery Methods

Delivering a high performing project successfully requires that STAs use an appropriate delivery method. For many years, the highway industry only used D-B-B. However, in recent years, alternative delivery methods have shown to provide comparable and in some cases better results than D-B-B projects *(1)*. While D-B-B remains the most common and acceptable method for delivering roadway and highway projects, STAs are now adopting alternative delivery methods to deliver projects. D-B-B remains the most common and traditional method, but the details in this section outline other options that STAs have in terms of delivering a roadway construction project. Table 2-1 outlines the common and less-common delivery methods used for roadway design and construction. Refer to Appendix A for the support documents that provide in-depth information of each method.

Table 2-1 – Delivery methods used for highway projects

Common Delivery Methods	Less Common Delivery Methods
❒ Design-Bid-Build	❒ Multi-prime contracting
❒ Design-Build	❒ Design-sequencing
❒ Construction Manager/General Contractor	❒ Public-Private partnership

2.1.1 Common delivery methods

Roadway projects most commonly use D-B-B, followed by D-B, and finally CM/GC. Each method has different opportunities and challenges and depending on the project, some opportunities can become challenges and some challenges may become opportunities. Below is a summary of the common delivery methods used for highway projects.

2.1.1.1 Design-bid-build (D-B-B)

D-B-B is the traditional method of delivery for roadway construction. When using D-B-B, a sequential process begins with the STA designing, or retaining a designer, to furnish complete design services, and then advertising and awarding a separate construction contract based on the designer’s completed construction documents. In D-B-B, the STA “owns” the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction *(1, 2)*.

2.1.1.2 Design-build (D-B)

The second most commonly used delivery method is D-B. The STA contracts with one single entity to design and construct the project based on very limited design details and selection criteria developed by the STA *(2, 3)*. This delivery method combines the design and construction phases of a project into a single contract for the STA to manage *(3, 4)*. D-B allows for greater private sector involvement, but does not allocate any of the risks of financing, operating and/or maintaining a facility to the design-builder *(1)*.

2.1.1.3 Construction manager / general contractor (CM/GC)

A delivery method that is gaining interest across the United States is CM/GC. When using this delivery method, the STA contracts separately with a designer and a construction manager. STA can perform design or contract with an engineering firm to provide the design. The STA selects a construction manager to perform construction management services during design and to act as the general contractor and build the project during construction *(5)*. The significant characteristic of this delivery method is a contract between a STA 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 a STA would select the CM/GC method. Unlike D-B-B, 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 STA to develop the technical requirements that would be necessary for D-B procurement without industry input.

2.1.2 Less common delivery methods

The less common delivery methods are listed in table 2-1. The majority of projects in the highway industry use D-B-B, D-B, or CM/GC. There are other delivery methods, however, that STAs use for transportation projects. These methods are less-frequently used, but may be applicable to certain projects. Each of these methods is summarized below.

2.1.2.1 Multi-prime contracting

Multi-prime contracting utilizes multiple prime contractors to construct a project. In this setup, the STA has many contracts with different contractors to perform specific aspects of the construction. In essence, the STA becomes the general contractor who manages the multiple "sub-contractors" during construction. STAs use multi-prime contracting as a method to fast-track construction or for emergency purposes *(6)*. Since work can be bid for each discipline of construction, STAs gain the flexibility of bidding portions of the work as soon as the design of that aspect is complete. This gives the overall schedule control to the STA. Additionally, multi-prime contracting gives the STA the opportunity to procure materials directly from suppliers to avoid contractor mark-ups and to make sure materials are ready when needed *(6)*.

2.1.2.2 Design-Sequencing

Design-sequencing is a delivery method that allows STA to bid work using an initial bid package in which the design has only been advanced to approximately 30% complete. Similar to D-B, bidding work at this point in design development gives the STA control to begin construction before design is fully complete. However, unlike D-B, the STA still controls the details of the design *(7)*.

2.1.2.3 Public-Private Partnership (PPP)

A PPP is a delivery method where the STA contracts with a private firm or consortium (concessionaire) in a development agreement to design, build, finance, operate, and maintain a project over a long period of time. The design and construction portions of the contract operate in similar fashion to a D-B contract. However, the uniqueness of this contract is the infusion of private funds to finance the project. Then, once the project is complete, the design-builder firm becomes the operations and maintenance firm for that project. A PPP allows for sharing of project risks or properly allocating risks to the party best equipped to handle them. At the end of the contract, the project is then turned back over to the STA *(8)*.

2.2 Procurement Procedures

Procuring a third-party firm is a decision that STAs cannot take lightly. Depending on the project attributes, goals, and constraints, procurement can occur through different techniques. Currently, a large number of procurement procedures exist that STAs can use as these procedures have been used successfully. The common understanding is that no one procedure is the most appropriate for all roadway and highway projects, but most STAs do not have a formal approach for selecting the most appropriate contracting methodology. There are three categories of procurement procedures: common procurement procedures, less common procurement procedures, and supplementary payment provisions. Table 2-2 lists the procurement procedures used for roadway projects. Also, refer to Appendix B for in-depth information for each procurement procedure.

Table 2-2 – Procurement procedures used for roadway construction projects

Common Procurement Procedures	Less Common Procurement Procedures	Supplementary Procurement Procedures
❒ Low bid	❒ Sole source	❒ Alternative technical concepts
❒ Best value	❒ Job order contracting	❒ Additive alternates
❒ Qualifications-based		❒ Alternate design
❒ Cost plus time		

2.2.1 Common procurement procedures

Roadway projects most commonly use low bid, best value, or qualifications-based for procuring constructors. Similar to delivery methods, each procurement procedure has different opportunities and challenges and depending on the project, some opportunities can become challenges and some challenges may become opportunities.

2.2.1.1 Low Bid

Low bid is a competitive, closed bid system where selection is based only on the price presented to the STA. This is the traditional procurement procedure, commonly used with the traditional D-B-B delivery method, where design documents are at or near 100% complete *(9)*. The STA awards the firm that submits the lowest bid for the project. The price presented by the selected firm is the basis for the contract price of the project.

2.2.1.2 Best Value

Best value is 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 *(10, 11)*. The STA has to develop a comprehensive request for proposal that addresses all areas critical to a project. Then, the STA has to have an established systematic process for evaluating proposals. Currently, there are seven variations or algorithms that STAs use when applying best value as the procurement procedure for a project, which are listed in table 2-3 below. Further details of each best value variation are found in the support documents in appendix B.

Table 2-3 – Best value algorithms used for roadway projects

Best Value Procurement Procedures	
❒ Fixed budget / best design	❒ Meets technical criteria – low bid
❒ Adjusted bid	❒ Quantitative cost – technical tradeoff
❒ Adjusted score	❒ Qualitative cost – technical tradeoff
❒ Weighted criteria	

2.2.1.3 Qualifications-Based (QBS)

QBS is 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 *(12, 13)*, however, price becomes critical once a qualified firm is selected and negotiations begin between the STA and the selected firm.

2.2.1.4 Cost plus time

Cost + Time, also commonly referred to as A+B, is a selection method used in procuring construction services where the "A" or cost portion is the bid amount and the "B" or time portion is the proposed project duration for the work. The "B" portion is multiplied by a value per day, also referred to as Road User Cost (RUC), which is established by the Agency prior to reviewing the proposals. The agency then awards the contract to the bidder whose proposal has the lowest sum of "A" + "B" *(14)*.

2.2.2 Less-Common Procurement Procedures

The common procurement procedures provide the boundaries and median of a spectrum of various procurement procedures. Other procurement procedures fit along this spectrum, but are not as commonly used for roadway projects or are a variation of one of the common procurement procedures. The less-common procurement procedures provide alternative options for STAs when determining a procurement contracting strategy.

2.2.2.1 Sole source

Sole source is a procurement procedure used on projects with a single bidder for specialty work or in emergency situations where the STA can select any firm based on any selection factor *(13)*. Selection factors range from qualifications-based to relationship-based. Sole source does not include a competitive price factor and limits full and open competition, which is required on most public transportation projects *(15)*, but it is not required for emergency situations and extenuating circumstances.

2.2.2.2 Job order contracting

A competitively bid, firm fixed price and indefinite quantity procurement contract that lasts for a specified duration of time *(16)*. Firms bid per unit of specific work for which the STA guarantees a minimum amount of work over the life of the contract. The location, scope, and duration of the work is determined under future work orders as a part of the job order contract *(12)*.

2.2.3 Supplementary procurement procedures

The procurement procedures below are options for STAs to use in conjunction with one of the common or less-common procurement procedures. Each of these methods cannot be used as a stand-alone procedure as an STA cannot award on the basis of one of these procedures, but they can assist an STA for specific situations and projects when applicable.

2.2.3.1 Alternative technical concepts (ATCs)

ATCs are a procedure for procurement where the STA issues a request for proposal that contains basic project configurations, design and construction criteria. Proposing firms then develop and submit alternative ideas, or concepts, based on their industry expertise. The STA then reviews the received proposals and the concepts. The concepts gain approval on a pass-fail basis. If a concept is accepted, then the proposing firm can incorporate this concept into the technical and price proposal. This approach fosters a best-value solution that allows firms to submit innovative concepts and solutions that increases the value to the public *(17)*.

2.2.3.2 Additive alternates

Additive alternates are used when it is necessary to keep the contract amount within a budget and lets the industry compete on the largest scope that fits within the budget. The STA provides the base bid package that includes most of the required scope for the project. The STA also provides a list of possible alternates for the project that could be incorporated based on the STA’s decision and budgetary constraints. Bidding firms are typically required to submit prices for all bid items. However, the STA may prioritize the alternates so the bidders know what alternates carry more weight *(2)*.

2.2.3.3 Alternate design

A bidding technique in which bidding firms are presented two or more designs for the same project in the bid documents or when the STA allows bidders to submit alternate designs that are equivalent in form and function to the design specifications/criteria presented in the bid documents. Bidding firms 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 *(2)*.

2.3 Payment Provisions

Payment provisions are a contracting strategy that addresses how the STA will pay a constructor for the work performed in accordance with the contract. Many payment provision options exist, but almost all roadway projects use one of two possible provision methods. The remainder of the other payment provisions is less-frequently used or is supplementary to one of the two common options and is useful for specific situations and projects. There are three categories of procurement procedures: common procurement procedures, less common procurement procedures, and supplementary payment provisions. Each of the payment categories are described below while the support documents found in Appendix C provide more in-depth details of each provision.

2.3.1 Common payment provisions

Roadway projects commonly use only two different payment methods: unit price or lump sum. Other provisions, such as cost reimbursable, are rarely used, or are not stand-alone payment provisions, such as lane rental and incentives/disincentives. Table 2-4 lists the contracting payment provisions used on roadway construction projects.

Table 2-4 – Payment provisions used for roadway projects

Common Payment Provisions	Less Common Payment Provisions	Supplementary Payment Provisions
❒ Unit price	❒ Cost reimbursable	❒ Price adjustment clause
❒ Lump Sum	❒ Guaranteed Maximum Price	❒ Shared-risk pool
	❒ Contract force account	❒ Payment by plan
		❒ Incentives / disincentives
		❒ No excuse incentives
		❒ Interim / milestone completion dates
		❒ Material and workmanship warranty
		❒ Performance warranty
		❒ Lane rental
		❒ Active management payment mechanism

2.3.1.1 Unit Price

Unit price is the most common payment strategy for roadway projects that establishes a set monetary price for construction items in which the STA pays the unit price multiplied by the quantity installed *(18)*. This is useful for projects where quantities are difficult to determine before the work begins. The contractor determines the quantities, the STA verifies the quantities, and then utilizes the unit price to find the total cost.

2.3.1.2 Lump Sum

Lump sum is a common payment strategy where a price is set for the total cost of the project based on a set amount of work. The STA pays the set amount to the contracting firm regardless of the actual costs that the firm incurs for the project *(15, 18)*.

2.3.2 Less common payment provisions

In most cases, STAs will use unit price or lump sum as the contracting payment provision. The payment provisions defined as less common provisions are cost reimbursable and guaranteed maximum price (GMP), which are other options for STAs to use as a contracting payment provision. Certain situations exist when STAs will need to consider these payment provisions over the use of the commonly used unit price and fixed price payment provisions.

2.3.2.1 Cost reimbursable

Cost Reimbursable is a payment provision under which the STA reimburses the contractor for the work performed based on an agreed calculation method *(6)*. The different calculation methods can be:

- Unit price - payment based on performed quantities at set unit prices
- Cost Plus Fixed Fee - payment based on actual costs and fixed fee
- Cost Plus Incentive Fee - payment based on actual cost plus an incentive based fee
- Cost Plus Award Fee - payment based on actual cost plus performance based fee
- Time Spent - payment based on actual hours spend at set billing rates
- Time and Material - payment based on actual costs with fixed markup on costs

2.3.2.2 Guaranteed maximum price

The Guaranteed Maximum Price (GMP) is a contract provision where a sum of money is agreed upon between the contractor and the STA for a project. This amount is a not-to-exceed total cost of the services provided during the construction phase of work including the direct costs, overhead, contingency, and fees *(2, 5)*. In the highway construction industry, this payment provision is commonly used in combination with CM/GC delivery method.

2.3.2.3 Contract force account

Force account is a payment method used for extra work when the contractor and the STA cannot agree on a unit price or lump sum amount, or if either of those methods are impracticable *(19)*. Force account payments are based on established hourly rates and the quantities of labor, materials, and equipment that are used to complete the work.

2.3.3 Supplementary payment provisions

The supplementary payment provisions are techniques that can be used in conjunction with the common or less-common payment provisions. These are not stand-along payment provisions as a contract will not make required payments based on one of these options exclusively, but these options can be helpful for certain situations or projects.

2.3.3.1 Price adjustment clause

A price adjustment clause (PAC) consists of providing contractors with protection against materials and fuel price increases that may occur during the execution of the work. Under these provisions, the STA accepts the risk for increasing prices by offering a PAC that will compensate the contractor for any increase above the bid price or a trigger amount of a specific material *(20)*.

2.3.3.2 Shared-risk pool

Shared-risk pool is a process that consists of identifying potential project risks that may cause cost and schedule growth, estimate the cost of such risks, create a contingency fund, and use management strategies to minimize the risk impacts on cost and schedule *(21)*. Under this provision, the STA sets aside a contingency fund and the contractor is allowed to spend the fund according to its unit rates; however, the provision also establishes that the STA will share the savings of the unused contingency funds with the contractor at the end of the project *(2, 22)*. This serves as an incentive to the contractor to minimize expenditures from the contingency fund.

2.3.3.3 Payment by plan

Payment by plan quantities is an alternative payment provision where contractor's reimbursement is based on measurement of quantities derived from plans and schedule instead of field measurements *(21)*.

2.3.3.4 Incentives / disincentives

Incentives is a contracting provision which compensates the contractor a specific amount of money for each day that critical work is completed ahead of schedule or for achieving set goals. Disincentives is a contracting provision that can assess a fee for each day identified that the contractor overruns the specified time or for failing to achieve set goals *(12, 24, 25)*.

2.3.3.5 No excuse incentives

No Excuse Incentives (NEI) is a monetary incentive for early completion, where the contractor receives the bonus by completing the work on or before a “drop-dead date” that cannot be adjusted for any reason *(2, 25)*.

2.3.3.6 Interim / milestone completion dates

Interim/Milestone Completion Dates (ICD) are a payment provision method designed to expedite completion of specific portions of a contract by providing contractors with incentives for milestone completion on or before a specified date. This type of provision also includes a disincentive amount if the milestone is not completed by the given date *(26)*.

2.3.3.7 Material and workmanship warranty

Under a materials and workmanship warranty the contractor is responsible for correcting defects in work elements that are within the contractor's control during the warranty period including defective material and workmanship *(27)*. The main advantage of materials and workmanship warranties is that they reduce the State Transportation Agency's (STA) exposure to risks by providing assurance that the contractor will correct early failures due to materials and workmanship that may have passed unnoticed during construction. However, this is not the only advantage as this type of warranty also provides opportunities for enhanced performance, as a result of improved materials and workmanship, and for reduction of agency personnel time required for testing and inspection during construction *(28)*.

2.3.3.8 Performance warranty

Performance warranty provisions require the contractor to guarantee some parts of a project for overall performance. This includes the design, construction, and some part of the maintenance. In comparison to a materials and workmanship warranty, performance warranty assign more responsibility to the contractors and are usually consist of a longer warranty period *(29)*. Performance warranties are usually divided in two forms: short-term performance warranties and long-term performance warranties. Short-term performance warranties include the performance criteria to be achieved and the minimum materials and construction requirement acceptable to the State Transportation Agency (STA). In pavement warranties for example, the STA is responsible for the structural design of the pavement while the contractor is responsible for the mix design and the overall performance of such mix for the duration of the warranty *(2)*. Long-term performance warranties, increase the contractor's responsibility for performance but provide more room for contractor made decisions.

2.3.3.9 Lane rental

Lane Rental is a payment provision that reduces the impacts of a project to the traveling public by charging a rental fee to the contractor for the time period a lane is closed to traffic for contract work *(30, 31)*. Lane rental fees are assigned in daily, hourly, or fraction of hour terms and the fee depends on the type of lane closed and the time of the day it is closed *(21)*.

2.3.3.10 Active management payment mechanism

Active management payment mechanisms (AMPM) are payment provisions designed to minimize travel time through a work zone by providing a contractual incentive to contractors. The incentives are based on the measured travel speed and measured volumes in comparison to theoretical percentages of roadway capacity *(32)*.

2.4 Chapter 2 Summary

Chapter two summarizes project delivery methods, procurement procedures, and contracting payment provisions that were found to be used on roadway construction projects. Then, the delivery methods, procurement procedures, and payment provisions were divided into common methods, less-common methods, and supplementary methods. The details of each method are provided in support documents found in Appendices A, B, and C. The next chapter details how to use the selection tools and the summary documents for selecting a delivery method, procurement procedure, and payment provision for roadway projects.

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CHAPTER 3. DECISION SUPPORT TOOLS

3.1 Project Delivery Selection Matrix

The project delivery decision-support tool, called the Project Delivery Selection Matrix (PDSM), provides a risk-based and objective selection approach to choosing a project delivery method from three common delivery methods of D-B-B, D-B, and CM/GC. It provides support for and justification of a delivery method chosen for a particular project. The evaluation uses project attributes, goals, and constraints as a comparison to a series of primary and secondary evaluation factors. The selection tool uses a non-numerical rating system for each evaluation factor, so that the cumulatively highest ranked method becomes the optimal delivery method *(1)*. Appendix D includes the full Project Delivery Selection Matrix tool and Appendix E provides an example of using the PDSM, which is in a format that any STA can use.

3.1.1 Project delivery evaluation factors

The selection of a project delivery method depends upon many factors. This research identified factors through a comprehensive literature review and workshop reviews with design and construction professionals who have extensive roadway construction experience. The purpose of the review workshops was to determine and validate delivery method selection factors as well as to develop and implement the framework. The workshops included a group of participants from Colorado Department of Transportation, Federal Highway Administration, the American Council of Engineering Companies, and the Associated General Contractors of America. Each workshop participant had more than ten years of professional experience in highway design and construction *(1)*.

Based on the workshops, the consensus from the workshop participants was to implement eight evaluation factors in the project delivery selection matrix. Further, the workshops produced a collection of general opportunities and obstacles in association with the eight evaluation factors. The eight evaluation factors were classified into two groups: primary and secondary. The STA evaluates the primary factors first before evaluating the secondary factors. The five primary and three secondary delivery evaluation factors are described in table 3-1.

Table 3-1 – Project Delivery Evaluation Factors

Project Delivery Primary Evaluation Factors
1. Delivery Schedule – The effect the overall project schedule (from scoping through design, construction and completion) has on selecting an optimal delivery method
2. Project Complexity and Innovation – The use of a project delivery method that addresses the overall project need for applications of new designs or processes to resolve complex & technical issues
3. Level of Design – The amount of design completed at the time of selection of a delivery method
4. Cost – The financial process related to meeting budget restrictions, accuracy of cost estimates, and the control of project costs
5. Risk Assessment – The process of quantifying uncertainties to ensure the selection of a method that addresses these uncertainties appropriately.
Project Delivery Secondary Evaluation Factors
6. Staff Experience and Availability – The STA staff experience and availability to execute a selected method
7. Level of Oversight and Control – The level of and manner in which the STA exercises control over the design and construction process
8. Competition and Contractor Experience – The amount of competition to expect and the experience that contractors possess in the market of the project location

3.1.2 Project delivery selection process

The selection approach, shown in figure 3-1, encompassing three major stages: Stage 1— reviewing project characteristics, setting project goals and identifying project constraints , Stage 2—evaluating factors , and Stage 3—conducting a pass/fail analysis, and performing a complete selection matrix.

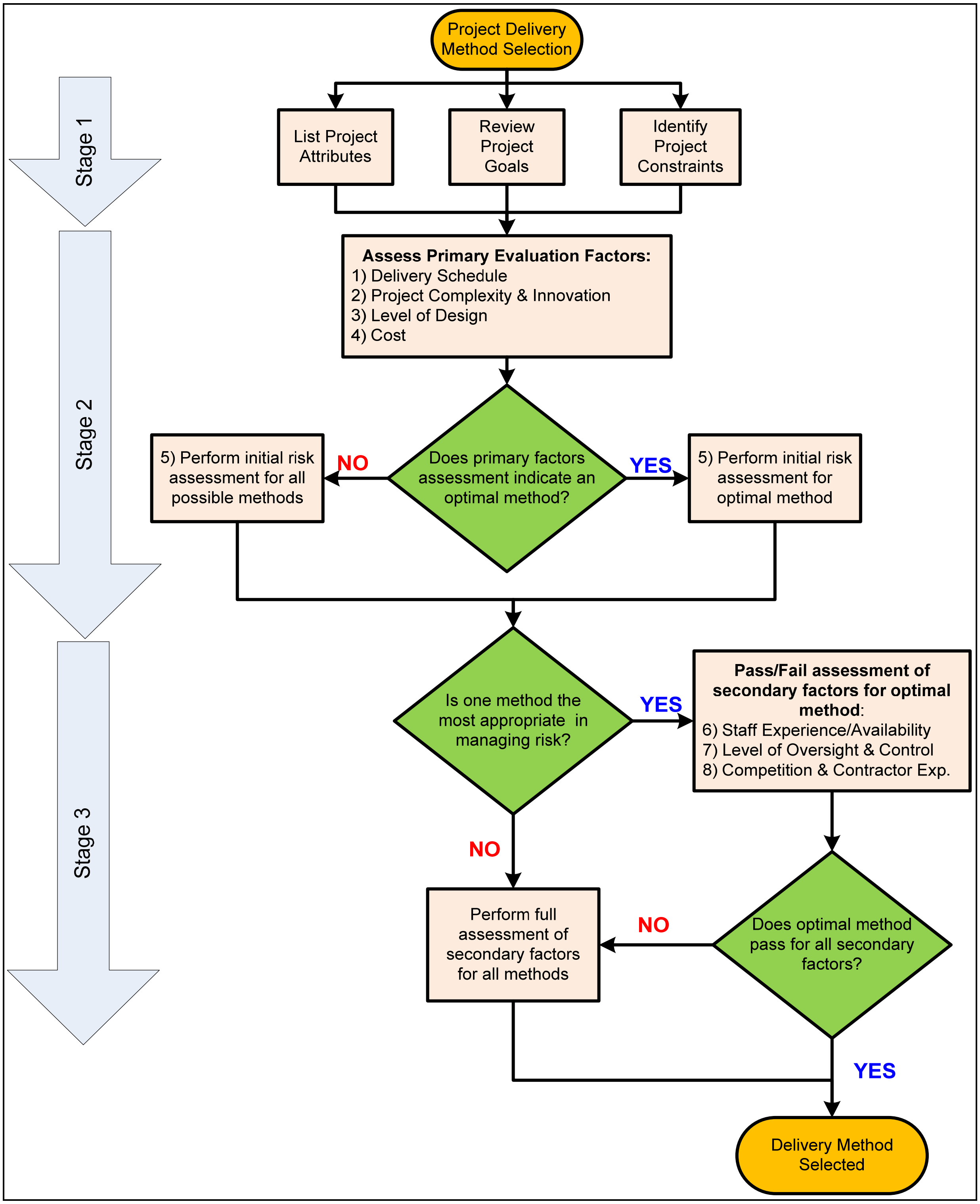

Figure 3-1 – Project Delivery Selection Matrix Process

Stage 1 is when a selection team will review the project characteristics such as total budget, schedule, sources of funding, known risks, and other common attributes. Then, the selection team develops project goals and discusses any known constraints.

In Stage 2, decision makers evaluate opportunities and challenges for the primary evaluation factors, based on the project characteristics, goals, and constraints. The selection team will discuss each factor in detail and provide a rating for each delivery method for that factor. The rating system developed for this tool is qualitative, ranging from most appropriate (++), to appropriate (+), least appropriate (—), fatal flaw (**X**), and not applicable (**NA**). The project team should document their discussions throughout the evaluation process.

It is important to note that the selection team can evaluate the first four primary factors and provide a rating for each delivery method for that factor. Then, the selection team can decide if there is a more appropriate choice of delivery method based on the first four primary methods. If these factors reveal a more appropriate method, then the selection team can proceed with evaluating the fifth primary factor, risk assessment on just the more appropriate delivery method. If the delivery method will suffice for risks and uncertainties, then the selection team moves to stage 3. If the first four primary factors do not show a clear, more appropriate method, then the selection team will need to assess all potential delivery methods for risk.

For Stage 3, if the primary factor evaluation process indicates an appropriate delivery method, a pass/fail analysis of the secondary factors is performed to complete the entire Project Delivery Selection Matrix. However, if the primary factor evaluation process did not indicate an appropriate delivery method, a full evaluation needs to be done with the secondary factors. At the completion of Stage 3, the STA has a single and clear choice for a project delivery method.

3.1.3 Using the less common project delivery methods

The PDSM tool assists an STA in selecting a delivery method from three options of D-B-B, D-B, and CM/GC. For certain projects, the common delivery methods may not be appropriate to deliver a roadway project successfully, in which case the STA has the option of potentially using a less-common delivery method. Three less-common delivery methods used for highway projects are multiple prime, design-sequencing, and public-private partnerships. Table 3-2 lists projects that benefit from the use of each of these less-common delivery methods.

Table 3-2 – When to use less-common delivery methods

Use of Multiple Prime *(2)*	**Use of Design Sequencing** *(3)*	**Use of Public-Private Partnership** *(4, 5)*
❒ Emergency projects	❒ Projects with minimal public controversy	❒ Large or mega projects
❒ Fast-track projects	❒ Projects that have obtained final environmental documents and determination	❒ Projects that public sector lacks funding capacity
❒ Phased projects	❒ Projects with well-established footprints	❒ Complex projects
❒ Sequentially designed projects	❒ Projects with all utility conflicts identified	❒ Projects that can generate revenue
	❒ Fully-funded projects	❒ Projects that need specialized expertise from the private sector
	❒ Projects with well-defined ROW footprint	❒ Projects with strong public support
		❒ Projects that have obtained final environmental documents and determination
		❒ Projects to alleviate significant congestion
		❒ Innovative projects

3.2 Procurement Procedure Selection Matrix

The procurement decision-support tool, called the Procurement Procedures Selection Matrix (PPSM), provides a risk-based and objective selection approach to choosing a procurement procedure from the three common procurement procedures of low bid, best value, and QBS. The PPSM then provides support and justification for the procedure chosen. The selection process, similar to the process used for selecting a delivery method, uses specific project attributes, goals, and constraints in order to evaluate factors critical to the decision. The evaluation factors utilize a qualitative rating system, and the overall highest ranked procedure becomes the most appropriate procurement procedure *(6)*. Appendix F includes the full procurement selection tool while Appendix G provides an example of using the PPSM, which is in a format that any STA can use.

3.2.1 Procurement procedure evaluation factors

Selecting a procurement procedure based on a selected delivery method involves many different factors. Using a review process with experienced roadway construction professionals, the factors determined to be critical to selecting a procurement procedure are the same eight evaluation factors used with the project delivery selection matrix tool. The only difference is that the PPSM does not distinguish between primary and secondary evaluation factors, as is the case with the PDSM. Using the same evaluation factors for the procurement selection from the project delivery selection allows for consistency between the tools, which makes using each tool more straightforward. Table 3-3 below describes the eight evaluation factors in terms of procurement selection.

Table 3-3 – Procurement Procedure Evaluation Factors

Procurement Procedure Selection Matrix Evaluation Factors
1. Delivery Schedule – The overall project schedule from scoping through design, construction and completion
2. Project Complexity and Innovation – The overall project need for applications of new designs or processes to resolve complete and technical issues
3. Level of Design – The amount of design that is complete at the time of procurement
4. Cost – The financial process related to meeting budget restrictions, accuracy of cost estimates, and the control of project costs
5. Risk Assessment – The process of quantifying risk events to ensure the selection of a procurement procedure that addresses these uncertainties appropriately
6. Staff Experience/Availability – STA staff experience and availability to execute the procurement procedures under consideration
7. Level of Oversight and Control – The level of and manner in which the STA exercises control over design and construction as reflected in the procedure process
8. Competition and Contractor Experience – The level of competition expected based on the type of delivery method, procurement procedure, and the amount of experience contractors possess in the market where the project is located.

3.2.2 Procurement procedure selection process

Following the same process developed for the Project Delivery Selection Matrix, the Procurement Procedures Selection Matrix process includes three stages, as shown as in figure 3-2: Stage 1 — outlining the project attributes, setting project goals and identifying project constraints, Stage 2 – determine the procurement procedures and evaluation factors that are critical to procurement selection, and Stage 3 — evaluating the applicable factors to complete the selection matrix and provide a justified decision.

How an STA performs stage 1 depends on whether a selection team uses the Project Delivery Selection Matrix prior to using the Procurement Procedures Selection Matrix. If the STA did not use the PDSM to selection a delivery method for a specific project, then the STA will need to perform a full review the project characteristics and attributes, develop project goals, and discuss any known constraints. If the STA previously used the PDSM tool for selecting a delivery method for a specific a project, then the STA only needs to complete a brief review of that specific project's attributes, goals, and constraints.

Stage 2 helps to simplify the selection process by eliminating possible procurement procedures and evaluation factors. First, the decision makers review each of the three procurement procedures to determine if any do not apply to the selected project delivery method. Then, the decision makers review the eight evaluation factors to determine the primary factors to include in the evaluation process. In some instances, there may be factors that are not applicable or will not provide a difference between procurement procedures. Removing procurement procedures and evaluation factors from the selection reduces the time needed to complete the selection matrix, which makes the evaluation process easier to complete.

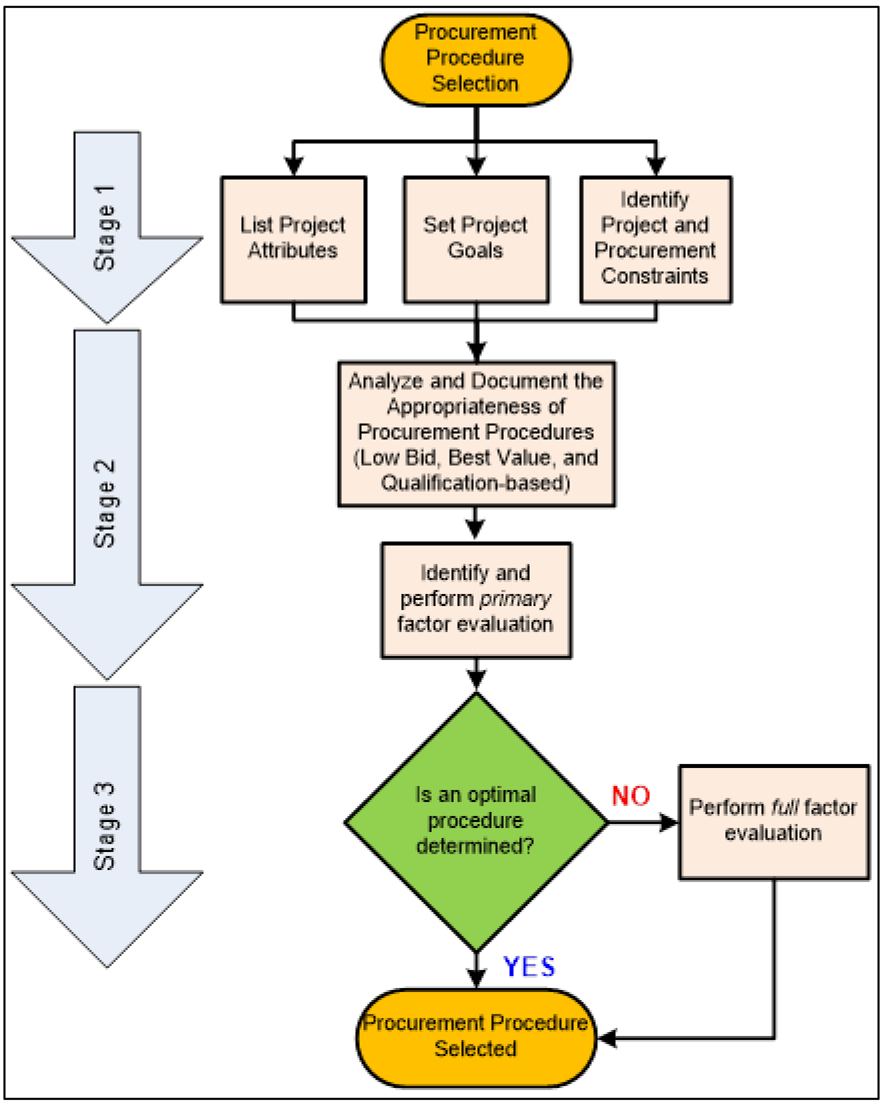

Figure 3-2 – Procurement Procedure Selection Process

In stage 3, the STA performs the evaluation. The STA decision makers or selection team for a project engage in conversations about each factor as it relates to each procurement procedure. The discussion includes investigating opportunities and obstacles for each factor, taking into account the project attributes, goals, constraints, and the project delivery method. The decision makers summarize their findings by rating the procurement procedure as most appropriate (**++**), appropriate (**+**), least appropriate (—), fatal flaw (**X**), and not applicable (**NA**). Upon completion of Stage 3, the STA has a single and clear choice for a project procurement procedure.

3.2.3 Selecting less common procurement procedures

Cost plus time, sole source, and job order contracting are three procurement procedures not used as often by STAs as low bid, best value, and qualifications-based, and therefore are not included in the procurement procedure selection matrix tool. However, there are specific situations and special types of projects that might benefit from using one of the less common procurement procedures over one of the common procurement procedures. Table 3-4 outlines when to use each of the less common procurement procedures to realize the benefits of that procurement procedure.

Table 3-4 – When to use less common procurement procedures

Use of Cost + Time *(3, 7)*	**Use of Sole Source** *(8)*	**Use of Job Order Contracting** *(9)*
❒ Traffic management is critical to project success	❒ The compatibility of equipment, accessories, replacement parts, or service is a paramount consideration	❒ Bituminous mill and overlay
❒ Restoration, rehabilitation, reconstruction projects	❒ A sole supplier's items are needed for trial use or testing	❒ High tension cable guardrail
❒ Projects located in urban settings with high traffic volumes	❒ A sole supplier's item is to be procured for commercial resale	❒ Concrete pavement repair
❒ Projects that can severely affect local businesses	❒ Procurement of public utility regulated services	❒ District-wide projects (e.g. pavement striping)
❒ Projects with tightly constrained completion time	❒ Procuring copyrighted or patented item/service that is available from the holder of the copyright/patent	❒ Contaminated soil disposal
❒ Accelerated projects when using with incentives/disincentives	❒ Procurement of media for advertising	❒ Combining multiple noise wall maintenance contracts
	❒ Procurement of art or entertainment services	❒ Combining small chip seal projects
	❒ Changes to existing contracts	❒ Culvert lining
		❒ Re-lamping maintenance

3.2.4 Selecting supplementary procurement procedures

Once the selection team determines a procurement procedure, an additional optional step is to determine if any supplementary procurement procedures would benefit the procurement process. The reason this step is optional is that depending on the project, the selected common procurement procedure might be sufficient for procuring a construction firm. However, an STA might want to incorporate one or more supplementary procedures along with the selected primary procedure in order to provide a better approach to choosing a construction firm. For roadway projects, the supplementary procurement procedures are alternative technical concepts (ATCs), additive alternates, and alternate design. Each can be used during the procurement phase, but in specific situations based on the particular project, as outlined in table 3-5.

Table 3-5 – When to use supplementary procurement procedures

Use of ATCs *(10)*	**Use of Additive Alternates** *(11)*	**Use of Alternate Design** *(11)*
❒ Large design-build projects where the scope is significant	❒ Helps ensure scope of the project is maximized for limited and tight-budget projects.	❒ Projects that allow for an alternate to be used for a structural or pre-engineered component
❒ Projects that use best-value selection, which depends on the degree of innovation in the received proposals	❒ Projects that include uncertainty regarding the cost of the project can price different features that can be incrementally added to the project scope to maximize the use of available funds	❒ Project involving the construction of alternate structures or devices, especially when the contractor has more experience than the STA in constructing these structures
	❒ Projects that have scope of work designed to be well within the project budget while providing additional items that can be awarded if the budget allows	❒ Standardized projects that do not require a large design effort, such as retaining walls, bridges or other structural components, traffic signs, and traffic control devices
	❒ Project scope that can be tailored to include add-ons based on priority of importance	❒ Projects that allow an alternate pavement design
	❒ Obtaining the best options for the funds available when substitutions are specified that improve the quality or performance based on the defined budget	

3.2.5 Selecting a best value procurement algorithm

A specific situation occurs when an STA selects best value to procure a construction firm. STAs use different variations of best value procurement, and the STA has to decide which variation, or algorithm, to use. If an STA has the flexibility to select from different variations of best value procurement, then the information in this section can assist with choosing the proper best value algorithm. This guidebook includes seven best value algorithms, which table 3-6 summarizes below.

Table 3-6 – Selecting a best value algorithm

Best Value Algorithm	Use of Algorithm
Fixed budget / best proposal	❒ Projects that have a set budget in place prior to procurement. Projects that need to maximize scope for a tight budget and innovative techniques are needed to accomplish this *(12)*
Adjusted bid	❒ Overall outcomes of a project can be clearly defined and a number of alternatives/innovations may exist to improve the probability of achieving a successful project *(13)*
Adjusted score	❒ Overall outcomes of a project can be clearly defined and a number of alternatives/innovations may exist to improve the probability of achieving a successful project *(14)*
Weighted criteria	❒ Projects that have specific evaluation and technical features that are more important than others and can be weighted as such. Fast-track schedule projects and projects where constructability is inherent to project success *(13)*
Meets technical criteria – low bid	❒ Projects that have a tight budget, well-defined scope, and innovations/alternatives are not being sought. Level of design for a project can be at the design development stage *(12)*
Quantitative cost – technical tradeoff	❒ Allows for evaluating price portion and technical portion separately and recorded as such. The actual price of the project is a critical component to rating each proposal *(12)*
Qualitative cost – technical tradeoff	❒ Allows for evaluating price portion and technical portion separately and recorded as such. A qualitative scale is used to rate the price portion along with the technical portion *(12)*

3.3 Payment Provision Selection

The two most commonly used payment provisions for roadway projects are unit price and lump sum, which STAs commonly choose between when contracting with a 3rd party construction firm. In some less-common situations, there are three additional payment provisions that can prove to be handy for STAs to use. The three less-common payment provisions are cost reimbursable, guaranteed maximum price, and contract force account. STAs tend to use each in specific situations, as discussed below.

3.3.1 Selecting the common payment provisions

Since STAs commonly choose between unit price and lump sum as the primary contracting payment mechanism, an extensive selection matrix tool is not needed. The selected delivery method, the selected procurement procedure, and the specific details of a project can usually lead an STA to choosing the optimal payment provision for a project. Further, STAs can choose to use a combination of both unit price and lump sum depending on the work and materials involved in the project. Table 3-7 summarizes when to use either unit price or lump sum as the primary payment provision when contracting with a construction firm.

Table 3-7 – When to use common payment provisions

Use of Unit Price *(15)*	**Use of Lump Sum** *(4)*
❒ Most common payment provision for roadway projects	❒ Projects with well-defined scope of work
❒ Projects that have few items that have unknown quantities	❒ Project where scope is unlikely to change
❒ Projects that define scope but cannot define actual quantities of items	❒ Projects with few bid items
	❒ Short duration projects
	❒ Design-build projects

3.3.2 Selecting the less-common payment provisions

STAs commonly use either unit price or lump sum to contract with a construction firm. However, STAs encounter certain contracting situations when cost reimbursable and GMP are better suited than unit price or lump sum. Table 3-8 outlines cases when GMP or cost reimbursable can provide a better contracting option than the two common provisions.

Table 3-8 – When to use less-common payment provisions

Use of GMP *(11)*	**Use of Cost Reimbursable** *(16)*
❒ CM/GC (CMAR) projects	❒ Consultant contracts
❒ Projects with reduced STA management resources	❒ Projects with variability in the scope of work
❒ Projects with limited time or funding	❒ Projects that need to start construction early
❒ Fast-track projects	

3.3.3 Selecting supplementary payment provisions

After the STA selects either unit price or fixed price as the project's payment provision, the STA then must determine if and what supplementary payment provisions to pair with the selected common payment provision. Table 3-9 outlines the supplementary payment provisions in use for roadway projects. Each has been classified as a cost provision, schedule provision, quality provision, or a traffic provision.

Table 3-9 – Supplementary payment provisions used to improve contracting performance

	Cost Provisions	**Schedule Provisions**	**Quality Provisions**	**Traffic Management Provisions**
Price adjustment clause (PAC)	✓			
Shared-risk pool	✓			
Payment by plan	✓			
Incentives / disincentives (I/D)		✓		
No excuse incentives		✓		
Interim / milestone completion dates (ICD)		✓		
Material and workmanship warranty			✓	
Performance warranty			✓	
Lane rental				✓
Active management payment mechanism (AMPM)				✓

Cost provisions provide payment options that can help to improve budget performance on a roadway project. Price adjustment clause, shared-risk pool, and payment by plan provide tools for STAs to improve budget performance on a roadway project. Table 3-10 summarizes instances when to use each of the cost provisions in order for an STA to achieve the full benefit of the provision.

Table 3-10 – When to use cost payment provisions

Use of Price Adjustment Clause *(17)*	**Use of Shared-Risk Pool** *(11, 18)*	**Use of Payment by Plan** *(18, 19)*
❒ Long duration projects	❒ Large and complex projects	❒ Projects with items that are estimated easily and accurately
❒ Projects using volatile-priced materials	❒ Projects with high risks associated with cost	❒ Projects with items that do not vary beyond the specification threshold
	❒ Design-build projects	❒ Projects that have items that can be measured linearly or by area

Schedule provisions provide payment options that can improve schedule performance of a roadway project. STAs have incentives/disincentives, no excuse incentives, and interim / milestone completion dates provisions to assist with schedule performance on a project. Table 3-11 outlines when to use each of the three schedule payment provisions when contracting a roadway project.

Table 3-11 – When to use schedule payment provisions

Use of Incentives/Disincentives *(20)*	**Use of No Excuse Incentives** *(11)*	**Use of Interim / milestone completion dates** *(21, 22)*
❒ Projects with high traffic volume in urban areas	❒ Projects with significant RUC that impact the community and local businesses	❒ Functional elements of a larger project (e.g. ramps, intersections, bridges)
❒ Projects that complete a “gap” in a significant roadway system	❒ Projects with a fixed completion date	❒ Projects that have a critical intermediate phase
❒ Major reconstruction or rehabilitation that can severely disrupt traffic	❒ Projects with sequential contracts	❒ Projects with significant RUC that impact the community and local businesses
❒ Major bridge that is out of service	❒ Projects with high traffic volumes	
❒ Projects that have lengthy detours	❒ Projects with political interests	
❒ Projects with environmental or political commitments	❒ Projects with public interests	

Quality provisions provide STAs with a way to warrant the quality, materials, and workmanship of a roadway project. Warranties provide insurance to the STA that the product installed will perform as it should and for a specific duration *(23)*. If something fails or needs repair during that period, the warranty provides the STA with a way to fix the issue without spending additional funds. Two warranties are used in roadway projects. Material and workmanship warranty protects the STA from materials and labor installation that fails while performance warranty insures that the project functions as it should and at a high level. Table 3-12 summarizes the instances when STAs might want to consider using a warranty as a part of the payment provisions of a roadway contract.

Table 3-12 – When to use quality payment provisions

Use of Material and Workmanship Warranty *(24)*	**Use of Performance Warranty** *(24, 25)*
❒ Projects using a specific construction material or feature	❒ Warranty element is for work within the contractor's control and is measurable
❒ Pavement items – Asphalt, concrete, pavement marking, micro-surfacing, chip sealing	❒ Attributes of performance can be explicitly defined and accurately measured in the field
❒ Bridges – Deck waterproofing, crack treatment, Microsurfacing, painting, deck joints,	❒ Projects that provide opportunities to develop and incorporate innovation
❒ Support items – Roofs, ITS, landscaping, irrigation, reflective sheeting for signage	❒ Existing conditions of a project are well defined

Traffic provisions provide STAs a tool to encourage high performing traffic management during construction of a project. The payment provisions of lane rental and active management payment mechanism (AMPM) provide tools for STAs to improve the traffic management of a project. Refer to table 3-13 for a list of projects that would reap the benefits of using either lane rental or AMPM.

Table 3-13 – When to use traffic payment provisions

Use of Lane Rental *(20)*	**Use of Active Management Completion Dates** *(26)*
❒ Traffic management projects	❒ Design-Build-Finance-Operate projects
❒ Projects where detours are unavailable or impractical	❒ PPP projects
❒ Projects that adversely affect peak hour traffic flow	❒ Projects that are appropriate for consistent traffic flow measures
❒ Projects with critical completion dates	
❒ Projects with significant road user costs (RUC)	
❒ Projects that highly impact the community and local businesses	

3.4 Chapter 3 Summary

Chapter Three summarizes how to use the project delivery selection matrix and the procurement procedure selection matrix. Further, the chapter also details the less-common and supplementary procurement procedures and contract payment provisions. Summary documents (found in appendices A, B, and C) provide detailed information for delivery methods, procurement procedures, and contracting payment provisions used on roadway projects. The following appendices include the summary documents along with the project delivery selection matrix, and the procurement procedure selection matrix tools.

STAs are encouraged to review and use the tools for determining an optimal contracting method for a roadway project.

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APPENDIX A. DELIVERY METHODS SUPPORT DOCUMENTS

<u>Common Delivery Methods</u>

A.1 Design – Bid – Build

A.2 Design – Build

A.3 Construction Manager / General Contractor

<u>Less-Common Delivery Methods</u>

A.4 Multi-Prime Contracting

A.5 Design – Sequencing

A.6 Public-Private Partnership

A.1 Design-Bid-Build

What is it?

Design-bid-build (D-B-B) is the traditional and most commonly used method of delivery for roadway construction projects. When using D-B-B, a sequential process begins with the STA designing, or retaining a designer, to furnish complete design services, and then advertising and awarding a separate construction contract based on the completed construction documents. In D-B-B, the STA "owns" the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction *(1, 2)*.

Why use it?

The D-B-B delivery method is the most widely-used and well-established project delivery method *(3)*. Some of its advantages are *(4)*:

- STA controls design and construction~~ *(4)*~~,
- Design changes can be easily accommodated before start of construction~~ *(4)*~~,
- Design if complete before construction award~~ *(4)*~~,
- Allows for a fixed cost at contract award ~~until change orders~~ ~~*(4)*~~,
- Low bid costs allows for maximum competition among contractors~~ *(4)*~~, and
- STA controls design/construction~~ *(4)*~~.

What does it do?

The main characteristic of this delivery method is that the design and construction phases of a project are completely ~~separate~~ sequential to one another and do not overlap. The STA lets the bid ~~out~~ only when the design is fully or nearly completed and detailed. The underlying assumption behind D-B-B is that any qualified ~~contractor~~ construction firm will produce the same product from a given set of plans and specifications, ~~always and~~especially when ~~these~~ plans and specifications are complete and properly written *(5)*.

How to use it?

D-B-B is a sequential process to deliver a roadway project. First, the STA completes the project design to 100% or near 100% complete internally or with the use of a 3rd party design firm. Once the design is completed, the bidding stage begins where the design is released to interested firms. After the bids are received and the lowest priced and responsive bidder is awarded the project, the construction or build portion begins.

When to use it?

D-B-B is useful for projects that can be designed to or near 100% complete. Typical and common projects will benefit the most from the use of D-B-B as the delivery method. Projects that involve high risk and many unknowns as well as projects that have a limited amount of time to complete the project will not achieve the benefits of D-B-B and another delivery method might be a better choice.

Limitations

Although D-B-B is the most used delivery method in construction, there has been questioning regarding the efficiency of this method *(3)*. Some of the identified risks and disadvantages of D-B-B are *(4)*:

- Requires significant owner expertise and resources ~~*(4)*~~,
- Shared responsibility for project delivery ~~*(4)*~~,
- STA bares the risks for design errors ~~*(4)*~~,
- Sequential design and construction results in longer schedules than with other methods ~~*(4)*~~,
- Construction costs unknown until contract award ~~*(4)*~~, and
- No contractor input in design or planning ~~*(4)*~~.

Who uses it?

All state transportation agencies across the United States has extensive experience using design-bid-build.

Example

Design-bid-build is the most common delivery method and all STAs have used D-B-B extensively. As a resource, a project completed by the Washington Department of Transportation (WSDOT) used D-B-B to provide bridge improvements to the Wenatchee River crossing near the city of Wenatchee, WA *(6)*. The SR 285 George Sellar Bridge was originally built in 1950. The capacity before construction was only one westbound lane and two eastbound lanes that carry 50,000 to 60,000 vehicles a day.

The scope of the project included expansion of the existing bridge deck from 54ft to 61ft to accommodate five 11ft wide lanes, a 2ft wide median, and 2ft wide shoulders. Additional scope included:

- Removal of the sidewalks on either side of the roadway to make way for a fifth lane
- To carry the increased load, significant strengthening of 100 truss members was required involving either the addition of steel plates or replacement of the members
- The truss strengthening required the removal of 10,000+ rivets near active lanes of traffic and the installation of 35,000 high strength bolts

- The parabolic portals on either end of the bridge had to be cut and strengthened to raise their clearance height to accommodate truck traffic further from the centerline of the bridge
- Sway frames at either end of the bridge had to be removed and replaced (this was performed without bridge closure)
- Construction of a 10 foot wide cantilevered pedestrian and bike pathway on the south side of the bridge
- Construction of a tunnel below the East side approach to accommodate the nearby Apple Capital Recreational Loop Trail~~.~~
- Widening of the bridge approaches on both sides of the bridge and modification of three approach/exit ramps in addition to general civil site work
- Construction occurred above an active BNSF railroad line (30+ trains/day) on the West end of the bridge and maintained four open lanes of traffic during the day.

Due to some of the complexities of the project, for example the strengthening of truss members, WSDOT determined that design needed to be fully completed by the agency before putting the project out for bid. By completing the design in-house, WSDOT proceeded with the project using D-B-B. Further, at the time of this project (2009-2011), WSDOT projects that were budgeted at less than $20 million were all completed using D-B-B.

The bridge project was completed successfully in 2011. The project was delivered late, but that was due to the unforeseen complexity in strengthening the truss members along with the fact that WSDOT authorized 57 change orders that lengthen the initial schedule. However, the project was completed under budget and had minimal disruptions to the traveling public. One key aspect of this project was the acknowledgement of the project organizations ~~of the~~for achieving a high level of teamwork and communication that existed throughout the construction of the project. This example then provides evidence that the traditional D-B-B delivery method can provide ideal results and D-B-B should still be considered for delivering a project along with the other alternative contracting methods mentioned throughout this guidebook.

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A.2 Design Build

What is it?

Design build (D-B) is the second most commonly used delivery method for roadway projects, but it is used less frequently as D-B-B. The ~~State Transportation Agency~~ STA contracts with one single entity to design and construct the project based on very limited design details and selection criteria developed by the STA *(1, 2)*. This delivery method combines the design and construction phases of a project into a single contract for the STA to manage *(2, 3)*. D-B allows for greater private sector involvement, but does not allocate any of the risks of financing, operating and/or maintaining a facility to the design-builder *(4)*.

Why use it?

The D-B method is the most used alternative to the traditional design-bid-build (D-B-B) method. Its main benefit is that it allows overlapping of the design and construction phases often reducing project completion time. Other advantages of this method are that it *(5, 6, 7)*:

- Allows for greater innovation in selecting design, materials, and construction methods ~~*(5, 6)*~~,
- Reduces claims due to design errors ~~*(5)*~~,
- Accelerates response time and dispute resolution through a team effort ~~*(5)*~~,
- Single contract that addresses quality, costs, and schedule from design through construction ~~*(5, 6)*~~,
- Shortened project delivery time can reduce user costs ~~*(5)*~~,
- Risk are transferred to the design-builder ~~*(6)*~~,
- Can use various procurement options (i.e. short-listing, low bid, best value selections, A+B/Lane Rental Provisions, Fixed Price Variable Scope, etc) ~~*(6)*~~,
- Offers price certainty as construction cost is known and fixed during design ~~*(7)*~~, and
- Requires less STA expertise and resources ~~*(7)*~~.

What does it do?

Under the D-B delivery method, the STA develops detailed procurement documents that communicate the ~~STA's~~ expectations about the project's physical components, basic configuration, operational requirements, and performance *(1)*. Upon completion of these documents, the STA procures and awards the project to ~~the Design-Build~~a design-builder firm, ~~who~~ which then bases the design and construction of the project on ~~these~~ the procurement documents (e.g. Request for Proposals). During design and construction, the STA acts in an oversight role. It performs "over-the-shoulder" design reviews, and oversees the construction process. It should be noted that while the STA can enforce the~~enforcing~~ D-B contract requirements, the STA should refrain from directing, completing, or actively controlling the design-builder's engineering and design efforts *(1)*.

How to use it?

The California Department of Transportation (Caltrans) *Alternative Procurement Guide (1)* provides a process chart for D-B procurement. The following are the steps included on this chart:

1. **Define Project Scope –** Things to consider are project size and complexity as well as type and location. In addition, any unique or special conditions, schedule requirements, and traffic maintenance requirements should be identified. The purpose of this stage is to develop a preliminary project scope definition.

2. **Identify Project Goals/Objectives –** Here, some of the principal project goals and objectives should be identified such as cost control, public relations, accelerated delivery, promote innovation, or enhance quality. These should be goals and objectives essential to project success.

3. **Preliminary Project Development –** During this stage, some things to consider are the level of design and development required for a D-B project, permitting requirements, right of way acquisition, environmental clearance, utility relocation, and any other third party project-related issues. Some of the data to be collected and investigated should be geotechnical conditions, drainage conditions, and traffic studies.

4. **Identify and Allocate Project Risks –** Some of these risks are usually related to environmental clearance, right-of-way acquisition, third party issues, construction phase risks (i.e. differing site conditions, traffic maintenance, and schedule), public questions, security, and the procurement method (low-bid or best-value).

5. **Preliminary Project Design -** During~~On~~ this stage, the purpose is select the best design option available. Different tasks for STAs to perform are design alternative identification and evaluation, cost/benefit analysis, and the alternative selection process. The factor to consider should be traffic, alignment, geotechnical, survey and mapping, and drainage.

6. **Finalize Project Scope Criteria –** Tasks to complete by the STA are to determine design criteria and the extent to which performance-based specification can be used, to select a request for qualifications/request for proposals (RFQ/RFP) evaluation system, and to develop and outline of the RF~~G~~Q/RFP package. The STA should ensure here that the level of design is appropriate to maximize the benefit of the D-B method.

7. **Develop RFQ/RFP Package –** During this step, the STA develops the contract language including the scope of work, any special provisions, and the technical specifications and finalizes the RFQ/RFP package. Some things to consider are the risk allocation, procurement approach, stipends, and whether this D-B will be combined with other procurement methods such as alternative technical concepts.

8. **Advertise, Select, and Award –** This is the final step of the D-B procurement process and includes advertising the RFQ, evaluating the statements of qualifications, publishing the RFP to selected proposers, evaluating proposals, and selecting design-builder.

When to use it?

The D-B method is not suited for every project. This method works best for project that require acceleration, projects that have unique opportunities to appropriately transfer risk to the design-build team, and on projects with opportunities for innovation *(8)*. This method has been used successfully on projects for which *(1)*:

- A compressed schedule was needed,
- Schedule certainty was needed,
- Early costs certainty was required,
- Project scope could be adequately defined without 100% complete plans, specifications, and estimates.
- Project quality could defined through minimum design, and
- Where minimal third party risks existed or could be mitigated.

Limitations

Although the D-B delivery method is a good alternative to the traditional D-B-B method, it also has some risks and disadvantages. For instance D-B *(6, 7)*:

- Shifts additional control and responsibility to the design-builder ~~(6)~~,
- Makes bidding process more expensive for D-B teams ~~(6)~~,
- Makes coordination more challenging due to faster pace ~~(6)~~,
- Parties are more familiar with traditional methods ~~(6)~~,
- Requires a comprehensive and carefully prepared performance specification ~~(7)~~,
- There is potential for conflict of interests between design and construction ~~(7)~~, and
- STA interests may be underrepresented throughout the process ~~(7)~~.

Who uses it?

Based on a FHWA Division Offices survey conducted in 2012, 42 U.S. States have authority to use design-build for roadway projects. ~~States that do NOT have authority for using are Wyoming, Nebraska, Iowa, Illinois, Wisconsin, Oklahoma, Arkansas, and Alabama.~~ The states with the most experience with D-B are Florida DOT, Utah DOT, and Virginia DOT. States that do NOT have authority for using D-B are Alabama, Arkansas, Illinois, Iowa, Nebraska, Oklahoma, Wisconsin, and Wyoming. ~~Wyoming, Nebraska, Iowa, Illinois, Wisconsin, Oklahoma, Arkansas, and Alabama.~~

Example

The Colorado Department of Transportation (CDOT) embarked on a U.S. highway reconstruction project in 2009 that included safety and mobility improvements along U.S. Highway 285 from Federal Blvd to Kipling Blvd in Denver, CO *(9)*. The project included replacing three structurally deficient bridges and reconstructing portions of U.S. 285 that were determined to be in poor condition.

Initially, the project was budgeted at $10 million to replace one of the structurally deficient bridges. However, after further investigation, the project ballooned to a $40.1 million reconstruction project. Due to the length and complexity of replacing three bridges and still allowing four lanes of traffic to flow, CDOT determined (with the use of the PDSM) that D-B would be the best delivery method for this project.

Using D-B allowed CDOT to merge a high level of buy-in and dedication from the project team with an innovative contracting method that led to the design and construction of the project to be bid along with specific innovations such as keeping traffic flow and keeping the traveling public safe. The use of D-B resulted in efficiencies and benefits that typically are found on much larger projects. The benefits received included:

1. Optional procurement selection approaches: Used best value, but initially considered low bid
2. Expanded scope within a set budget: D-B firm provided the maximum possible scope to fit the set budget
3. Design innovations: Design innovations were included as a part of the bidding process and during the project, which occurred without numerous change orders.
4. Positive schedule impacts: Contractor and STA were co-located at the project site, which allowed issues to be quickly addressed. CDOT estimates this saved two years of time on this project
5. Maximized budgets: D-B allowed for additional scope to be completed within the set budget

6. More efficient owner involvement: With co-location of CDOT with the contractor, CDOT was able to adapt to its role as overall quality assurance, owner verification, and owner approval.

7. Effective teaming and partnering: The nature of D-B encouraged the project team to work more closely together. Co-location also assisted with creating a team atmosphere

8. Increased accountability to the project and team: By eliminating the separation between design and construction, project team members acknowledged a more vested interest in the project, which led to improvements in project quality

9. Shared risk: CDOT found three elements that are critical to successful risk sharing (1 – focus on removing any ambiguity from the specs, 2 – plan ahead with the specialty contractors, and 3 – require an issue resolution process as part of partnering and implement it quickly)

CDOT did make one final note about this project in that the U.S. 285 reconstruction project was successfully completed on time and on budget due to gaining the entire project team's commitment to collaboration and partnering. This critical element turned out to be essential to the project and CDOT uses this project as a model for current and future mid-sized D-B projects.

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A.3 Construction Manager / General Contractor (CM/GC)

Also known as Construction Manager at Risk (CMR)

What is it?

Construction m~~M~~anager ~~at Risk~~ / general contractor (CM/GC~~R~~) is a project delivery method in which the State Transportation Agency (STA) holds contracts with two parties: the design consultant and the Construction Manager/General Contractor firm.~~(CM/GC).~~ However, unlike the typical design-bid-build system, here, the CM~~/~~GC's services are retained early on the design phase. As a result, the CM~~/~~GC has an input during design and controls the entire construction phase. Under this method, the CM~~/~~GC is said to be "at Risk" because the project is delivered under a Guaranteed Maximum Price (GMP) that is negotiated during the design phase *(1, 2)*.

Why use it?

The ~~CMR~~ CM/GC delivery method provides the following advantages *(2, 3)*:

- Allows fast-tracking of design and construction activities resulting in potential time savings ~~*(3)*~~,
- Allows for innovation and constructability recommendations during design, but the STA retains significant control over design ~~*(3)*~~,
- Once GMP is established the CM/GC invests more in cost engineering and constructability reviews in order to minimize risks ~~*(3)*~~,
- Fixes project costs and completion responsibility ~~*(3)*~~, and
- CM/GC services provided during preconstruction reduce design costs by reducing the amount of detail that is required and by focusing the early design effort on constructible solutions ~~*(2)*~~

What does it do?

Under the CM/GC~~R~~ delivery method, the STA selects a CM~~/~~GC firm to perform preconstruction and construction management services. During the design phase, the CM~~/~~GC firm acts in an advisory/management role. It provides constructability reviews, value engineering suggestions, construction estimates, and other construction-related recommendations *(1, 4)*. At some point on or before design reaches 100% completion, the STA and CM~~/~~GC firm negotiate a GMP, which is based on o partially completed design and includes the CM~~/~~GC estimate of the cost for the remaining design elements *(1)*.

Once the GMP is established, the CM~~/~~GC firm starts the construction phase, thus allowing an overlap of the design and construction phases. During construction, the CM~~/~~GC firm acts as a general contractor and performs contractually obligated work. The contractor holds the construction contract and risk for any construction costs that exceed the GMP *(1)*.

How to use it?

Upon selection of the ~~CMR~~ CM/GC method as a project's delivery method, the process can be divided into three parts:

1. **Project development and CM~~/~~GC selection** – As a first step i~~o~~n the project development phase, the STA identifies and allocates the risks associated with the project. The second step is to develop preliminary documents including environmental, right of way, and utilities *(1)*. The ~~following~~ third step is to develop preliminary design documentation, which should be minimal in order to maximize the effectiveness of the ~~CMR~~ CM/GC method but enough to conduct ~~the CM/GC~~effective procurement of a CM/GC firm. The project goals and objectives should guide ~~these steps~~the STA through these steps. In case of the CM~~/~~GC selection, the procurement is generally made using a qualifications-based selection *(5)*. Here, the STA negotiates a fee for the pre-construction services with the highest ranked proposer awarded the project *(1)*.

2. **Pre-construction services and GMP negotiation** – The pre-construction services include almost anything the agency requires from the CM~~/~~GC firm. Typical ~~CMR~~ CM/GC packages include costs estimates, schedule analysis, work sequence, risk identification, mitigation and pricing, constructability reviews, development of work packages for bid, and development of a GMP that meets owner requirements and budget restraints *(2)*. During this stage of the project delivery process, the STA and CM~~/~~GC should begin negotiations for the GMP. This payment provision is described more in detail in the ~~supplementary~~ payment provisions ~~section~~ appendix of this guidebook. The GMP is a maximum price to which the ~~contractor~~ CM/GC firm will commit to deliver the project for a quantified scope of work expressed in the design documents. It includes project direct costs, indirect costs, a profit, and the ~~CMG~~ project contingency *(2)*. The GMP can be negotiated any time during the design phase. It should be taken into account that when the GMP is negotiated closer to the design completion it will include less contingency. Conversely, when the GMP is negotiated earlier in the design, the overall costs may be higher due to a larger contingency; however, it allows construction to start earlier. Some special aspects to consider in the GMP are the CM~~/~~GC self-performance limits which is regulated by laws in some states, subcontract competition and selection constraints, and the use of a shared savings clause which allows sharing a percentage of any GMP savings with the ~~contractor~~ CM/GC firm upon project completion *(2)*.

3. **Construction services** – During the construction phase of the project, the STA should provide a ~~way~~ method to review and respond to construction issues compatible with the GMP contract requirements, and maintain an~~d~~ accounting system that supports the review of contractor invoices and justifications, and make timely payments to the ~~contractor~~CM/GC firm. Key aspects to consider are~~here are a~~ strong communication between the STA and the CM~~/~~GC, subcontractor control, quality control, contract changes procedures, and ~~an~~ invoicing system.

When to use it?

The CM/GC~~R~~ delivery method is most advantageous *(1, 6)*:

- On projects where the STA has limited management resources ~~*(1)*~~,
- On projects where there is limited time or funding ~~*(1)*~~,
- When there is a need for immediate transportation improvements ~~*(6)*~~,
- On project where the design is complex, difficult to define, subject to change and there are several design options ~~*(6)*~~, and
- When the project is sequence or schedule sensitive ~~*(6)*. When the project has multiple contracts *(1)*~~.

The CMR methods is less suitable for straight-forward projects, projects with easily defined scope and low risk, and projects that lack schedule sensitivity ~~*(6)*~~.

Limitations

Some of the major risks and disadvantages of a CM/GC~~R~~ delivery method are (2, 3):

- Project price is negotiated with a CM and not competitively bid ~~*(3)*~~,
- CM~~/~~GC input may not be included by designer ~~*(3)*~~,
- Use of GMP may lead to a large contingency to cover uncertainties and incomplete design elements ~~*(3)*~~,
- Use of GMP can lead to disputes over the completeness of the design and contract changes ~~*(3)*~~, and
- CM~~/~~GC design input does not necessarily translates into better design quality ~~*(2)*~~

Who uses it?

STAs that have executed or experimented with CM/GC projects are: Alaska, Arizona, Florida, Oregon, and Utah *(2)*. With the passage of the Moving Ahead for Progress in the 21st Century Act (MAP-21) on July 2012, SEP-14 approval is no longer required for CM/GC~~R~~ projects as long as the state statutes allow for it. STAs with full authority to use CM~~/~~GC are: Alaska, Arizona, California, Colorado, Connecticut, Florida, Idaho, Michigan, Minnesota, New Mexico, Oregon, and Utah *(7)*.

Examples

Example 1) Florida Department of Transportation

The Florida Department of Transportation (FDOT) is using the CM/GC~~R~~ delivery method on the Miami Intermodal Center (MIC). The MIC is transportation hub that will provide connectivity between all forms of ground transportation available in the county and includes road, bridge, and interchange construction to improve access to the Miami International Airport; rail components; bus facilities; and airport landside improvements *(2)*. FDOT made the decision to use CM/GC~~R~~ before starting design. Given that this is a complex project that combines horizontal and vertical construction the DOT viewed CMR as an opportunity to increase technical expertise. Other reasons to use ~~the~~ CM/GC~~R~~ ~~project~~ were a desire to improve coordination requirements and early contractor involvement, reduce the project delivery period, establish project budget at an early stage of design development, and redistribute risks *(2)*.

The CM~~/~~GC firm was selected early in the design process, immediately after the consultant. FDOT issued a request for letters of interest, and the solicitation document contained a description of the scope of work and preliminary plans and specifications. Competing CM~~/GCs~~ GC firms were required to show past CM/GC~~R~~ experience, past project experience, and CM~~/GC's~~ GC firm's project manager qualifications. The winner was determined by the results of the scoring of the selection panel as published in the advertisement. The GMP was established before 100% design was reached. The CM~~/~~GC firm can self-perform up to 50% of the work, and must publicly accept bids to conduct subcontract selection. The project has an approximated cost of $1.7 billion and is scheduled to be completed by 2014.

Example 2) Oregon Department of Transportation

Another example of CM/GC~~R~~ is Oregon Department of Transportation's (ODOT) I-5 Willamette River Bridge Project *(2)*. This project consisted on the removal of the old Willamette River Bridge, construction of a new 1,800-foot long bridge to replace the old bridge, replacement of the old Canoe Canal Bridge, reconstruction of approximately 2,500 feet of road approaching and between bridges, and modifications several ramps. The project had a total cost of $150 million ~~and was the ODOT CMR project~~. The decision to use this delivery method was made before 30% design completion was reached and the main reason was to gain experience before using the CM/GC~~R~~ method on a much larger bridge project over the Columbia River. Some of the project specific reasons for choosing CM/GC~~R~~ included budget and schedule control issues, and a desire to redistribute risks.

The CM~~/~~GC firm was chosen as soon as possible after the consultant selection. ODOT issued and RFP, which contained five unit prices for major pay items. The solicitation documents included a description of the scope of work, quality management roles and responsibilities, and design criteria checklists.

Contractor were required to submit past CM/GC~~R~~ experience, past related project experience, qualifications of the project management, construction manager, and project principal, construction quality management plan and public relations plan, preliminary project schedule, and proposed preconstruction services fee, post-construction services fee, and general conditions. The ~~winner~~ wining CM/GC firm was determined by the output from the weighted scores given the selection panel. Here, price carried 15% of the weight.

The GMP was defined before 100% design was reached. It included a single transparent project contingency and the CM~~/~~GC firm was allowed to keep any remaining contingency as a shared savings clause. The CM~~/~~GC firm was also allowed to self-perform 30% of the work, and there were no restrictions regarding subcontractor selection.

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A.4 Multi-Prime

What is it?

Multi-prime contracting is a variation of design-bid-build in which the STA utilizes multiple ~~prime~~ contractors to construct a project. In this setup, the STA has ~~many~~ several contracts with different contractors ~~to~~ that perform specific aspects of the construction. In essence, the STA becomes the general contractor who manages the multiple "sub-contractors" during construction *(1)*. Typically, the STA may procure a general prime contractor, but also procures a ~~prime~~ contractor for the specialty trades of structural, mechanical, plumbing, and electrical *(2)*.

Why use it?

STAs use multi-prime contracting as a method to fast-track construction or for emergency situation purposes *(1)*. Since work can be bid for each discipline of construction, the STA~~s~~ gains the flexibility of bidding portions of the work as soon as the design of that aspect is complete. This gives the overall schedule control to the STA. Additionally, multi-prime contracting gives the STA the opportunity to procure materials directly from suppliers to avoid contractor mark-ups and to make sure materials are ready when needed *(1)*.

STAs may also benefit from increased competition among the various prime contractors and therefore result in lower bid costs. The increased competition is the result of the specialty contractors having the ability to avoid working under a general contractor, resulting in more control by the specialty contractor *(3)*.

What does it do?

Multi-prime contracting allows the STA to have more control over the project schedule as the STA sets the timeline for bidding individual portions of the work. An STA

How to use it?

Multi-prime contracting works in the same manner as Design-Bid-Build, except that instead of procuring and contracting with one general contractor, the STA now procures and contracts with several prime contractors to complete the project scope of work according to completed or nearly completed construction design documents. Since the design does not need to be completed across all of the trades, once a design is complete for a portion of the project, it can be procured, usually with competitive low bid.

When to use it?

Multi-prime contracting works best for projects that are of an emergency scenario or projects that need the schedule to be reduced. STAs have the advantage of “fast-tracking” a project by constructing components of a project as the design is completed for that component. Projects with phasing and sequentially completed designs are also candidate projects to use multi-prime contracting.

Limitations?

Due to the fact that many contractors are a part of multi-prime contracting, the major disadvantage to this type of delivery method is the increased coordination in the development of the separate bidding and contract packages for each separate prime contractor. If not coordinated properly, there is the possibility of work scope being duplicated or omitted. Other concerns in using multi-prime contracting are:

- Final cost of the project not known until final prime contractor is procured *(1),*
- Lack of authority and coordination during construction *(1),*
- Contractor delay issues that can delay sequential prime contractor work *(1),*
- Lack of authority of one prime contractor to dictate the schedule of another prime contractor *(1),*
- Potential for numerous claims to occur between the various prime contractors *(1),*
- Higher costs and more change orders *(2),*
- Poor quality *(4).*

Bidding can be affected by multi-prime contracting in that firms will tend to raise bid prices to offset the risk of working with other prime contractors or firms may abstain from bidding altogether *(5).*

Who uses it?

California, Illinois, Minnesota, New Jersey, New York, Ohio, and Pennsylvania have experience using multi-prime contracting. It is important to note that most multiple prime contracting projects are vertical or temporary structure type projects for highway projects.

Example

References

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A.5 Design-Sequencing

What is it?

Design sequencing is a delivery method where the State Transportation Agency (STA) sequences design activities in a manner that allows the start of construction of different project phases as soon as design is for each given phase *(1)*. This method allows the STA to award the project to a contractor based on plans that are at least 30% complete *(2)*.

Why use it?

As this method allows the start of construction early in the design phase its main advantage is that it provides a path for a faster project delivery *(1)*. In addition, by allowing early contractor involvement in design the design sequencing delivery method also provides potential for increased constructability. Under the typical design-bid-build delivery method, where 100% design completion is reached before advertising the project, the STA bares the risks for escalation costs while under design sequencing these risks can be quickly transferred to the contractor *(3)*.

What does it do?

The design sequencing delivery method synchronizes the sequencing of design activities with a construction phasing plan which allows each phase to start when design for that phase is complete *(3)*. Under this delivery system the entire project contract is awarded to the contractor with a minimum of 30% design completion. This allows the contractor to start construction of the phases with completed design before project design is while it also adds contractor involvement in the remaining parts of design, much like in a Construction Manager/General Contractor contract. Such involvement provides a potential for increased constructability in the remaining 70% of the project *(3)*.

How to use it?

During the project development phase the STA develops plans and a cost estimate to a level sufficient to define well the project scope and to allow the contractor to select anticipated subcontractors *(3)*. The estimates should include all anticipated items and quantities of the complete design with the understanding that some items may be modified at a later date. All utility conflicts should be identified and addressed in the bid package. The bid package should also contain dates for delivery of 100% complete designs for each sequence. A+B bidding or incentive/disincentive specification are usually not incorporated into design-sequencing projects because there is potential for STA caused delays as a result of the unknown nature of the different design sequences.

The California Department of Transportation *(2)* defines 30% complete plans as follows:

- All plans and items of work for the initial bid package should be 100% complete,
- All plans completed at least 30%,
- 90-100% of all work items and 100% of all major items should be identified, and
- 90-100% of all Special Provisions should be identified.

The contractor procurement is made on a low bid for initial bid packages and the subsequent design sequence packages. The contractor is required to submit unit prices for all items including those in subsequent phases, but those unit prices can be adjusted if the quantities end up outside a specified variation form the bid quantity *(3)*.

When to use it?

The Caltrans *Alternative Procurement Guide (2)* recommends using design sequencing for projects that:

- Have minimal public controversy,
- Have final environmental documentation and determination,
- Have project approval,
- Have a well-established project footprint.
- Where all utility conflict have been well identified,
- Have full funding, and
- Where the right of way footprint is well-defined.

Limitations

Some of the risks and disadvantages identified with this project delivery method are:

- It does not redistribute risk between STA and contractor. The STA most of the risks *(1)*,
- There is the potential for construction inefficiency as a result of conflicting or overlapping work between the each project sequence *(1)*, and
- Any unforeseen site condition or third-party conflict during construction may affect the method's ability to reduce project delivery time *(1)*.

Who uses it?

The California Department of Transportation (Caltrans) is the only STA currently experimenting with this delivery method.

Example

The California Department of Transportation (Caltrans) is using the design sequencing delivery method on the I-15 Express Lanes project. This project provides four lanes on the median on I-15 between state route 163 and state route 78. I-15 has high traffic volumes ranging from 197,000 to 312,000 vehicles per day, estimated to be 380,000 by 2020. Delays added on average between 30 to 45 minutes to commute times, and future projections showed that these delays would increase to 90 minutes by 2020. The design sequencing method divided the construction of the project into three segments: north, middle, and south which were further divided into four units each. The middle segment with a total cost $477 million opened in 2008, south segment with a total costs of $364 million opened in 2011, and the north segment with a total cost of $208 million opened in 2012 *(4)*. Construction started with 30% design completion which is the minimum allowed by California law which allowed opening the corridor a year ahead of schedule *(5)*.

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A.6 Public-Private partnerships (PPP)

What is it?

PPPs are contractual agreements between the State Transportation Agency (STA) and a private sector entity which allows grater private sector participation in the delivery and financing of transportation projects *(1)*. There are several definitions of PPP on the industry. The Federal Highway Administration (FHWA) *(1)* for instance includes design-build (D-B), design-build-operate-maintain (D-B-O-M), design-build-finance (D-B-F), and design-build-finance-operate-maintain (D-B-F-O-M) as PPP options, while STAs such as the Michigan Department of Transportation (MDOT) and the California Department of Transportation (Caltrans) define PPP projects solely as D-BFOM projects. On this document, the PPP definition includes the D-B-O-M and D-B-F-O-M options as these include the Operation and Maintenance of the project into the contract and therefore result in similar contract lengths.

Why use it?

The following are some of the advantages of the D-B-O-M PPP:

- Integrates the process of design, construction, operation, and maintenance which allows considering maintenance and operation issues during design and construction (2),
- Allows having one contract for all services and products (2),
- Allows a faster project completion as it benefits from the same advantages of a design-build delivery method (2),
- The STA can get a better approximation of the total life cycle costs of the project including maintenance and operations (2), and therefore commit funds for appropriate maintenance beforehand as well as eliminate political conflicts (1), and
- Motivates the contractor to increase quality of design and workmanship in order to minimize maintenance (3).

In addition to the previous advantages, when re assigning the financing component of the project the private sector some additional advantages can be:

- Allows for the implementation of large projects that are would be otherwise prohibitive *(4)*
- Provides an opportunity for better budgetary management *(4)*
- Gives a potential for generation of revenue *(4)*
- Allows the submission of unsolicited proposals allowing the private market to select potentially viable projects *(4)*

What does it do?

PPP projects combine the design and construction responsibilities with the operations, maintenance, and financial responsibilities under a single contract with the private sector resulting in long term concessions of 30 years or more. In case of the D-B-M-O PPP, financing is secured by the STA. As a result, the STA retains the operating revenue risks and any surplus operating revenue *(1)*.

In the case of D-B-F-O-M PPP the private sector is responsible for securing financing for the project. Two different models of D-B-F-O-M have been used in the United States: Road Toll Concession, and Availability Payment Concessions. Under the first model, tolls generated by the project are the primary source of revenue. Here the private sector retains the right to collect the revenues during the concession period and assumes the risk that these may not meet the expected forecasts. The contract usually provides some provision to help the private sector if revenues are lower than expected such as development subsidies, right-of-way provisions or limited revenue guarantees. Ultimately however, these toll revenues are expected to cover the costs of the project. Similarly, in order to protect the public interest in case of robust revenue generation, the contract includes revenue-sharing provisions.

Under the second model, the project revenue risk is retained by the STA. This contractual agreement stipulates that the STA will compensate the private partner according a long term reimbursement schedule. This payment are made based on milestones, such as initially completing specified construction activities, and/or meeting operational performance standards such as lane closures, incident management, or snow removal. This model is used on projects that are not tolled or for which project revenues are not expected to cover the project costs.

How to use it?

Once a project has been identified as a good candidate for the PPP delivery method the FHWA *(5)* suggests the following typical steps:

1. ***Establish project goals –*** The project goals should include what construction or reconstruction needs to be done, what the risks are with the project, and what operational and performance measures are important for the project.

2. ***Hold Industry Meeting –*** Once the project goals have been identified, the STA should hold meetings with the private sector to allow for industry input that will provide feedback on the PPP potential of the project.

3. ***Examine Revenue Options –*** Different revenue alternatives should be analyzed with a project. The revenue source identification usually starts by analyzing the users of the project, and is dependent on the type of project to be constructed.

4. ***Evaluate Financial and Other Risks –*** Upon identification of the revenue sources, the STA should establish how much of the financing can be supported by the revenue. This calculation depends on the current market conditions and the reliability of the revenue forecast. In addition to the financial risks, other risks include environmental, permitting, archeological, geotechnical, and other existent conditions.

5. ***Evaluate Public Sector Capacity for Project Development –*** Here, the STA will examine its capacity to complete the project using traditional methods. Generally, STAs develop a comparator that shows the costs and risks that would assumed under such traditional delivery.

6. ***Examine Possible Benefits of PPP or Conduct Value for Money Analysis –*** Upon defining a comparator, the STA should analyze the benefits of using a PPP delivery instead of a more traditional delivery. Risk, benefits and costs of the comparator and the PPP project should be compared, this process is called a value for money (VfM) analysis.

7. ***Determine how to implement PPP –*** The VfM analysis provides a tool for deciding whether to deliver the project as a PPP. However, it also serves as tool for identifying the PPP model to use, and a general overview of the concession should work.

During the procurement of the project typical steps include *(5)*:

1. ***Development of Request for Information or Request for Qualifications (RFI/RFQ) –*** These documents provide contractors with information about the project and the STA's goals. It also provides a tool for eliminating interested contractor who do not have adequate qualification from the procurement process.

2. ***Development of Request for Proposals and bidding process –*** With a list of potential bidders from the previous step, the STA should issue a request for proposals (RFP). The RFP usually includes information gained through the RFI/RFQ process.

3. ***Select and Negotiate with Private Partner –*** Differently from traditional methods, cost is only one of the factors in PPP procurement. Experience and technical capabilities are other important factors. Upon selection of the Private Partner, both parties should negotiate contract details such payment delivery.

Upon selection of a private partner concessionaire, it is time to implement the PPP. Typical steps are *(5)*:

1. ***Gather Debt and Equity Capital –*** The private partner find the resources for the project from different lenders and bond issuers. The private partner needs to show that the money it has is enough to build the project and secure the revenues used to repay the debt.
2. ***Design – Build –*** Construction starts as soon as possible after financial close. The STA should provide contract provision that cover damages for delays that are under the private partner control. Payment may or may not be done depending on the PPP model chosen.
3. ***Operate and Maintain –*** Upon completion of construction the private partner operates and maintains the project according to performance levels specified by the STA. These can include keeping a certain number of lanes open to traffic during peak hours, responding to traffic incidents within a set period of time, and establishing time limits to clear roadside debris. During this stage the STA should monitor the private partner's performance. The contract should specify the steps to be followed in case the private partner fails to meet the performance standards. Some of these provisions allows for financial penalties, or "default points" for serious violations. A series of Default Points usually allow cancelling the concession, giving it to another concessionaire, or bringing it under STA control.

When to use it?

PPP contracts are most appropriate for:

- Large or mega projects *(4)* where the public sector may lack the financial capacity to execute and complete such projects *(5)*.
- Project that are complex, as PPP allows taking advantage of specialized expertise in the private sector *(5)*.
- Projects that can or could generate revenue *(4)*,
- Project with strong public support which secures the required political approvals *(5)*,
- Project with complete or almost completed environmental work because there is less risk of delays and unknown environmental costs *(5)*,
- Projects that provide possibilities for innovation *(4)*, and
- Projects with significant congestion needs *(5)*.

Limitations

The D-B-M-O PPP delivery system has similar advantages and disadvantages than the D-B system. The following are additional risks and limitations that are caused by adding operations and maintenance to the D-B contract.

- It may be difficult to estimate operation and maintenance costs at the early stages as design is incomplete. This could lead to higher contingencies, which results in higher project costs *(3)*.
- The STA loses some control over the design details and some aspects of operation and maintenance (3),
- There is the risk that this delivery method will reduce project bidders (3),
- Since STA has less overall control of the project there is the risk that the project may not achieve the desired level of disadvantaged business enterprise (DBE) participation (3).

Additional risks and limitations that come from adding financing by the private sector to a PPP agreement are:

- Existence of legislative challenges at the State and Federal levels that limit the applicability of PPP *(4)*
- PPP is a politically sensitive method mainly due to source of funding and duration of contract *(4)*
- Generally imposes road user fees which can be an issue at the onset of the project *(4)*

Who uses it?

STAs that currently have projects under concession, or that have PPP project under construction include California, Colorado, Florida, Indiana, New Jersey, New York, Texas and Virginia *(6)*.

Examples

Example 1) Texas Department of Transportation

One example of PPP is the construction of SH 130 (segments 5-6) in Texas. This is a four-lane, 91-mile toll road southeast of Austin built to relieve congestion on I-35. Segments 1-4 of the roadway were built under a different contract and were opened between November 2006 and April 2008. The concession agreement for segments (5-6), a 40 mile extension to SH1-130, is a D-B-F-O-M contract with a 50-year duration from the opening date and a total cost of $1,327.9 million. Construction began in April 2009, the project opened on October 2012, and service commenced on November 2012. Financial close was reached on March 2008, and the first interest payment is scheduled for June 2017. Main repayments are scheduled to begin in 2018. This was the first privately developed and operated toll road facility in Texas *(1)*.

Example 2) Florida Department of Transportation

Another example is of PPP can be found on the Florida Department of Transportation (FDOT) which is using the availability payment PPP type of provision for the improvement project of the I-595 corridor. This is the first project using this provision in the U.S *(7)*. The project involves the reconstruction, widening, and resurfacing of the 10.5 mile mainline in central Broward County, addition of two auxiliary lanes in each direction, construction of three reversible express lanes along the I-595 median, and the addition of two frontage lanes along SR 84. The project has an estimated cost of $1,835 billion and will be concluded by spring 2014. The contract is a D-B-F-O-M with a duration of 35 years including construction.

The FDOT will pay the Concessionaire $65.9 million per year in availability payments as well as $685.5 million in facility acceptance payments for the timely construction of the highway with pre-defined standards. Availability payments will begin once the project reaches substantial completion. That is, when all lanes have been constructed and are operational.

According to the VfM analysis performed by FDOT *(8)*, using this provision accelerated the program by 15 to 20 years; the time it would have taken to build with a traditional pay-as-you go procurement. The VfM analysis was performed twice. The first, on August 2007, showed that using Availability Payments would provide a better value for the STA of $24 to $104 million compared to a D-B-F-O-M contract where the project would be completely covered by the project's own revenues. The second VfM analysis, performed on August 2009, showed that the actual availability payment was 8% lower than what was initially estimated in the 2007 VfM analysis.

The following are the contract provisions for the availability payment of this project extracted from the actual contract published in the project's website *(9)*. They include the formulas used for the calculation of the maximum availability payments, and the criteria for the adjustments:

Payments to Concessionaire

1.1 Timing and Basis for Availability Payments

1.1.1 Upon Substantial Completion of the Project, FDOT will begin making Availability Payments to Concessionaire as provided in this Article 12. Concessionaire is not entitled to earn any Availability Payments before the Early Completion Date.

1.1.2 The Availability Payments are based on the Segments being open and available for public travel as measured through Concessionaire's conformance with the Contract Documents, including the minim operating and maintenance requirements set forth in Section 4 of Division II.

1.2 Availability Payment Calculation and Invoicing

1.2.1 Calculation of availability Payment

1.2.1.1 Availability Payments shall be calculated and earned by Concessionaire according to the methodology set forth in Appendix 6. The Availability Payments payable during any given Fiscal Year during the Operating Period shall never exceed the MAP for that year, adjusted for inflation, as described in Appendix 6.

1.2.1.2 Each Availability Payment constitutes a single, all-inclusive payment with no fixed component and no separation of payments for operations, capital, maintenance, Renewal Work, Handback Renewal Work or Upgrades. In addition to any other deductions or withholdings allowed under this Agreement, the Availability Payments shall be subject to adjustment for Unavailability Events in accordance with Appendix 6.

Appendix 6

Section 1.

1.1 Annual Maximum Availability Payment

MAP_y is the Maximum Availability Payment for that Fiscal Year Indexed for inflation according to the following formula:

$$MAP_y = MAP_{base} * k * \frac{CPI_y}{CPI_{base}} + MAP_{base} * (1-k) * (1+FR)^{y-FY_{base}}$$

Where:

Base = July 1, 2008

k=30% (Indicating the portion of the maximum availability payment indexed to CPI);

CPI_y = The Consumer Price Index at the commencement of Fiscal Year “y” (CPI_y shall apply to all calculations relating to Fiscal Year “y” regardless of the date upon which CPI_y is officially published);

y = the Fiscal Year for which the inflation-adjusted MAP is being calculated;

FR = fixed rate of 3.00%; and

FY_{Base} = Fiscal Year beginning July 1, 2008.

The availability Payments in any Fiscal Year will never be less than zero or greater than the MAP for that given Fiscal Year.

Adjustment for Benchmark Interest Rate and Credit Spread Changes

The above MAP (in July 1, 2008 US dollars) has been adjusted in accordance with Appendix 6-A of the Agreement.

Quarterly Payment

The Quarterly Payment shall be calculated as follows:

$$QP_{q,y} = \frac{MAP_y}{4} - QPA_{q,y}$$

Where:

$QP_{q,y}$ = the Quarterly Payment for Quarter “q” in year “y,” and

QPA_{qy} = the Quarterly Payment for Adjustment for Quarter “q” in year “y”

If substantial completion occurs on a date which is not the first day of a Quarter, the first Quarterly payment will correspond to a fraction of a Quarter and the first element of the above formula (1/4 MAP_y) shall be pro-rated according to the number in days in that fraction of a Quarter.

1.2 Quarterly Payment Adjustments

Payment adjustments shall be calculated as follows:

$QPA_{q,y} = QUA_{q,y} + QVA_{q,y}$

Where

$QPA_{q,y}$ = Quarterly Payment Adjustment for Quarter "q" in year "y;"

$QUA_{q,y}$ = Quarterly Unavailability Adjustment for Quarter "q" in year "y,"

$QVA_{q,y}$ = Quarterly O&M Violation Adjustment for Quarter "q" in year "y."

Section 2.

2.1 Quarterly Unavailability Adjustments

The Quarterly Unavailability Adjustment to the Quarterly Payment shall be calculated as follows:

$$QUA_{q,y} = \sum_{hour\ h=1}^{hq} HUA_h$$

Where:

$$HUA_h = \sum_{segment\ s=1}^{n} \left[HUF_{h,s} * SWF_{h,s} * TWF_{h,s}\right] * \frac{MAP_y}{(364 * 24)}$$

$QUA_{q,y}$ = Quarterly Unavailability Adjustment for Quarter "q" in year "y;"

HUA_h = Hourly Unavailability Adjustment for the Hour "h;"

$HUF_{h,s}$ = Hourly Unavailability Factor for Segment "s", hour "h;"

$SWF_{h,s}$ = Segment Weighting Factor for Segment "s", Hour "h;" and

$TWF_{h,s}$ = Time Weighting Factor for Segment "s", Hour "h."

MAP_y is the Maximum Availability Payment for that Fiscal Year Indexed for Inflation as described in Section 1.1 of this Appendix 6.

2.2 Hourly Unavailability Factors

(a) Each Unavailability Event will be deemed to have commenced form the moment such Unavailability Event actually began (not form the moment it was discovered or reported), and to persist during each Hour thereafter until such Unavailability Event is cured, provided that an Unavailability Event occurring at any time during an Hour shall be deemed to have occurred at the beginning of the Hour, and an Unavailability Even that ends at any time during an Hour shall be deemed to have ended at the end of that Hour.

(b) Each Unavailability Event is described by an Availability Classification and a corresponding Hourly Unavailability Factor for the given Hour with respect to the given Segment in accordance with Tables A,B and C in Section 5 of this Appendix

(c) The Hourly Unavailability Factor $HUF_{h,s}$ for a given Segment during a given Hour shall be calculated by adding together the Unavailability Factors of the Unavailability Events which occur with respect to the Segment during that Hour, provided that the Hourly Unavailability Factor may never exceed 1.00. When no Unavailability Event occurs, the Hourly Unavailability Factor is 0.00.

2.3 Segment Weighting Factors

(a) The Segment Weighting Factors are shown in Table D in Section 5 of this Appendix 6.

(b) At FDOT's discretion after consultation with Concessionaire, the Segment Weighting Factors may be changed to reflect changes in the relative traffic utilization of the Segment and/or, the level of revenue generated from Express Lanes tolls. However, Segment Weighting Factors must always equal the sum of 1.00, and may not be changed more than once in any five-year interval. FDOT will provide Concessionaire with notice of any changes at least 120 days prior to the effective date of the changes.

2.4 Time Weighting Factors

(a) Time Weighting Factors will be assigned to each Segment for every Hour of the Operating Period.

(b) The current Time Weighting Factor assignments for each Segment are shown on Table E to this Appendix. At FDOT's discretion after consultation with Concessionaire, the Time Weighting Factor may be changed, provided that (i) the annual average Time Weighting Factor for each Segment equal seven (when rounded to the nearest second decimal), as determined by adding together the Time Weighting Factors assigned to each Hour of the year for a given Segment, and then dividing the sum by the number of hours in the year; (ii) the Time Weighting Factor assigned to any category of Low Priority Hours does not exceed two; (iii) the Time Weighting Factor assigned to any category of Mid Priority Hours does not exceed 15; (iv) the Time Weighting Factor assigned to any category of High Priority Hours does not exceed 20; (v) on each day, there are at least six Low Priority Hours and a combined total of at least ten Low Priority Hours and Mid Priority Hours; (vi) during every 48 Hour period, there are at least six contiguous Low Priority Hours and Mid Priority Hours; (vii) changes may not be made more than once per three year period; and (viii) Concessionaire receives notice of proposed changes 120 days prior to the effective date of the proposed changes and is provided with a reasonable opportunity to comment on the proposed changes.

Section 3. O&M Violation Adjustments

Concessionaire will be required to operate maintain and renew the facility in accordance with Section 4 of Division II. O&M Violations are triggered by noncompliance of certain contractual obligations set forth therein.

2.1 Quarterly O&M Violations Adjustments

The Quarterly O&M Violations Adjustment to the Quarterly Payment shall be calculated as follows

$$QVA_{q,y} = \sum_{OMV\ i=1}^{n} VA_{i,q}$$

Where:

$QVA_{q,y}$ = Quarterly O&M Violations Adjustment for the Quarter "q" in Fiscal Year "y;"

$VA_{i,q}$ = O&M Violations Adjustment for each applicable O&M Violations "i" in Quarter "q".

2.2 O&M Violation Adjustments and O&M Violation Classifications

O&M Violation Classifications are set forth in Section 4 of Division II for each O&M violation. Each O&M violation Classification has an associated O&M Violation Adjustment amount as shown in Table F in Section 5 of this Appendix 6.

Each O&M Violation has the cure period and an Interval Recurrence as described in Section 4, Table 4.2 of Division II. After the cure period, any O&M Violation that is not cured within its respective Interval of Recurrence will be deemed to occur anew and assessed another O&M Violation Adjustment, and such new occurrence shall have no cure period.

Section 5. Tables

Table A – Hourly Unavailability Factors

Availability Classification	Hourly Unavailability Factor
A	0.1
B	0.2
C	0.4
D	0.6
E	0.7
F	0.8
G	1.0

Table B – Classification of Closures during Mid and High-Priority Hours

I-595 Corridor Segments (Segments 1, 2, 3, and 4)	Availability Classification	Express Lanes Segment (Segment 5)
	A	
	B	
❒ 1 lane of a 3 lane part of SR-84 or ❒ 1 lane of a 6 lane part of I-595 or ❒ 1 lane of a 2 lane Ramp or ❒ any lane of a crossroad is not available at some time during the Hour	C	
❒ 1 lane of a 3, 4, or 5 lane part of I-595 or ❒ lanes of a 6 lane part of I-595 or ❒ 1 lane of 2 lane part of SR-84 or ❒ lanes of a 3 lane part of SR-84 or ❒ 1 lane of a 2 lane High Impact Ramp or ❒ All lanes of a Ramp or ❒ more than 1 lane of crossroad is not available at some time during the Hours	D	❒ 1 lane of a 3 lane part or 1 lane of a 4 lane part of the Express Lanes or ❒ 1 or more lanes of an ingress Express Lanes Ramp Are not available some time during the Hour
❒ lanes of a 4 or 5 lane part of I-595 or ❒ lanes of a 6 lane part of I-595 is not available at some time during the Hour	E	
❒ lanes of a 3 lane part of I-595 or ❒ lanes of a 4 lane part or 5 lane part of I-595 ❒ lanes of a 5 lane part or 6 lane part of I-595 or ❒ lanes of a 6 lane part of I-595 or ❒ All lanes of SR-84 or ❒ All lanes of a High Impact Ramp are not available at some time during the Hour	F	❒ 1 lane of a 2 lane part, 2 lanes of 3 lane part, or 2 lanes of 4 lane part of the Express Lane or ❒ 1 or more lanes of an egress Express Lanes Ramp are not available some time during the Hour
❒ All lanes of I-595 are not available during the Hour	G	❒ All Express Lanes are not available at some time during the Hour

Table C – Classification of Closures during Low-Priority Hours

I-595 Corridor Segments (Segments 1,2,3 and 4)	Availability Classification	Express Lanes Segment (Segment 5)
❒ 1 lane of a 3,4,5 or 6 lane part of I-595 ❒ 2 lanes of a 4,5, or 6 lane part of I-595 or ❒ 1 lane of a 3 lane part of SR-84 or ❒ any 1 lane of a crossroad is not available at some time during the Hour	A	
❒ 2 lanes out of 3 lane part of I-595 or ❒ 1 lane of a 2 lane part of Sr-84 or ❒ 1 lane of a 2 lane Ramp or ❒ more than 1 lane of a crossroad is not available at some time during the Hour	B	
❒ 2 lanes of a 3 lane part of SR-84 or ❒ 1 lane of a 2 lane High Impact Ramp or ❒ All lanes of a Ramp are not available at some time during the Hour	C	❒ 1 or more lanes of an ingress Express Lanes Ramp are not available some time during the Hour
❒ 3 lanes of a 5 or 6 lane part of I-595 or ❒ All lanes of a High Impact Ramp are not available at some time during the Hour	D	❒ 1 lane of a 3 lane part or 1 lane of a 4 lane part of the Express Lanes or ❒ 1 or more lanes of an egress Express Lane are not available some time during the Hour
	E	
❒ 3 lanes of a 4 lane part of I-595 or ❒ 4 lanes of a 5 or 6 lane part of I-595 or ❒ 5 lanes of a 6 lane part of I-595 or ❒ All lanes of SR-84 are not available at some time during the Hour	F	❒ 2 lanes of a 3 lane part or 2 lanes of a 4 lane part of the Express Lanes are not available some time during the Hour
❒ All lanes of I-595 are not available at some time during the Hour	G	❒ All Express Lanes are not available at some time during the Hour

Table D – Segment Weighting Factors

Segment Number	Segment	Segment Weighting Factor
1	I-595 eastbound and SR-84 eastbound west of Sewell Lock, including crossroads, High impact Ramps, and Ramps	0.2
2	I-595 eastbound and SR-84 eastbound east of Sewell Lock, including crossroads, High Impact Ramps, and Ramps	0.2
3	I-595 westbound and SR-84 westbound west of Sewell Lock, including crossroads, High impact Ramps, and Ramps	0.2
4	I-595 westbound and SR-84 westbound east of Sewell Lock, including crossroads, High Impact Ramps, and Ramps	0.2
5	Express Lanes and Express Lanes Ramps	0.2

Table E – Time Weighting Factors

I-595 Corridor Segments (Segment 1, 2, 3 and 4)

Category Hours	TWF	Definition
Peak Days		Monday at 0:00 through Friday at 19:00
High Priority Hours	12.00	06:00 – 09:00 and 16:00 – 19:00
Mid Priority Hours	6.00	09:00 – 16:00 and 19:00 – 22:00
Low Priority Hours	2.00	22:00 – 6:00
Weekends		Friday at 19:00 through Sunday at 24:00
High Priority Hours	12.00	12:00 – 02:00 (except Sunday 21:00 – 24:00)
Mid Priority Hours	6.00	08:00 – 12:00
Low Priority Hours	2.00	02:00 – 08:00 and Sunday 21:00 – 24:00

Table E – Time Weighting Factors

Express Lanes Segment (Segment 5)

Category Hours	TWF	Definition
Peak Days		Monday through Friday
High Priority Hours	20.00	06:00 – 09:00 and 16:00 – 19:00
Mid Priority Hours	6.00	09:00 – 16:00 and 19:00 – 22:00
Low Priority Hours	1.00	22:00 – 6:00
Weekends		Saturday through Sunday
High Priority Hours		None
Mid Priority Hours	6.00	06:00 – 23:00
Low Priority Hours	1.00	23:00 – 06:00

Table F – O&M Violation Adjustments

O&M Violation Classifications	O&M Violation Adjustment
A	**MAP_y / (40,000)**
B	**MAP_y / (8,000)**
C	**MAP_y / (4,000)**
D	**MAP_y / (1,600)**
E	**MAP_y / (360)**

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APPENDIX B. PROCUREMENT PROCEDURES SUPPORT DOCUMENTS

<u>Common Procurement Procedures</u>

- B.1 Low Bid
- B.2 Best Value
  - B.2.1 Fixed Budget / Best Design
  - B.2.2 Adjusted Bid
  - B.2.3 Adjusted Score
  - B.2.4 Weighted Criteria
  - B.2.5 Meets Technical Criteria – Low Bid
  - B.2.6 Quantitative Cost – Technical Tradeoff
  - B.2.7 Qualitative Cost – Technical Tradeoff
- B.3 Qualifications-Based Selection
- B.4 Cost plus Time

<u>Less Common Procurement Procedures</u>

- B.5 Sole Source
- B.6 Job Order Contracting

<u>Supplementary Procurement Procedures</u>

- B.7 Alternative Technical Concepts (ATCs)
- B.8 Additive Alternates
- B.9 Alternate Design

B.1 Low Bid

What is it?

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 (*1*). The price presented by the selected firm is the basis for the contract price of the project.

Why use it?

Low bid procurement is the most common procurement procedure used for selecting a contractor for roadway projects. This simplest procurement procedure relies only on selecting the contractor that provides the lowest responsive price. Most projects that STAs perform can use low bid, as long as the received bids are fully responsive to the design and specifications of the project *(2).*

What does it do?

Low bid procurement allows STAs to request a price from multiple contractors. The bid price that contractors submit are based on the completed design documents (plans and specifications). Then, the STA only has to compare the total price provided by the bidding contractors and the bid that is the lowest price that is fully responsive to the design documents is selected as the contractor to build the project.

How to use it?

The STA develops the design of the project to at or near 100% complete, either in-house or with a 3rd party design firm. Once the design is ready for bidding, the STA advertises the project to the contracting industry around the project location. Firms interested in bidding the project obtain an instruction to bidders (ITB) document. The ITB provides directions for bidding the project, how to obtain a set of plans, and when bid opening will take place. Bidding firms then provide bids for the project that includes a total cost for the STA to review. At the time of bid opening, all accepted bids are opened and reviewed to make sure that each bid is fully responsive. After bids are determined responsive, the lowest bidding firm is awarded the project.

When to use it?

Low bid is the most common procurement procedure for roadway projects and all STAs have experience using low bid. Therefore, low bid has been and can be used for all types of projects. However, projects that are large in size and/or include a high number of risks and is considered a complex project, low bid procurement might not be the optimal procurement procedure and alternative methods should be considered.

Limitations?

Although low bid is the most common method to procure a project, it may not be the best choice based on the project. Projects that are more complex and/or large in size can be procured using low bid, but the STA is then absorbing more risk that the awarded firm has the best estimated price for a project. If the price is inaccurate, the project will be subject to many RFIs and change orders, which can drastically increase the price of the project over the initial contract price. Additionally, low bid does not allow for other qualifications to be reviewed during the procurement process, which makes the STA solely depend on just the actual price of the project.

Who uses it?

All State Transportation Agencies have used low bid procurement.

Example

Low bid procurement is commonly used with design-bid-build and all STAs know the process for low bid procurement for a D-B-B project. However, low bid can also be used with design-build delivery. The California Department of Transportation (Caltrans) has the option to use either low bid or best value with a design-build project. The procurement process used by Caltrans to procure a design-builder using low bid is summarized below *(3)*.

> Under a lowest-priced design-build approach, the Selection Committee will award the contract to the proposer that submits the lowest price and has a responsive technical proposal. To be responsive, the technical proposal must meet or exceed the requirements specified in the RFP.
>
> Implementing the lowest-price procurement approach typically entails the following:
>
> 1. Develop evaluation criteria based on the goals and risks identified for the project, and whether criteria are evaluated on a pass-fail basis or scored. To the extent possible, evaluation criterion should have a measurable standard against which responsiveness will be measured on a pass/fail basis.
> 2. Prepare and issue the design-build solicitation package. The package should include the following items, as a minimum:
>   - Scope of work, plans, and specifications.
>   - Bid form.
>   - Contract completion date or days.

- Design-build evaluation plan identifying the evaluation criteria along with
- corresponding standards.
- Description of what constitutes a non-responsive proposal.

3. Receive design-build technical and price proposals.
4. Evaluate technical proposals against published standards and a minimum score to determine which are responsive to the RFP evaluation criteria.
5. Include responsive proposals meeting the minimum standard. Return sealed price proposals to the authors of the non-responsive proposals.
6. Open price proposals for those competitors that are responsive.
7. Award to the lowest priced proposal within the competitive range.

This approach has also been implemented by first opening sealed proposals to determine the apparent low bid, then evaluating the low bidder's technical proposal for responsiveness. This post-qualification approach reduces the time and effort necessary to evaluate proposals. In general, this lowest-price-responsive-proposal approach is most appropriate for small-to-medium sized projects having a relatively standardized design and for which no innovation or alternatives are desired. Example projects could include resurfacing projects and bridge projects with a specified foundation type, spans lengths, and beam type.

This approach has the advantage of being the most similar to the Department's traditional low-bid approach to procuring construction contractors. Also, awarding only the basis of price and responsiveness introduces relatively little subjectivity into the evaluation and selection process. However, by precluding the consideration of factors other than cost alone (e.g., quality, innovation, schedule, etc.), it may be difficult to ensure that the Department ultimately receives the best-value, particularly for large, complex projects.

References

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B.2 Best Value

What is it?

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 (*1, 2*).

Why use it?

In certain circumstances, an STA may have a project that is complex and/or large in size that requires additional qualifications to be considered along with the price of the project.

What does it do?

Best value allows STAs to select a constructor for a project based on price and other factors such as qualifications, schedule, quality and others.

How to use it?

Best value can be used in a variety of ways using different algorithms. The most common types of best value are found in sections B.2.1 through B.2.7 and are listed below:

- Fixed budget / best proposal (B.2.1)
- Adjusted score (B.2.2)
- Adjusted bid (B.2.3)
- Weighted criteria (B.2.4)
- Meets technical criteria – low bid (B.2.5)
- Quantitative cost – technical tradeoff (B.2.6)
- Qualitative cost – technical tradeoff (B.2.7)

When to use it?

Best value is a procurement procedure most commonly used with the design-build delivery method. Design-build projects only have limited design complete so that just procurement based on price would not be the best option for selecting a firm. Also, design-build projects require the selected firm to perform design and construction, so other factors need to be considered when selecting a firm.

Best value can also be used with other delivery methods in instances when selecting a contractor just on price is not the best option due to the scope, size and complexity of a project. Also, best value allows for more innovations to be thought out during procurement that can then be implemented during design and/or construction.

Limitations?

The majority of limitations to using best value are related to federal, state, and local laws and regulations. When competitive bidding (low bid) is required for a project, best value cannot be used without receiving special consideration from legislation. In addition, many STAs may not have the knowledge or resources to conduct a best value procurement, which then deters its use.

Who uses it?

Colorado, Florida, Minnesota, Utah

Example

The Minnesota Department of Transportation (MnDOT) recently completed the new Hastings Bridge design-build project (3). This project was a major bridge replacement along TH 61 in Hastings, MN to replace the existing 2-lane highway over the Mississippi River with a 4-lane highway along with design and constructing the approaches on the north and south sides of the new bridge.

The Hastings Bridge project was selected to be design build based on the direction of the interim highway commissioner to accelerate the project as the schedule was the most important aspect of the project. Based on this, MnDOT moved forward with procuring a design-build firm using best value procurement. The information below is taken from the Hastings Bridge request for proposal (RFP), which outlines the evaluation and scoring method used to compare the received bids for the more than $100 million project.

4.0 Evaluation Procedure

The Proposals will arrive in three separate marked packages; the Technical Proposals in one package, the Price Proposals in the second package, and the EEO/DBE Submittal in the third package. The Price Proposals will remain unopened until the Technical Evaluation process has been completed and all Technical Proposals have been scored by the TRC. The Technical and Price Proposals will remain separated until the Technical Proposal scores are submitted to the Commissioner or designee prior to the Price Proposals opening. The Mn/DOT Office of Civil Rights will begin evaluating the EEO/DBE Submittal.

The following presents a general framework for the organization of the TRC and the methodology for scoring the Proposals in relation to the information that was requested in the RFP.

4.1 Technical Evaluation Procedure

The following steps summarize the general procedures for the Technical Proposal evaluation:

- *Step 1 – Responsiveness Review: Pass/Fail Evaluation.* The Legal Subcommittee will review the Technical Proposals for responsiveness and make a recommendation to the TRC for consideration.
- *Step 2 – Responsiveness Review: ATCs:* The TRC Chair or designee will review whether the Proposer properly incorporated any ATCs into its Technical Proposal and make recommendation to the TRC for consideration.
- *Step 3 – Responsiveness Review: PAEs*: The TRC Chair or designee will review whether the Proposer properly incorporated all PAEs into its Technical Proposal and make recommendation to the TRC for consideration
- *Step 4 – Technical Proposal Review:* The TRC, Technical Subcommittees, Technical Advisors, and Process Oversight Committee will review the Technical Proposals.
- A representative of each Technical Subcommittee will provide their subcommittee's findings of strengths and weaknesses to the TRC.
- *Step 5 – Responsiveness Review: Technical Proposals:* The TRC will determine if each Technical Proposal is responsive to the RFP.
- *Step 6 – Interviews (if used):* The TRC will participate in an oral presentation and Technical Advisors and Technical Subcommittee members may participate in an oral presentation with each proposing teams.
- *Step7 – Technical Scoring:* The TRC will determine the Technical Proposal scores.
- *Step 8 – Oversight Review:* The TRC Chair will present a summary of the technical Proposal scores to the Chief Engineer. The TRC will finalize scores. Scores are final and not subject to modification by an outside party.
- *Step 9 – Price Proposal Opening:* The Commissioner or designee will publicly open the Price Proposals and determine the adjusted score of each Proposal.

4.2 Step 1 – Responsiveness Review: Pass/Fail Evaluation

The Legal Subcommittee and/or the Process Oversight Committee will review the Technical Proposals for responsiveness to the RFP requirements by completing and forwarding to the TRC Chair, Appendix A for each Technical Proposal. The Chair will also request that a representative of the Legal Subcommittee report its findings to the Technical Review Committee.

If a Proposal obtains an initial non-responsive or fail score, the TRC Chair may issue requests for clarification or supplemental information from the Proposer to obtain a subsequent responsive or passing rating.

If a Proposal fails to achieve a passing score on any of the pass/fail portions of the evaluation, refer to Step 4 – Responsiveness Review: Technical Proposal.

4.3 Step 2 – Responsiveness Review: ATCs

The TRC Chair and/or designee will verify that any ATCs included in the Technical Proposal were properly incorporated by completing Appendix B for each Technical Proposal. The TRC Chair reserves the right to request clarifications from Proposer's if incorporation of an ATC is unclear.

4.4 Step 3 – Responsiveness Review: PAEs

The TRC Chair and/or designee will verify that all PAEs in the Technical Proposal were properly incorporated by completing Appendix B for each Technical Proposal. The TRC Chair reserves the right to request clarifications from Proposer's if incorporation of a PAE is unclear

4.5 Step 4 – Technical Proposal Review

The TRC, the Technical Subcommittees, and Technical Advisors will conduct the Technical proposal review and evaluation. The following procedures outline the process to be followed during Step 3 of the evaluation process.

- The TRC Chair will assign members of the TRC, along with other personnel, to serve on Technical Subcommittees. This assignment will be based on the technical expertise of the individual member being asked to serve.
- The TRC Chair will hold a Proposal evaluation kick-off meeting to review the Instruction to Proposers (ITP) and the Technical Proposal Evaluation Manual with the TRC, POC, Technical Subcommittees, and Technical Advisors.
- Following the kick-off meeting, each Technical Subcommittee as a group will review each Proposal, focusing on the technical issues associated with that subcommittee. The Technical Subcommittee facilitators may provide written clarification questions to the TRC Chair to request a clarification notice be sent to a Proposer. Each Technical Subcommittee will provide a single collective assessment of strengths and weaknesses findings to the TRC Chair on Appendix C (or other format approved by the TRC Chair) for each Technical Proposal. Strengths and weaknesses are defined with respect to the qualitative ratings set forth in Section 5.
- In conjunction with the completed strengths and weaknesses findings from the Technical Subcommittees, the Technical Advisors will review the Proposals and provide input to the TRC during the TRC Proposal Evaluation meeting.
- The TRC Chair will hold an initial TRC Proposal Evaluation meeting that will include the TRC and Technical Advisors. TRC members and Technical Advisors will independently review the Proposal materials. TRC members will be allowed to begin drafting comments on the forms in Appendix C, make notes in Proposals, formulate clarification questions, or draft potential interview questions. TRC members shall not begin any scoring in Appendix E at this time. No discussions regarding the Proposal contents shall occur during this initial review, unless authorized by the TRC Chair. TRC members may take notes on separate pieces of paper or request additional forms from the TRC Chair. However, all notes must

be included with the Evaluation Manual at the conclusion of the Proposal review process. TA members will also be allowed to make notes on the forms in Appendix C.

- The TRC, TA and POC members meet to discuss the Proposals. After the TRC has reviewed each Proposal at least once, representatives of the Technical Subcommittees will report their committee's strength and weakness findings of each Proposal to the TRC. Discussions may take place before the Technical Subcommittee reports, but shall not conclude before the Technical Subcommittee reports. Copies of the strength and weakness findings of the Technical Subcommittee reports will be provided to each TRC, POC and TA member. TRC, TA and POC members will be allowed to ask the Technical Subcommittee questions regarding their findings. The Technical Subcommittees and Technical Advisors may also suggest questions for the oral presentations.
- The TRC members may provide written clarification questions to the TRC Chair to request a clarification notice be sent to a Proposer.
- The POC will assign each TRC member with a unique identification number. The TRC members shall use their unique identification number on all forms, not their names. The POC will maintain a log detailing TRC members and their corresponding identification numbers.

4.6 Step 5 – Responsiveness Review: Technical Proposals

The TRC will meet and discuss the overall responsive of each Proposer to the RFP. A Proposal will be determined as Responsive unless:

- The Proposal does not receive a "pass" in Step 1 (Responsiveness Review: Pass/Fail Evaluation) or Step 2 (Responsiveness Review: ATCs and PAEs).
- The Proposal contains a major defect or defects that, in Mn/DOT's sole discretion, would significantly violate an RFP requirement.
- The Proposer places any condition on the Proposal.

The TRC shall vote orally on the responsiveness of each Technical Proposal. The TRC Chair shall record the results on the form provided in <u>Appendix D</u>. A Technical Proposal shall be deemed non-responsive if at least 2/3 (66%) of the TRC members vote in favor of declaring a proposal non-responsive.

If a Proposal is deemed non-responsive, TRC may request, through the TRC Chair, clarification or supplemental information from the Proposer to obtain a subsequent responsiveness determination. The TRC Chair will obtain the requested information from the Proposer. The POC will review the clarification received and provide the TRC with information only relevant to the question of responsiveness.

If a Proposal is deemed non-responsive by the TRC, the TRC shall document the reasons to the TRC Chair. The TRC Chair will notify the Commissioner or designee that the Proposer has been determined as non-responsive to the RFP. If the Commissioner or designee concurs with the TRC non-responsive recommendation, the TRC Chair shall draft a notice for the Commissioner's or designee's signature after which the notice will be issued to the appropriate Proposer.

4.7 Step 6 – Interviews (if used)

- If an oral interview is required, the TRC and TA members shall formulate questions. The interview questions must include questions that are asked to all teams, but may also include questions specific to individual teams.
- The TRC will participate in the oral interviews. Technical Advisors, Process Oversight Committee and representative from each Technical Subcommittees may be present, but will not be allowed to directly ask follow-up questions to the Proposers.
- TRC members may consider the contents of the oral interviews in their evaluations.

4.8 Step 7 – Technical Scoring

- Following the oral interviews, the TRC, TA and POC members will meet again to discuss the interviews and contents of the Proposals. After all discussions have ended, each TRC member will independently record his/her final comments on the evaluation forms included in Appendix C. Evaluation comments shall be specific and not generalized.
- The TRC members shall independently score each Proposal by assigning a percentage based on the Qualitative Assessment rankings shown in Section 5.0. TRC members will multiply the percentage by the maximum total points in each category and record this value in the Evaluators Technical Proposal Score column in Appendix E.
- Each TRC member will complete the Evaluator Scoring Sheet in Appendix E by summing the Evaluator's Technical Proposal Score column. Each TRC member must give 50 points for responsiveness if the Proposer passes Step 5 (Responsiveness Review: Technical Proposals).
- The Process Oversight Committee and/or Technical Advisors will audit the evaluation forms and score sheets from each TRC member and sign the Form in Appendix E following the audit.
- The TRC Chair, with assistance from the POC, will determine the average score for each Technical Proposal from all of the scores provided by the TRC members. The average technical score will be computed on Appendix F with a breakdown by criteria shown on Appendix G.
- The TRC chair shall keep a log of the identification of each TRC member and Proposer. The TRC Chair may reveal the overall technical scores to the TRC members.

4.9 Step 8 – Oversight Review

- The TRC Chair and a member of the POC will submit the results shown in Appendix F and Appendix G to the Chief Engineer. The TRC chair and POC shall not reveal to the Chief Engineer the names of the Proposers unless the Chief Engineer requests that he/she is considering having the TRC continue to review the proposals.
- The Chief Engineer will review the results. The scores shall be considered final if the Chief Engineer has no questions regarding the results.
- The Chief Engineer may meet with the TRC and request clarification on the scoring. The Chief Engineer may also request that the TRC continue reviewing the proposals.
- TRC members may adjust their scoring and comments in Appendix C after further consideration. Adjustments to the scores shall be made on the Appendix E sheet by crossing out changed scores with adjusted scores.
- The Process Oversight Committee and/or Technical Advisors will audit the revised evaluation forms and score sheets from each TRC member and initial and date the Form in Appendix E following the audit.
- The TRC Chair, with assistance from the POC, will recompute the average score for each Technical Proposal from all of the scores provided by the TRC members on Appendix F and Appendix G. The TRC Chair will reveal the results of Appendix F and Appendix G to the TRC members.
- The TRC Chair will submit the results along with a report of the results of the evaluation to the Commissioner or designee, following an audit by the Process Oversight Committee.

4.10 Step 9 – Price Proposal Opening

- On the Price Proposal opening date, the Commissioner or designee will announce the Technical Proposal score for each Proposal, and will publicly open the Price Proposals and divide the Price Proposal by the Technical Proposal score to obtain the adjusted score of each Proposal. The Commissioner or designee may use a spreadsheet similar to Appendix H.
- After the adjusted scores are determined, the TRC Chair or his designee will perform a responsiveness review of the Price Proposal with the lowest adjusted score.
- Proposers that submit Price Proposals that exceed $220,000,000 will be deemed non-responsive.

5.0 Technical Proposal Scoring

The TRC will review the Technical Proposals, along with the strength and weakness findings prepared by the Technical Subcommittees, according to the criteria set forth in the RFP. Each TRC member will then qualitatively evaluate each of the major categories. Proposal elements will initially be given a qualitative rating. The five assessment levels of general competency are:

- **Excellent (91-100 percent):** The Proposal demonstrates an approach with unique or innovative methods of approaching the proposed work with an outstanding level of quality. The Proposal contains many significant strengths and few minor weaknesses, if any. There is very little risk that the Proposer would fail to satisfy the requirements of the design-build contract.
- **Very Good (76-90 percent):** The Proposal demonstrates an approach offering unique or innovative methods of approaching the proposed work. The Proposal contains many strengths that outweigh the weaknesses. There is little risk that the Proposer would fail to satisfy the requirements of the design-build contract. Weaknesses, if any, are very minor and can be readily corrected.
- **Good (61-75 percent):** The Proposal demonstrates an approach that offers an acceptable level of quality. The proposal contains strengths that are balanced by the weaknesses. There is some probability of risk that the Proposer may fail to satisfy some of the requirements of the design-build contract. Weaknesses are minor and can be corrected.
- **Fair (50-60 percent):** The Proposal demonstrates an approach that marginally meets the RFP requirements/objectives. The weaknesses are not offset by the strengths. There are questions about the likelihood of success and there is a risk that the Proposer may fail to satisfy the requirements of the design-build contract. There are a significant number of weaknesses and very few strengths.
- **Poor (0-49 percent):** The Proposal demonstrates an approach which contains significant weaknesses/deficiencies and/or unacceptable quality. The Proposal failed to meet the stated RFP requirements/objectives and/or lacked essential information and is conflicting and/or unproductive. There is not a reasonable likelihood of success and a high risk that the Proposer would fail to satisfy the requirements of the design-build contract. There are a significant number of weaknesses and very few strengths, if any.

Strengths and weaknesses are defined as follows:

- Strengths – That part of the Proposal that ultimately represents a benefit to the Project and is expected to increase the Proposer’s ability to meet or exceed the RFP requirements.
- Weaknesses – That part of a Proposal which detracts from the Submitter’s ability to meet the RFP requirements or may result in inefficient or ineffective performance.

Once the TRC members assign qualitative ratings to each Proposal category, the TRC members will convert the ratings to a numbered value for the purpose of arriving at the official technical score for the Proposal. The Proposer will not receive a stipend unless the Proposal is deemed responsive.

The progression of scoring from Fair to Good to Very Good through Excellent will reflect the aggressiveness of the Proposer’s unique and innovative ideas to bring Mn/DOT increased benefit, advantage, quality and overall best value.

The Technical Proposal and oral interview, if held, will account for 100 percent of the total technical score.

Each Proposal will receive an average technical score. The average technical score will be determined by summing all TRC members' official technical scores and dividing by the number of TRC members. The Commissioner of Transportation will be advised of the Technical Review Committee average technical scores for each team. The TRC average technical scores are not subject to modification and will be used in the determination of the Design-Build Best-Value Team.

MnDOT used the above evaluation and scoring to rate the proposals from three design-build firms. The technical portion of each proposal received the evaluation first before opening the bid price portion. The table below summarizes the technical scoring for the three proposals using the evaluation information from above. The scores shown are the average scores from the five MnDOT evaluators.

	Max points possible	D-B Firm #1	D-B Firm #2	D-B Firm #3
Bridge components	34	30.54	29.30	26.17
Environmental management	6	4.78	5.15	4.08
Maintenance of traffic	5	4.29	4.16	2.75
Public communication	2	1.90	1.84	1.74
Schedule	3	1.78	2.77	2.45
Responsive proposal	50	50.00	50.00	50.00
TOTAL SCORE	100	94.29	93.22	88.75

The next step was then to open the bid prices from each proposing firm. The table below outlines the total costs proposed by the three D-B firms.

	D-B Firm #1	D-B Firm #2	D-B Firm #3
Project Management	$34,241,000.00	14,579,142.00	25,170,937.87
Engineering & Construction	$125,118,000.00	$105,251,748.00	$109,022,563.00

TOTAL PRICE	$159,359,000.00	$119,830,890.00	$109,022,563.00

The final analysis is to compute the final proposal scores using the technical score and the total price. MnDOT used an adjusted bid best value method by dividing the total price by the technical score. The table below summarizes the final results. Using the lowest score as the best score, D-B firm #2 was awarded the project.

	Technical Proposal Score	Proposal Price	Adjusted Score (Price / Technical Score)
D-B FIRM #1	94.29	$159,359,000.00	1,690,126.65
D-B FIRM #2	93.22	$119,830,890.00	***1,285,416.43***
D-B FIRM #3	87.11	$134,193,500.87	1,540,431.99

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. Anderson, Stuart D., and Jeffrey S. Russell. *NCHRP Report 451: Guidelines for Warranty, Multi-Parameter, and Best Value Contracting*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, 2001.

B.2.1 Fixed Budget / Best Proposal

What is it?

Fixed budget/best proposal is a variation of best value procurement procedure in which the STA stipulates the contract price in the proposal request as well as the qualitative and technical evaluation factors for project elements upon which the selection will be determined. Firms then provide proposals addressing the qualitative and technical factors for 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 (*1*). In general, fixed budget/best proposal is similar to weighted criteria except there is no price component to evaluate (*2*).

Why use it?

Fixed budget / best proposal allows STAs to focus on the critical qualifications and technical aspects of a project. The cost component is already known based on the established fixed price and therefore, the proposing firms will concentrate on developing the best solution to the project aspects for the price given. Innovation increases and constructability can improve when using this best value approach.

For design-build procurement, fixed budget / best proposal permits STAs to develop an RFP that the proposing firms design a proposal to that cost, making this best value approach an efficient way to maximize the use of capital by committing all available funding up front (*3*).

What does it do?

In some instances, the STA may establish a fixed total budget for a project that includes a specified amount for construction. When this occurs, soliciting bids for price is not applicable. The qualifications and technical aspects of the project are the factors that are then evaluated for selecting a construction team.

How to use it?

Molenaar et al (*4*) summarized a fixed budget/best proposal algorithm for design-build best-value procurement using the following steps:

1. Develop qualifications, technical, schedule, and cost evaluation criteria as appropriate for project goals. For each evaluation criteria, the owner must develop a measurable standard against which responsiveness will be measured. Typically a direct point scoring system is be devised around the measurable standards.
2. Publish the design-build request for qualifications (RFQ). The solicitation should contain the following items as a minimum:

   a. The fixed budget price
   b. Scope of work, plans, and specifications.
   c. Bid form.
   d. Contract completion date or days.
   e. Best-Value evaluation plan listing the qualifications evaluation criteria with corresponding standards.
   f. Design-build proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards.
   g. Description of what constitutes a non-responsive proposal.
3. Receive Statements of Qualification (SOQ).
4. Evaluate SOQ's against published standards and determine which proposals are fully responsive in meeting the qualifications criteria.
5. Announce the competitive range made up of all fully responsive SOQ's.
6. Publish the design-build request for proposals (RFP). The solicitation will contain the following items as a minimum:
   a. The fixed budget price
   b. Scope of work, plans, and specifications.
   c. Bid form.
   d. Contract completion date or days.
   e. Method to carry forward Step 1 qualifications ranking/scores into final evaluation.
   f. Design-build proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards.
   g. Description of what constitutes a non-responsive proposal.
7. Evaluate design-build proposals against published technical and qualification standards and determine which proposals are fully responsive in meeting the qualifications criteria.
8. Eliminate any non-responsive proposals from the competitive range. Roll-up evaluation results and determine the final technical point score for each responsive proposal.
9. Compute the technical scores using the formula published in the RFP to identify the best proposal. Award to the highest technical score that meets the stipulated fixed budget and is fully responsive.

When to use it?

Fixed budget / best proposal is useful when the STA knows the price of the project ahead of procurement and can then determine from received proposals if the project scope is achievable within the limits of the stipulated budget (*3*). Fixed Budget / best proposal can be helpful for projects when the maximum scope of a project needs to fit within a tight budget and proposing firms can develop innovative techniques to develop the most attractive offer.

Limitations?

For Fixed budget / best proposal to be used appropriately, the STA must have a firm and accurate understanding of what the project will cost. It is then up to the proposing firms to provide a response based on this initial cost. This process is a reverse of other procurement procedures when the price is provided by the proposing firm based on the information provided by the STA. The STA must have the knowledge and resources needed to conduct a fixed budget / best proposal procurement.

Who uses it?

Michigan is currently the only STA that has experimented with Fixed Budget / Best Proposal. The City of Wheat Ridge, CO has also used fixed budget / best proposal with a weighted criteria process to procure contractors *(1)*.

Example

The Michigan Department of Transportation (MDOT) experimented with a Fixed Price Best Proposal innovating construction contracting method (MDOT calls it "Fixed Budget Variable Scope") in an effort to maximize the work performed on the construction project (*5*). This method of contract procurement allowed MDOT the ability to establish a final project budget and select a contractor based on the best value for the established fixed project budget.

Project Timeline	
02-03-2012	MDOT request for SEP-14 Approval
02-08-2012	FHWA SEP-14 Approval
02-09-2012	MDOT/Industry (MITA/MRPA) Partnering Meeting
04-13-2012	Notice of Bid Advertisement
04-23-2012	Mandatory Contractor Pre-Bid Meeting
05-11-2012	Project Bid Letting
06-13-2012	Contract Award
07-09-2012	Construction Start Date
09-10-2012	Construction Completion Date
10-18-2012	Final Inspection/Acceptance Date

Scope of work

The project scope of work included a maximum of 103.78 miles of hot mix asphalt crack treatment on 15 segments of various roadways in MDOT's University Region. Roadway cross sections included rural 2 lane, rural 4 lane, urban 3 lane, and rural 4 lane freeway sections. Condition of the various roadway sections added another variable component to the project.

The project was classified as a programmatic categorical exclusion and was approved as part of the General Program Account (GPA) for capital preventative maintenance projects. The portions of the project that were not constructed will be included in future crack sealing projects funded by the GPA.

Bid Process and Results

Early in the project development process, MDOT met with representatives from Industry to discuss the innovative contracting method. MDOT used information from that meeting to develop a unique bidding process. In an effort to inform prospective contractors of the new process, MDOT required contractors to attend a pre-bid meeting.

The project had 3 bidders, each providing the maximum number of roadbed miles of work that could be completed for the established project budget of $387,000. In addition, bidders were required to compile their bids in priority order that was set by the Department. The bid results are as follows:

Bid Results

Bidder	Road bed miles bid	Cost per road bed mile
No.1	74.43 mi	$5,199.52
No.2	70.50 mi	$5,489.36
No.3	53.46 mi	Bid Not Considered

The bid document submitted by Bidder No.3 did not follow the requirements set forth by the Department, which were discussed in detail at the Pre-Bid Meeting as well as being defined in the Notice To Bidders for low bid determination included in the Proposal. Because the bid was incorrectly submitted, the bid was not considered.

Industry Reaction

There were 3 bidders on this experimental project which when compared to other conventionally bid HMA crack treatment projects in MDOT's University Region, was slightly lower than average. The other University Region projects averaged 5 bidders.

The Department received feedback from contractors at the completion for the project. The only comment received suggested the maintaining traffic requirements for each section of roadway be more clearly defined in the specifications. Industry agreed with MDOT that this procurement method worked well for this type of project.

Typically, if there is bid savings, the additional money may go to projects with other types of fixes. With this project, the crack sealing industry performed the work estimated and any bid savings came in the form of additional crack sealing work. Industry informed MDOT that one of the benefits they view with this method of contracting is that their niche market received a fixed dollar amount of work, and the allocated budget stayed within their segment of the industry and within the same geographic location.

Summary

Evaluation of Construction Cost Effectiveness: The letting results from this project were compared with two other conventionally bid HMA crack treatment projects in MDOT's University Region. The contract award for each of the conventionally bid projects yielded low bids 7.68% and 18.81% below Engineers Estimates, covering 66.90 roadbed miles and 52.09 roadbed miles, respectively. These bids resulted in unused funding originally intended for crack treatment coverage. Conversely, using the Fixed Price Variable Scope innovating construction contracting method, 100% of the programmed project cost was utilized to treat a maximum coverage of 74.43 roadbed miles. In addition, using average unit prices, the Department estimated a total coverage length of 70.62 roadbed miles for the fixed funding amount of $387,000. Therefore the use of the Fixed Price Variable Scope method yielded an additional 3.81 roadbed miles of coverage. The use of the Fixed Price Variable Scope procurement method effectively used all available funding to provide maximum roadbed mile coverage. The conventionally bid projects did not use all available funding due to low bids and thus did not maximize roadbed mile coverage. This approach met the Department's expectations.

Performance Results

Job Number	Construction Year	Budget	Work Type	Expected Work*	As-Constructed Work	Results
113613	2012	$387,000	HMA Crack Sealing	70.62 road bed miles	74.43 road bed miles	+3.81 road bed miles

* Based on Average Unit Process

One of the goals of using FPVS is to reduce the amount of work required by staff to manage MDOT's program. A project with a constrained budget reduces the burden on staff to reallocate funds from projects if the estimate is exceeded or reduced. By using a fixed amount of funds, MDOT did not have to search for additional projects to allocate any bid savings to, or conversely find additional funds from un-let projects. This process saved the Department staff time and effort.

References

1. Design-Build Institute of America (DBIA). *DBIA Position statement of Best value.* Washington, DC, 2012.

2. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

3. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

4. Molenaar, K., D. Gransberg, S. Scott, D. Downs, and R. Ellis. *Project No. 20-7/Task 172: Recommended AASHTO Design-Build Procurement Guide – Final Report*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, Aug. 2005.

5. Michigan Department of Transportation (MDOT). *Fixed Price Variable Scope Contracting*, Final Evaluation Report Special Experimental Project 14 (SEP-14), CS 84916 – JN 113613A, Jun. 2012.

B.2.2 Adjusted Bid

What is it?

Adjusted low bid best value procurement is a two stage procedure in which a bid is first analyzed based on technical merit and is scored using pre-defined technical criteria. After the 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 (*1*).

Why use it?

The advantage to using adjusted bid procurement is the combination of two components, low bid selection and qualifications-based selection, into one procurement method. Further, adjusted bid promotes the potential for multiple design solutions and innovations in materials use from the bidding firms (*2*).

What does it do?

Adjusted bid allows STAs to modify the price portion of a proposal by some factor related to the technical evaluation. The modification of the price is done in a manner that reflects the value of the underlying proposed qualitative factors included in the technical portion of the proposals. Using this approach indicates that the price of the proposal is important to STAs, but that other aspects of the project must be included to determine the best value, which is basically a unit pricing of quality (*3*).

How to use it?

NCHRP report 561 (*1*) provides guidelines for using adjusted bid procurement:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications, technical, schedule, and cost evaluation as appropriate based on the screening criteria. For each evaluation criterion, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value RFQs. The solicitation will contain the following items as a minimum
    a. Description of scope of work
    b. SOQ forms
    c. Contract completion date or days
    d. List of qualifications evaluation criteria with corresponding standards
    e. Description of process to be followed for the best-value proposal evaluation plan

   f. Description of what constitutes a non-responsive SOQ

4. Receive SOQ.
5. Evaluate SOQs against published standards and determine which statements are fully responsive and meet the qualifications criteria.
6. Announce the list of prequalified firms.
7. Publish the best-value RFPs. The solicitation will contain the following items as a minimum:
   a. Scope of work and relevant plans and specifications
   b. Proposal forms
   c. Contract completion date or days (if applicable)
   d. Method to carry forward Step 1 qualifications ranking/ scores into final evaluation (if applicable)
   e. Best-value proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards
   f. Description of what constitutes a non-responsive proposal
8. Evaluate proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
9. Eliminate any non-responsive proposals from the competitive range.
10. Roll-up evaluation results and determine the final point score for each responsive proposal.
11. Compute the $/technical adjusted bid using the following formula to determine the best value for the project

$$Adjusted\ Bid = \frac{Price\ portion}{Technical\ portion\ score}$$

12. STA awards the project to the firm within the competitive range offering the lowest adjusted bid price.

When to use it?

The adjusted bid approach may be used when the overall outcomes of a project can be clearly defined and a number of alternatives may exist that could potentially improve the probability of achieving successful outcomes (*4*). Bidding firms are then willing to provide alternatives and innovations in order to improve their chances of being awarded the project, which in turn provides benefits to the project and the STA.

Limitations?

The STA must be careful in using adjusted bid best value procurement in that this procedure is only appropriate for projects that have outcomes that can be clearly defined by the STA (*5*). If any discrepancies exist in the RFP that are interpreted differently by different proposing firms, the scoring procedure will be incorrect. This can lead to protests by unsuccessful firms. Clearly defining the outcomes and scoring system in the RFP is critical in using adjusted bid procurement.

Who uses it?

Arizona, Maine, Michigan, Montana, North Carolina, Pennsylvania, South Carolina, South Dakota, Maricopa County (Arizona)

Example

The Maine Department of Transportation used adjusted bid best value to procure a design-builder for the Bath/Woolwich Bridge project (*1*). The Bath-Woolwich Bridge is a bridge that spans the Kennebec River between the City of Bath and the Town of Woolwich near the existing Carlton Bridge, together with the Bath approach to the bridge. The project consisted of the design and construction of a trapezoidal concrete box girder bridge.

To evaluate the received proposals, the department publicly opened and read the responsive lump sum price proposals and divided each price by the score of that firm's design-build proposal, yielding an overall value rating for each firm.

$$The\ Value\ Quotient\ = \frac{Price}{Score}$$

The score was determined by evaluating the best value criteria of lifecycle cost, schedule, maintenance of traffic, management plan, quality of construction and technical solution. The department awarded the contract to the firm with the lowest responsive overall value rating. Therefore, proposing firms wanted to lowest price and highest score. A direct scoring method was used and evaluated using the following scale:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Marginal							Average			Exceptional

Maine DOT's award decision was considered final and is not subject to review or appeal, which was stated in the RFP. The RFP also provided for the payment of a stipend upon specified terms to unsuccessful firms that submitted responsive proposals.

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. Pennsylvania Department of Transportation. *Innovative Bidding Toolkit*. Publication 448, Bureau of Project Delivery, 2011.

3. Gransberg, D.D., W.D. Dillon, H.L. Reynolds, and J. Boyd. Quantitative Analysis of Partnered Project Performance. *Journal of Construction Engineering and Management*, American Society of Civil Engineers, Vol. 125, No. 3, 1999, pp. 161-166.

4. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

5. Montana Department of Transportation (MDOT). *Design-Build Guidelines*, update #3, April 14, 2008. http://www.mdt.mt.gov/other/const/external/design-build_cr_va/db_guidelines.pdf [Accessed: March 27th, 2014].

B.2.3 Adjusted Score

What is it?

Similar to adjusted bid, adjusted score is a two-stage best value procurement procedure in which the STA analyzes a technical bid and assigns a technical score. Then, the STA opens and analyzes the price component of the bid. Using a specified formula, an adjusted score is calculated using the technical score, engineer's estimate, and price of the bid. The highest adjusted score is awarded the project (*1*).

Why use it?

The advantage to using adjusted score procurement is the combination of two components, low bid selection and qualifications-based selection, into one procurement method. This allows comparison of bids across the technical portion and the cost portion. Adjusted score also encourages bidding firms to provide alternate and innovative solutions to projects that STAs determined to have multiple alternatives available (*1*).

What does it do?

Adjusted bid allows STAs to modify the price portion of a proposal by some factor related to the technical evaluation. The modification of the price is done in a manner that reflects the value of the underlying proposed qualitative factors included in the technical portion of the proposals. Using this approach indicates that the price of the proposal is important to STAs, but that other aspects of the project must be included to determine the best value, which is basically a unit pricing of quality (*2*).

How to use it?

NCHRP report 561 (*3*) provides guidelines for using adjusted score procurement:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications, technical, schedule, and cost evaluation as appropriate based on the screening criteria. For each evaluation criterion, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value RFQs. The solicitation will contain the following items as a minimum
    - g. Description of scope of work
    - h. SOQ forms
    - i. Contract completion date or days
    - j. List of qualifications evaluation criteria with corresponding standards

k. Description of process to be followed for the best-value proposal evaluation plan

l. Description of what constitutes a non-responsive SOQ

4. Receive SOQ.
5. Evaluate SOQs against published standards and determine which statements are fully responsive and meet the qualifications criteria.
6. Announce the list of prequalified firms.
7. Publish the best-value RFPs. The solicitation will contain the following items as a minimum:

g. Scope of work and relevant plans and specifications

h. Proposal forms

i. Contract completion date or days (if applicable)

j. Method to carry forward Step 1 qualifications ranking/ scores into final evaluation (if applicable)

k. Best-value proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards

l. Description of what constitutes a non-responsive proposal

8. Evaluate proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
9. Eliminate any non-responsive proposals from the competitive range.
10. Roll-up evaluation results and determine the final technical score for each responsive proposal.
11. Compute the adjusted score to determine the best value for the project. The adjusted score is calculated using the following equation:

$$AS = (T \times EE)/P$$

$AS\ =\ Adjusted\ score;\ award\ to\ the\ highest\ scored\ proposal$

$T\ =\ Technical\ score;\ found\ by\ using\ the\ pre-determined\ evaluation\ method$

$EE\ =\ Engineer's\ estimate$

$P\ =\ Price\ propsal$

12. STA awards the project to the firm within the competitive range offering the highest adjusted score.

When to use it?

The adjusted score approach may be used when the overall outcomes of a project can be clearly defined and a number of alternatives may exist that could potentially improve the probability of achieving successful outcomes. For example, a bridge project can be properly scoped and clearly defined, but the STA is open to possible alternatives to the project such as alternative foundations, spans, and material types that the STA deems acceptable (*1*).

Limitations?

The STA must be careful in using adjusted score best value procurement in that this procedure is only appropriate for projects that have outcomes that can be clearly defined by the STA (*4*). If any discrepancies exist in the RFP that are interpreted differently by different proposing firms, the scoring procedure will be incorrect. This can lead to protests by unsuccessful firms. Clearly defining the outcomes and scoring system in the RFP is critical in using adjusted score procurement.

Who uses it?

Alaska, Colorado, Florida, Montana, Washington State, District of Columbia Department of Public Works, Alberta Ministry of Highways (Canada), Nashville County (Tennessee)

Example

Washington State Department of Transportation (WSDOT) utilized adjusted score to procure a design-builder for an interchange project located in Vancouver, WA (3). The SR 500 Thurston Way Interchange is a redevelopment of the “at grade” interchange of SR 500 and Thurston Way, which is located in the WSDOT southwest region. The project lies between the SR 500 Andresen Road Interchange and the SR 500 I-205 Interchange. The proximity of the project is in a tight corridor that creates many challenges as well as opportunities for alternative and innovative approaches in addressing the traffic flow logistics during construction. Traffic volumes on the main route, the proximity of the main entrance to Vancouver Mall and another plaza on the south side, along with challenging weaving requirements, made this project demanding for traffic control.

WSDOT included key personnel, management plan, schedule, and technical solutions as part of the technical component of proposals. The technical component of received proposals was reviewed to determine if the proposal is responsive or not. The price component was locked away and not opened until after the scoring of the technical proposals is complete

For the responsive proposals, WSDOT had the evaluation team review each of the relevant areas of the technical component individually to gain an understanding of the subject matter. Each evaluation team member then provided a preliminary raw score based on the following scoring system (total score is 1,000 points):

- Management = 100 points
- Schedule = 100 points
- Technical solution = 800 points

The evaluation team members will then complete their evaluation, adjust the raw scores and add it to the draft summary. During this phase of the evaluation, the evaluation team notes any defects discovered in a proposal. The raw scores, the draft summary, and the list of minor defects is transmitted to WSDOT management team for review.

After review of the raw scores, each evaluation team member meets with the management team individually to discuss the technical areas and raw scores. Using pre-established weighting criteria, the management team then develops final scores for each technical area. The weighted raw scores are then combined using a pre-determined formula to arrive at a composite technical solution score. The price component of received proposals is publically opened and combined with the technical component using the following equation.

$$Total\ Score = \frac{Technical\ Score\ \times 10{,}000{,}000}{Bid\ Price}$$

The $10,000,000 in this equation represents WSDOT engineer's estimate. The STA awarded the project to the firm with the highest total score.

References

1. Florida Department of Transportation (FDOT). *Design-Build Procurement and Administration*. Topic No. 625-020-010-k, Executive Committee, Office of Construction, Tallahassee, FL., 2011.

2. Gransberg, D.D., W.D. Dillon, H.L. Reynolds, and J. Boyd. Quantitative Analysis of Partnered Project Performance. *Journal of Construction Engineering and Management*, American Society of Civil Engineers, Vol. 125, No. 3, 1999, pp. 161-166.

3. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

4. Montana Department of Transportation (MDOT). *Design-Build Guidelines*, update #3, April 14, 2008. http://www.mdt.mt.gov/other/const/external/design-build_cr_va/db_guidelines.pdf [Accessed: March 27th, 2014].

B.2.4 Weighted Criteria

What is it?

Weighted criteria is a two-part type of best value procurement in which bidding firms submit a technical component and price component to the STA. The STA scores the technical component using pre-determined criteria that are weighted according to pre-determined importance. Then, the price component is analyzed. The lowest bid is assigned the highest price score and remaining bids are assigned a score proportional to the lowest bid score. The proposal with the highest combination score of technical and price is awarded the project (*1*, *2*).

Why use it?

Using the weighted-criteria best value procurement process allows for STAs to encourage innovation and to obtain the proper specific experience that is needed to for the desired outcome. If an STA is attempting to gain innovative design solutions, the weight for those items can be larger than other factors (*3*).

What does it do?

The weighted criteria approach to best value procurement provides a generalized process for using best value procurement in a way that emphasizes the more critical areas of a project over the less important aspects.

How to use it?

Molenaar et al (*3*) summarized a weighted criteria algorithm for design-build best-value procurement using the following steps:

1. Develop qualifications, technical, schedule, and cost evaluation criteria as appropriate for project goals. For each evaluation criteria, the owner must develop a measurable standard against which responsiveness will be measured. Typically a direct point scoring system is be devised around the measurable standards.
2. Publish the design-build request for qualifications (RFQ). The solicitation should contain the following items as a minimum:
    a. Scope of work, plans, and specifications.
    b. Bid form.
    c. Contract completion date or days.
    d. Best-Value evaluation plan listing the qualifications evaluation criteria with corresponding standards.
    e. Design-build proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards.

   f. Description of what constitutes a non-responsive proposal.

3. Receive Statements of Qualification (SOQ).
4. Evaluate SOQ's against published standards and determine which proposals are fully responsive in meeting the qualifications criteria.
5. Announce the competitive range made up of all fully responsive SOQ's.
6. Publish the design-build request for proposals (RFP). The solicitation will contain the following items as a minimum:
   a. Scope of work, plans, and specifications.
   b. Bid form.
   c. Contract completion date or days.
   d. Method to carry forward Step 1 qualifications ranking/scores into final evaluation.
   e. Design-build proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards.
   f. Description of what constitutes a non-responsive proposal.
7. Evaluate design-build proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
8. Eliminate any non-responsive proposals from the competitive range. Roll-up evaluation results and determine the final point score for each responsive proposal. The score is determined using the following weighted criteria formula:

$$TS = W_1 S_1 + W_2 S_2 + \cdots W_i S_i + W_{i+1} PS$$

   $TS = Total\ score;\ award\ project\ to\ highest\ total\ score\ proposal$

   $W_i = Weight\ of\ factor\ i$

   $S_i = Score\ of\ factor\ i$

   $PS = Price\ proposal\ score$

9. Compute the final scores using the weighted criteria formula to identify the best proposal. STA awards the project to the highest final score within the competitive range.

When to use it?

The weighted criteria best value approach is useful when a fast track schedule is required. It is also useful for projects when constructability is inherent to the successful execution of the project (*2*). Further, any project that has one or a couple highly important technical aspects is ideal for weighted criteria in that those highly important aspects can be weighted higher than other technical aspects.

Limitations?

The STA must clearly define the scoring system in the RFP so that potential bidders understand the areas that are more critical than others *(1)*. If any discrepancies exist in the RFP that are interpreted differently by different proposing firms, the scoring procedure will be incorrect. This can lead to protests by unsuccessful firms. Defining the outcomes and scoring system in the RFP is critical in using any of the best value procurement options such as weighted criteria.

Who uses it?

Alaska, Delaware, Idaho, Massachusetts, Nevada, Oregon, Utah, Virginia, City of Reno (Nevada), Ft. Lauderdale County (Florida)

Example

The Alaska Department of Transportation used a weighted criteria best value approach for the Glenn-Parks Interchange project (*1*). Located 40 miles north of Anchorage, the Glenn-Parks Interchange project provides two lanes of continuous flow in each direction for the Glenn Highway from Eklutna to Parks Highway. The project included the construction of overpasses over the Alaska Railroad.

Short-listed firms prepared and submitted technical and price proposals. The price proposals were submitted following the evaluation of the technical proposals. The technical evaluation criteria included project approach plan, technical solutions, environmental work plan, project staffing plan, and enhancements to minimize life-cycle costs. All items were scored using a direct point scoring system that totaled 100 points. Then, all technical scores were normalized using the following formula:

$$Normalized\ Technical\ Proposal\ Score\ (NTPS)\ = \frac{(Proposer's\ Technical\ Proposal\ Score)}{(Highest\ Technical\ Proposal\ Score)}$$

All fixed price was normalized using the following formula:

$$Normalized\ Fixed\ Price\ (NFPS)\ = \frac{(Lowest\ Fixed\ Price)}{(Proposer's\ Fixed\ Price)}$$

A final score was then determined using the following formula:

$$Final\ Score\ =\ [(0.25 \times NTPS)\ +\ (0.75 \times NFPS)] \times 100$$

The proposing firm with the highest score was awarded the contract.

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

3. Molenaar, K., D. Gransberg, S. Scott, D. Downs, and R. Ellis. *Project No. 20-7/Task 172: Recommended AASHTO Design-Build Procurement Guide – Final Report*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, Aug. 2005.

B.2.5 Meets Technical Criteria – Low Bid

What is it?

A variation of best value procurement, meets technical criteria – low bid is a procurement procedure in which all non-cost criteria are evaluated using a pre-determined rating system. Direct point scoring might 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 (*1*). This variation of best value most closely resembles the traditional design-bid-build low bid procurement process (*2*).

Why use it?

Meets technical criteria – low bid is a useful best value procurement method that uses a basic yes or no in terms of responsiveness to technical and qualitative criteria specified in the RFP. A technical score might be calculated during the evaluation, however, the score is not used in the final determination of award. The score just determines if a bid is responsive or not. The responsive bids are then evaluated using the low bid procurement method (*2*).

What does it do?

Meets technical criteria – low bid allows STAs to use best value to procure a construction team, but is less involved for developing the criteria and evaluating proposals since the technical portion is a pass or fail review and the lowest responsive proposal is award the project, similar to low bid procurement (*2*).

How to use it?

The NCHRP Report 561 (*1*) outlines a process to implementing meets technical criteria – low bid once the STA determines the use of best value procurement. The steps below summarize how to use this variation of best value procurement:

1. Develop qualifications and technical evaluation criteria and weight for the best value RFP based on the project. For each evaluation criteria, the STA must develop a measurable standard against which responsiveness will be measured.
2. It is important to limit the number of qualification and technical criteria to those from categories that carry high importance to the project at hand. Then, the evaluation plan should be written to be completely transparent to any bidding firm. To avoid the possibility of dispute or bid protest, the STA needs to state the evaluation criteria and the weight assigned to each item and ensure that the evaluation team uses them correctly (*4*).
3. Publish the best-value RFP. The RFP will contain the following items as a minimum:

a. Scope of work, plans, and specifications

b. Bid form

c. Contract completion date or days

d. Best-value evaluation plan listing the evaluation criteria with corresponding pre-determined standards

e. Description of what constitutes a non-responsive proposal

4. Evaluate the received best-value proposals against the pre-determined standards (which were included in the RFP) and determine which proposals are fully responsive in meeting the technical and qualifications criteria.
5. All non-cost criteria are evaluated using the pre-determined measureable standards. Direct point scoring may be used to determine if the technical proposal meets the minimum technical score. Those proposals found to be fully responsive make up the “competitive range” and the responsive bids are evaluated against one another.
6. Award the project to the lowest bidding firm that is fully responsive in the technical and qualifications criteria.

When to use it?

In general, meets technical criteria – low bid is preferred for projects that have a tight, but well defined scope and when innovations and/or alternatives are not being sought (*1*). It has also been used for project when the STA has most of the design development complete and will only need the proposing firms to complete the final construction documents.

Limitations?

Although meets technical criteria – low bid is considered a best value procurement procedure, the awarded firm still has to present the lowest priced proposal. Therefore, for this type of best value procurement to be used properly, the STA has to have more knowledge about a project, just as when low bid is used. Also, there has to be less variations in the project design and specifications so that the technical portions are easy to understand and can be compared equally across all of the received proposals.

Who uses it?

Colorado, Georgia, Indiana, Minnesota, Missouri, New Jersey, Ohio, Alameda Transportation Corridor Agency (California)

Example

The Minnesota Department of Transportation (MnDOT) used Meets Technical Criteria – Low Bid for the T.H. 100 Duluth Street project located in Golden Valley, Minnesota (*1*). This project generally consisted of grading, surfacing, ponds, noise walls and retaining walls, signals, lighting, signing, and installation of a bridge from south of Duluth Street to just south of Bassett Creek. The Project also contains work on Duluth Street from Lilac Drive to just east of T.H. 100. The Project also includes the construction of a fully designed pedestrian bridge just south of Bassett Creek. The preliminary estimate of the design-build project was between $15 and $20 million in 2001. The duration of the design-build portion of the project was schedule to take approximately two years.

Under the low bid selection process being used for this project, MnDOT awarded the design-build contract to the short-listed proposer whose technical proposal was determined to be responsive to the RFP technical requirements and whose price proposal was the lowest bid. The proposers technical and price proposals became contract documents.

After the proposal submittal deadline passed, but before the public bid opening, the technical proposal package and price proposal package submitted by each short-listed proposer was separated. The price proposal packages were not opened, but were kept stored in a locked container until the public bid opening. Using this process, no price proposal was opened until MnDOT reviewed all technical proposals and determined whether each technical proposal was either responsive (“yes”) or non-responsive (“no”).

MnDOT examined each proposal, discussed the contents of each, and determined whether a proposal complied with the objective requirements of the RFP and was considered responsive. MnDOT did not rank or score any of the technical proposals. They were only evaluated for responsiveness to technical criteria. The technical bid included criteria for schedule, qualifications, technical design, and warranty.

When MnDOT determined that a technical proposal did not comply with or satisfy any of the objective requirements of the RFP, that proposal was considered non-responsive. The price proposal corresponding to a non-responsive technical proposal was then not opened at the public bid opening, but rather returned unopened, along with the nonresponsive technical proposal, to the proposer. A proposer that submits a non-responsible technical proposal was not eligible to receive any stipend. Mn/DOT then opened the price proposals corresponding to the technical proposals that were determined responsive and the project was awarded to the lowest bidding firm.

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

3. Molenaar, K., D. Gransberg, S. Scott, D. Downs, and R. Ellis. *Project No. 20-7/Task 172: Recommended AASHTO Design-Build Procurement Guide – Final Report*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, Aug. 2005.

4. Parvin, C. Design-build: Evaluation and Award. *Roads and Bridges*, Vol. 38, No. 12, 2000, pp. 3-15.

B.2.6 Quantitative Cost – Technical Tradeoff

What is it?

In this variation of best value procurement, the STA 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 (*1*).

Why use it?

Quantitative cost – technical tradeoff is a best value method that allow certain jurisdictions that require the technical and price portions of a proposal to be evaluated separately to use best value for procuring a construction firm. Then, the STA can compare the technical portion score/rating to the price portion score/rating and justification can be made for selecting a proposal that is not the lowest priced proposal, but provides the best overall score/rating when comparing across both technical and price of the received proposals (*2*).

What does it do?

In some instances, STAs using best value procurement will want to utilize the lowest cost proposal, but the project may include specific technical aspects that are crucial to project success. Quantitative cost – technical tradeoff allows for a simplified low bid procurement, but allows for justification of selecting a higher priced proposal based on justifications made for the technical aspects.

How to use it?

NCHRP report 561 (*1*) provides guidelines for using quantitative cost – technical tradeoff procurement:

1. Screen the candidate project and determine its potential to accrue benefits by using best-value procurement. If the project appears to be a good candidate, capture the essential screening criteria that made it a good candidate and rank them in order of importance to the project.
2. Develop qualifications, technical, schedule, and cost evaluation as appropriate based on the screening criteria. For each evaluation criterion, the owner must develop a measurable standard against which responsiveness will be measured.
3. Publish the best-value RFQs. The solicitation will contain the following items as a minimum
    a. Description of scope of work
    b. SOQ forms
    c. Contract completion date or days

   d. List of qualifications evaluation criteria with corresponding standards
   e. Description of process to be followed for the best-value proposal evaluation plan
   f. Description of what constitutes a non-responsive SOQ

4. Receive SOQ.
5. Evaluate SOQs against published standards and determine which statements are fully responsive and meet the qualifications criteria.
6. Announce the list of prequalified firms.
7. Publish the best-value RFPs. The solicitation will contain the following items as a minimum:
   a. Scope of work and relevant plans and specifications
   b. Proposal forms
   c. Contract completion date or days (if applicable)
   d. Method to carry forward Step 1 qualifications ranking/ scores into final evaluation (if applicable)
   e. Best-value proposal evaluation plan listing the technical, schedule, and cost evaluation criteria with corresponding standards
   f. Description of what constitutes a non-responsive proposal
8. Evaluate proposals against published technical, schedule, and cost standards and determine which proposals are fully responsive in meeting the qualifications criteria.
9. Eliminate any non-responsive proposals from the competitive range.
10. Roll-up evaluation results and determine the final technical point score for each responsive proposal.
11. Open price component of responsive bids and order them by increasing price proposal.
12. To calculate the incremental technical score, the highest technical score is divided by the next highest technical score minus one and multiplied by 100%. The incremental price score is calculated by dividing the highest price by the next highest price minus one and multiplied by 100%. The formulas to use are as follows:

$$T_{increment} = \left[\left(\frac{T_j}{T_i}\right) - 1\right] \times 100\%$$

$$P_{increment} = \left[\left(\frac{P_j}{P_i}\right) - 1\right] \times 100\%$$

$If\ T_{increment} < Increment, award\ proposal$

$$If\ T_{increment} > P_{increment}, the\ retain\ proposal\ j\ for\ possible\ award$$

$$and\ repeat\ with\ proposal_{j+1}$$

$$Repeat\ process\ until\ T_{increment} > P_{increment}$$

$$T = technical\ score$$

$$P = price\ proposal$$

13. The STA awards the project to the lowest price proposal, unless a higher priced proposal can be justified to be awarded the project based on a high technical value. The justification is made by determining whether the added increment of price is offset by an added increment in technical score.

When to use it?

Quantitative cost – technical tradeoff is the best option for STAs in jurisdictions that allow best value procurement, but require that the price portion and technical portions are evaluated separately and recorded as such in the review process (*1*).

Limitations?

Using quantitative cost – technical tradeoff can be seen as a more subjective selection process. The STA compares the technical portion value against the proposed price using a rating or scoring system that relies on the knowledge that the STA has of a project. This can be worrisome for STAs in that firms that are not awarded the project could protest the selection, especially if a firm has the lowest price, but does not understand why the technical portion received a lower score/rating that eliminated that firm from consideration.

Who uses it?

United States Forest Service Highways, FHWA

Example

The United States Forest Service utilized quantitative cost – technical tradeoff best value procurement for the Coffman Cove highway project located in Coffman Cove, Alaska in 2003 (*1*). The Project consisted of upgrading an approximately 3-mile segment of a single-lane logging road to a double-lane public highway. Work included grading, drainage, base, aggregate surfacing, and other supplementary work. Additionally, work included maintaining 18 miles of a single-lane bypass road.

Proposing firms provided a technical component and a separate price component. The technical score was determined by having each board member first provide a numerical rating for each evaluation criteria in the Technical Proposal. The consensus method was used by the Board to determine a final numerical rating for each evaluation criteria. The revised numerical ratings were then summed to determine the overall technical score for each proposal. The maximum possible overall technical score was 1,000 using a direct point scoring system. Evaluation factor used included schedule, past project performance, key personnel, subcontracting plan, small business utilization plan, project management plan, quality management plan, environmental protection approach, and technical solutions.

After the overall technical scores were assigned, the Price Proposals were opened. A best-value cost-technical tradeoff was determined using the following steps:

1. The proposals were first ranked in order of price (Contract Bid Price plus Contract Administration Cost), starting with the lowest price. The following is an example of the initial ranking according to price:

Offeror	Contract Bid Price plus Contract Administration Cost	Overall Technical Score
C	$5,600,000	845
D	$5,905,000	912
A	$6,300,000	880
B	$6,470,000	95

A cost-technical tradeoff will then be performed by comparing the top two initially ranked proposals. A Price Increment (P.I.) and a Technical Score Increment (T.I.) will be computed by the following equations:

$$P.I. = \left(\frac{Price_{Offerer\ D} - Price_{Offerer\ C}}{Price_{Offerer\ C}}\right) \times 100\%$$

$$P.I. = \left(\frac{5{,}905{,}000 - 5{,}600{,}000}{5{,}600{,}000}\right) \times 100\% = 5.45\%$$

$$T.I. = \left(\frac{Tech\ Score_{Offerer\ D} - Tech\ Score_{Offerer\ C}}{Tech\ Score_{Offerer\ C}}\right) \times 100\%$$

$$T.I. = \left(\frac{912 - 845}{845}\right) \times 100\% = 7.93\%$$

The T.I. over P.I. ratio was then examined. If the ratio was greater than one (1), as in this example, than the second-ranked Offeror (D) is considered to provide a greater value to the Government:

$$\frac{T.I.}{P.I.} = \frac{7.93\%}{5.45\%} = 1.46$$

1.46 > 1.00 ; therefore, Offeror D is considered to provide a greater value (Technical Increment outweighs the Price Increment). Offeror D is retained for the next step, while Offeror C is eliminated.

If the T.I. over P.I. ratio had been less than one (1), then Offeror C would have been considered to provide a greater value to the Government.

2. A cost-technical tradeoff was then performed by comparing the higher-ranked proposal from the step above (Offeror D) to the next proposal listed in the initial ranking chart (from above, Offeror A). A P.I. and T.I. will be computed similar to above:

$$P.I. = \left(\frac{Price_{Offeror\ A} - Price_{Offeror\ D}}{Price_{Offeror\ D}}\right) \times 100\%$$

$$P.I. = \left(\frac{6{,}300{,}000 - 5{,}905{,}000}{5{,}905{,}000}\right) \times 100\% = 6.69\%$$

$$T.I. = \left(\frac{Tech\ Score_{Offeror\ A} - Tech\ Score_{Offeror\ D}}{Tech\ Score_{Offeror\ D}}\right) \times 100\%$$

$$T.I. = \left(\frac{880 - 912}{912}\right) \times 100\% = -3.51\%$$

Then, the T.I. over P.I. ratio was examined:

$$\frac{T.I.}{P.I.} = \frac{-3.51\%}{6.69\%} = -0.52$$

Since the ratio was less than one, Offeror D continues to be considered as providing the greater value. In this case, the Technical Increment decreased while the price increment increased. Offeror D is retained for the next step, while Offeror A is eliminated.

3. Lastly, a cost-technical tradeoff was performed by comparing the higher-ranked proposal from above (Offeror D) with the next proposal listed in the initial ranking chart (Offeror B). The P.I. and T.I. are calculated similar to above:

$$P.I. = \left(\frac{Price_{Offeror\ B} - Price_{Offeror\ D}}{Price_{Offeror\ D}}\right) \times 100\%$$

$$P.I. = \left(\frac{6{,}470{,}000 - 5{,}905{,}000}{5{,}905{,}000}\right) \times 100\% = 9.57\%$$

$$T.I. = \left(\frac{Tech\ Score_{Offeror\ B} - Tech\ Score_{Offeror\ D}}{Tech\ Score_{Offeror\ D}}\right) \times 100\%$$

$$T.I. = \left(\frac{965 - 912}{912}\right) \times 100\% = 5.81\%$$

The T.I. over P.I. ratio will then be examined:

$$\frac{T.I.}{P.I.} = \frac{5.81\%}{9.57\%} = 0.61$$

Since the ratio is less than one, Offeror D continues to be considered to provide a greater value. In this case, the Technical Increment did not outweigh the Price Increment. Offeror D is retained while Offeror B is eliminated.

The proposal offering the best value for the Coffman Cove highway project (Offeror D) was then forwarded to the selection official.

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. *Performance Contracting Framework Fostered by Highways for LIFE.* Federal Highway Administration, https://www.fhwa.dot.gov/construction/contracts/pubs/framework/09.cfm [Accessed: March 27, 2014].

B.2.7 Qualitative Cost – Technical Tradeoff

What is it?

For this variation of best value procurement, the STA evaluates all non-cost criteria using an adjectival or modified pre-determined scoring system. All proposals are evaluated and those proposals found to be responsive make up the competitive range. The STA then opens the bids from the responsive proposals and awards the project to the best value without any mathematical calculations or combination of price and technical factors (*1*).

Why use it?

Qualitative cost – technical tradeoff is a best value method that allow certain jurisdictions that require the technical and price portions of a proposal to be evaluated separately to use best value for procuring a construction firm. The tradeoff analysis is not conducted solely with technical and price ratings and scores alone. The evaluation must analyze the differences between the competing proposals and make a rational decision based on the facts and circumstances of the specific acquisition (*2*).

Qualitative cost – technical tradeoff is a more qualitative approach to best value procurement. It allows STAs to differentiate between bids when the technical and qualification components of a proposal are difficult to quantify using a point or scoring system. This is useful for projects that have specific technical or experiential requirements in order for success to occur.

How to use it?

The NCHRP Report 561 outlines a process for STAs to follow when using qualitative cost – technical tradeoff best value procurement (*1*):

1. Screen candidate projects first to determine the criteria that is critical to the project and rank the criteria in order of importance.
2. Develop the qualifications, technical, schedule, and cost evaluation criteria based on the screening criteria. The STA must develop a measureable standard for each evaluation criteria so that responsive bids received by the STA can be measured.
3. STAs then advertise the first step of the best value procurement, the Request for Qualifications (RFP). The qualifications solicitation needs to contain the following at a minimum:
   a. Description of the scope of work
   b. Statement of Qualifications (SOQ) forms
   c. Contract completion date or days
   d. List of qualifications evaluation criteria with corresponding standards

   e. Description of process to be followed for the best value evaluation plan
   f. Definition of non-responsive SOQ

4. Once qualifications are received, the STA evaluates the SOQs against the pre-determined standards to find which SOQs are responsive and which are not in terms of meeting the qualifications criteria.
5. The qualified and responsive firms then receive the request for proposal (RFP). The RFP should, at a minimum, contain the following information:
   a. Scope of work and relevant plans and specifications
   b. Proposal forms
   c. Contract completion date or days
   d. Method to carry forward the SOQ rankings/scores to the final evaluation (if applicable)
   e. Best value proposal evaluation plan that lists the technical, schedule, and cost evaluation criteria with corresponding standards
   f. Definition of non-responsive proposal
6. Evaluate the received proposals against the pre-determined standards to find which proposals are responsive and which are not in terms of meeting the qualifications criteria.
7. Eliminate the non-responsive proposals and roll up the evaluation results.
8. A pre-determined selection panel then conducts a qualitative cost-technical tradeoff to identify the best proposal. This best value variation of procurement is more subjective than most as the selection panel conducts a discussion of qualifications and technical criteria in order to determine the best proposal that includes enough qualifications and does not trade-off too many technical requirements.
9. Award project to the firm that is identified as the best proposal and provides a cost in the range determined by the STA to be acceptable.

When to use it?

Qualitative cost – technical tradeoff is the best option for STAs in jurisdictions that allow best value procurement, but require that the price portion and technical portions are evaluated separately and recorded as such in the review process (*1*). Further, qualitative cost –technical tradeoff is useful when an STA evaluates the price portion on a qualitative scale rather than the actual price.

Limitations?

Using quantitative cost – technical tradeoff can be seen as a very subjective selection process, even more so than the similar best value procurement process quantitative price – technical tradeoff. The STA compares the technical portion value against the proposed price using professional judgment, not a specific objective process. This can be worrisome for STAs that firms that are not awarded the project could protest the selection.

Who uses it?

City of Santa Monica (California), FHWA, General Services Administration, National Park Service, US Army Corps of Engineers, National Aeronautics and Space Administration (NASA)

Example

Qualitative Cost – Technical Tradeoff has not been used by a state transportation agency. Other municipalities and federal organizations have used it on past projects. One of these projects completed by the United State Army Corp of Engineers (USACE) was the Hurricane Protection Project of West Algiers Canal located in Jefferson Parish, Louisiana *(1)*. The scope of work for this project consisted of fabricating, transporting, settling, and ballasting a float-in sector gate, which consisted of a post-tensioned reinforced concrete pile foundation monolith structure with structural steel sector gates. A sheet pile cutoff wall below water needed to be installed with accurate excavation in the cut-off wall area, along with constructing floodwalls, dredging as needed, constructing guidewalls, pile clusters, and placing of stones for erosion control. In addition, the selected construction team had to construct a casting facility for the fabrication of the float-in structure. The USACE provided a graving site to construct the casting facility, or the potential bidders were able to elect to use an alternative site or facility.

The USACE used a best value procurement method using qualitative cost –technical tradeoff as the algorithm. The selection was to be to the proposing firm that represents the best value to the government using the tradeoff process described in FAR part 15, which permits tradeoffs between price and technical merit/quality to occur. The USACE could then select the proposing firm that was not the lowest responsive bidder. The award decision was made on a comparative assessment of proposals against all source selection criteria found in the request for proposal.

The RFP stated the non-cost evaluation factors of past performance, personnel experience, project management plans, and technical approach. The combination of these four non-cost evaluation factors was approximately equal to the price. The USACE wanted to strike a balance between the technical merit of the non-cost factors and the cost factor. The degree of importance of price was allowed to become greater depending upon the equality of the proposals for the non-cost technical evaluation factors. When technical proposals were determined to be equal, then the price portion becomes the controlling factor in selecting a proposing firm.

References

1. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

2. *Performance Contracting Framework Fostered by Highways for LIFE.* Federal Highway Administration, https://www.fhwa.dot.gov/construction/contracts/pubs/framework/09.cfm [Accessed: March 27, 2014].

B.3 Qualifications-Based Selection

What is it?

Qualifications-based selection (QBS) is 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 (*1*, *2*). STAs have experience procuring architectural and engineering services using QBS. However, this document refers to the use of QBS for selecting a contractor to provide services during design and construction, most likely with the use of the CM/GC delivery method.

Why use it?

When an STA has a project that requires input from the contractor during design, the STA may decide to procure the contractor at the same time as the designer. In these cases, the design and specifications information is limited or non-existent, making it difficult to ask a contractor to provide a price for the project.

STAs also may use qualifications as a first step to selecting a contractor. To limit the proposals/bids received for a project, the STA can pre-qualify select contractors. The pre-qualified contractors are then allowed to submit a proposal for the project during the second step of procurement, which then asks the contractor to provide a price for the project.

What does it do?

QBS allows the STA to select a contractor without the contractor providing a price for the project. The procurement is based on qualification criteria such as past performance, structure of the contracting organizations, and others. In many cases, STAs use QBS to select a contractor for the CM/GC delivery method.

How to use it?

Procuring a contractor using QBS utilizes a request for qualifications (RFQ), which requests statement of qualifications from interested firms. Based on a qualifications-based selection process used by Arizona Department of Transportation, the following steps outline how to select a contractor using QBS (3).

1. General: The contractor is to be selected based on qualifications, which involves the submission of a statement of qualifications (SOQ) for all interested firms. The agency then develops a final list from the responsive submittals. The final list of submittals is then evaluated and interviews may be conducted. The contractor is then selected based on demonstrated competency and the required qualifications.

2. Advertisement of project: The agency notifies the highway industry of an impending project and that SOQs will be accepted for the project. In advertising for a contractor, the agency follows a solicitation process similar to the acquisition of professional services (e.g. architects, engineers, consultants). The advertisement must include a general description of the work, the requirements for pre-qualification, and any additional technical requirements. The estimated project cost and required completion time will also be included in the advertisement. The selection process schedule, included in the advertisement, summarizes the deadlines for submitting SOQs and establishes the deadlines for final listing of firms and the award of the contract.

3. Pre-submittal conference for the statements of qualifications: A pre-submittal meeting is held for all interested contractors to discuss the scope of the project, to introduce the agency project team, to clarify the selection process, to discuss the project package, and to answer any questions contractors may have about the process.

4. Request for statement of qualifications: The Request for SOQs should include the criteria for the selection process, design requirements, pre-construction scope of work, project constraints, utilities, environmental reports, right-of-way, and construction requirements. Organization of the request for SOQs uses the following order:

    a. Solicitation advertisement
    b. Description of the selection process
    c. SOQ formatting instructions and documentation requirements along with scoring criteria
    d. Oral interview requirements
    e. The pre-construction scope of work
    f. The construction scope of work
    g. A copy of the designer's scope of work
    h. The pre-construction contract agreement
    i. The construction contract agreement

5. Statement of Qualifications Requirements: The request for SOQs needs to include all specific documentation requirements and procedures that each interested contractor must follow. It is advised to use past projects that have used qualifications-based selection as a starting point for developing the request for SOQs, but remember to tailor the request to the specific project.

    The project team develops and includes in the request for SOQs the general content, evaluation criteria, and scoring requirements based on the specific project. The project team must establish the required content of each submittal on a section-by-section basis, determine the evaluation criteria to use, and decide on the scoring breakdown for the proposal.

6. Contractor Question and Answers: During the selection process, the agency receives questions regarding the technical aspects of the project, SOQ formatting, availability of agency reports and records, and procedural issues. The project team will review the questions and discuss the question before submitting a response.

   If required, the project team may issue addenda to ensure fairness and maintain a level playing field for all potential contractors. No direct discussions about the project between the agency and interested contractors may take place once the project is advertised.

7. Selection team: The selection team receives, reviews, and evaluates all responsive SOQs in order to determine the final list of contractors. The selection team consist of at least three members that may be department employees of outside consultants. At least one member needs to be a senior management employee of a licensed contractor, at least half of the team must be professionally licensed engineers or architects. Finally, no member can have any interest in the project or association with the project that can be construed as a conflict of interest with potential contractors, designers, or subcontractors.

8. Contractor interviews: Each potential responsive contractor is invited to participate in an oral interview. Each interview will be held separately with each firm. The length, location, and format of the interview will be detailed in the request for SOQs. As a minimum, the format should include an oral presentation by the contractor addressing their plan and approach to the project followed by a question and answer session. The order of the interviews shall be random and can be determined and published well ahead of the interview dates. The notification will include information about location, set the number of people allowed to attend, state the amount of time allotted for each interview, and include any scheduling constraints. The selection team develops a list of standard questions before the interviews. Then, during the interview, each selection team member individually grades the oral presentations.

9. Evaluation and Selection of Contractor: Each member of the selection team will individually grade both the SOQs and the interviews for each contractor using the approved scoring sheet. Each member then submits their grades to the project team, which then meets to discuss strengths and weaknesses of each proposal. During the discussion, members are allowed to adjust their scores accordingly. When a member’s score exceeds 1.65 times the standard deviation of all scores (plus or minus), that member’s score is not included.

Each selection team member should provide written comments on each firm. These comments and notes are used to compile de-briefs with the contractors. Contractor de-briefs cannot occur until after the pre-construction contract has been executed with the selected contractor.

Scores for each firm is calculated by adding individual team member's scores for both the SOQs and interviews, then calculating the average. Each firm is then ranked by the score and the list is submitted to the state engineer to begin negotiations with the top ranked firm.

10. Pre-construction services negotiations: The agency enters into negotiations with the highest ranked firm. If the agency is unable to negotiate a satisfactory contract with the highest ranking firm, then the agency terminates the negotiations. Also, if during negotiations, the agency requests the contractors "best and final offer" and rejects the offer, then negotiations are terminated. At the termination of negotiations, the agency then moves onto the second-highest ranked firm to begin negotiations. This process is repeated until an agreement is reached or a determination is made to reject all the firms on the final list.
11. Award of pre-construction services contract: Following the development of a budget and an agreeable method of payment for the services to be provided during pre-construction, the project and selection team will make a recommendation to the State Engineer's office, which then issues the notice to proceed.

When to use it?

Most STAs use QBS to select a contractor when using the CM/GC delivery method. QBS is also used as a pre-qualification tool to limit the pool of bidding firms to the most qualified organizations.

Limitations?

The major drawback to using QBS procurement is the lack of a firm price being presented by the proposing firms. Although qualifications are the main source of selection, many STAs can be discouraged by the lack of knowing what the project will cost once it goes to construction.

Who uses it?

Arizona, Colorado, Florida, Maine, Michigan, Minnesota, Nevada, Oregon, Utah

Examples

<u>Example 1) Nevada Department of Transportation</u>

The Nevada Department of Transportation (NDOT) recently procured a contractor for a construction manager at risk (CMAR) project near Lake Tahoe (4). The project is a four mile stretch of mountainous road along SR 207 (Kingsbury Grade Road) and the scope of work includes 13inch full-depth pavement reconstruction, improving roadway drainage and stormwater runoff quality, improving poor sight-distance at Tramway Drive, relocating utilities, increasing the pedestrian visibility with improved lighting, handling complex maintenance of traffic, and improving sidewalk, curb and gutter, and compliance with ADA requirements. Due to the project's location near the resort area of Lake Tahoe, specific and complex traffic constraints had to be met during construction, especially during the busy tourist summer months. Therefore, NDOT determined that CMAR would be the optimal delivery method for this project in order to determine the best traffic maintenance to use during design and to accelerate the project delivery schedule to no more than 18 months.

Procuring the contractor for the Kingsbury Grade Road project utilized a qualifications-based selection approach. A request for proposal (RFP) was issued on April 10, 2013. Five firms provided responsive proposals for the Kingsbury Grade Road project. Using a similar process as outlined by Arizona DOT, a selection team comprised of members from both internal and external to NDOT evaluated the received proposals using a pre-determined scoring system to rate the qualifications.

After reviewing the proposals and ranking them, the top three firms were then short-listed and invited to an oral interview with the NDOT project selection team. The interviews all took place on May 13th, 2013. The selection team then made their final rankings and provided the deputy director and the FHWA with the recommended contractor to award the project. Once the deputy director and FHWA signed off on the recommended firm, NDOT moved into negotiations with the recommended firm for the pre-construction services contract.

<u>Example 2) California Department of Transportation (Caltrans)</u>

Caltrans developed a formal process to select contractors using QBS through the use of the Brooks Act to procure construction management services associated with a CM at risk (CMAR) contract. Information about the Brooks Act is found at
http://www.nauticalcharts.noaa.gov/ocs/hsrp/archive/march2005/brooksAct_92-582.pdf.

The Brooks Act, which more formally addresses the selection of architect and engineer professional services, applies to selection of CM services in the state of California. Using QBS requires that projects be advertised and ranked based on published weighted criteria for experience, capabilities, availability, and qualification. Once the top rated company is determined, Caltrans moves into negotiations for pre-construction services with the top rated company. If negotiations fail with the top rated company, Caltrans then moves to the second top rated company and negotiates with that firm.

The Caltrans QBS selection process includes three elemental processes:

1. An advertisement of a Request for Qualifications (RFQ): The RFQ should include general information that identifies Caltrans as the entity soliciting SOQs from qualified companies. The RFQ identifies the estimated contract amount, term, location of intervies, and day and location of the negotiation of the contract. In terms of the project, the RFQ needs to include the scope of work (pre-construction and construction), identifying the required CM services, the percent design complete, schedule of performance, anticipated milestones, location of the project/work, availability and work hours, personnel requirements, equipment requirement, deliverables, standards of the poject, goals and objectives for the delivery of the project, and any documents that Caltrans should provide. Finally, in terms of rating of SOQs, the RFP at a minimum must include information on the proposal criteria, weights of the criteria, and the rating descriptors.
2. Submission Of SOQs from Interested Contractors: A prospective CMAR contractor submits an SOQ that identifies the following items:
    - Contract information
    - Point of contact
    - Proposed team
    - Organization chart
    - Resumes of proposed key personnel including the project manager
    - Example projects for proposed team's qualifications for the contract
    - Key personnel participation in example projects
    - Additional information
    - General qualifications
    - Work force analysis chart
    - Resources
    - Location of resources
3. Evaluation of the SOQs and Selection of a Contractor: The evaluation process is conducted by Caltrans panels composed of members that collectively have experience in architecture, engineering, construction, government, and relationed acquisition matters. The evaluation panel measures each SOQ against the criteria mentioned in the RFP.

The evaluation panel then ranks the contractors according to an identified ranking system that can include professional qualifications, experience with CMAR, performance record and review and analysis of the contractor's workload as a measurement criteria (which is included in the RFQ).

At the conclusion of the evaluation, Caltrans develops a short-list of the top-ranked SOQs. At this point, Caltrans as the option to conduct oral interviews with the top ranked contractors or conduct open discussions for further information on the short listed contract's qualifications. Caltrans then selects the CMAR contractor based on this process and the scoring outcome, with Caltrans proceeding with negotiations with the highest ranked contractor for the CMAR project.

References

1. American Association of State Highway and Transportation Officials (AASHTO). *Primer on Contracting for the Twenty-First Century*. 5th ed., AASHTO Subcommittee on Construction, Washington, DC, 2006.

2. El Wardani, A. Marwa, John I. Messener, and Michael J. Horman. Comparing Procurement Methods for Design-Build Projects. *Journal of Construction Engineering Management*, American Society of Civil Engineers, Vol. 132, No. 3, 2006, pp. 230-238.

3. Arizona Department of Transportation (ADOT). *Construction Manager at Risk (CMAR) Guide*, Intermodal Transportation Division, ADOT Construction Group, September 2010.

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B.4 Cost plus Time (A+B)

What is it?

Cost + Time, also commonly referred to as A+B, is a selection method used in procuring construction services where the "A" or cost portion is the bid amount and the "B" or time portion is the proposed project duration for the work. The "B" portion is multiplied by a value per day, also referred to as Road User Cost (RUC), which is established by the Agency prior to reviewing the proposals. The agency then awards the contract to the bidder whose proposal has the lowest sum of "A" + "B" (*1*).

Why use it?

Cost + Time procurement often provides for reduced overall project time. The NCHRP Synthesis 293 (*2*) states that when using Cost + Time, the project is typically completed earlier than initially estimated by the contractor.

The California Department of Transportation Guidelines For Use of A+B Bidding Provisions (*3*) provides the following benefits of Cost + Time contracting:

- Reduces construction-induced congestion and delays;
- Encourages bidders to develop more detailed and well thought out plans;
- Encourages contractors to develop innovative means of reducing overall construction time at the lowest cost;
- Encourages contractors to schedule construction operations in a manner that maximizes the efficiencies of crews and equipment;
- Reduces complaints related to congestion from road users and local communities;
- Lessens environmental impacts and reduces pollution related to construction.

What does it do?

Cost + Time procurement encourages bidders to consider the time the project construction will require and how to incorporate innovative means and methods to reduce this time.

How to use it?

According to Caltrans (*3*), other than a few specific exceptions, only projects that have an estimated cost of $5 million or more <u>and</u> a daily RUC of $5,000 or more should be considered for A+B bidding. Once the agency establishes these parameters, the project engineers establish a maximum number of construction days for bids to be considered responsive. Any bids that exceed this amount are considered unresponsive and are discarded. Next, the project engineers determine the daily RUC for the time portion of the bids.

To evaluate the proposals, the agency will multiply the construction duration estimate by the RUC to create the time portion of the bid. This "B" value is added to the project cost (the "A" portion) to generate the Total bid. The bidding firm with the lowest Total A+B is awarded the contract.

When to use it?

A study performed on 101 projects that utilized Cost + Time procurement found that 76% of the projects were related to restoration, rehabilitation, or reconstruction type projects (*4*). The projects were typically characterized as having substantial traffic management requirements and road users were frequently subject to construction work zones. Therefore, Cost + Time procurement is best suited for highway projects in urban settings with high volumes of road users. Also, Cost + Time is suitable for projects that severely impact local businesses during the construction and for projects with a tightly constrained end date (*5*). Some STAs use cost plus time procurement along with incentives/disincentives. This has been shown to accelerate the construction schedule and reduce the duration of construction *(1)*.

Limitations?

Cost plus time is not a procurement procedure for all projects. Issues with using Cost + time include the risk associated with changes and delays that are beyond the control of the awarded firm (6). Problems can arise for adjusting a contract time due to unforeseen conditions, STA implemented changes, and delays due to uncontrollable situations. Therefore, it is critical to work out any delay risks associated with third-parties (railroads, ROW, utilities, etc) prior to bidding and constructing the project. Further, the STA will need to make sure that the awarded firm can accurately predict the duration of all activities of the project during the procurement phase. Due to this, projects that are large and complex are not ideal for cost + time procurement *(6)*.

Another issue to consider with cost + time bidding is the potential for increased cost of the project *(6)*. STAs will need to consider that shortening the duration of a project will cost a premium due to acceleration, aggressive management of subcontractors, and/or the use of specialty equipment. For example, a bidding firm may see an opportunity to reduce the total impacts on a project with a shorter duration solution that increases the primary cost items, but in return would reduce the impact on overall traffic control cost. However, a bidding firm would not likely want to bid the shorter duration as savings associated with traffic control are not shared with the firm. To avoid this situation, STAs may want to implement incentives/disincentives in contracting with the selected firm *(6)*.

Other limitations to consider are (7):

- Contractor must take time to develop a reliable schedule
- Contract changes are magnified, which means when there are too many changes, the advantages of cost + time are nullified
- More resources might be needed for contract administration
- More intense negotiations for additional work because of timeliness is critical

Who uses it?

Arkansas, California, Georgia, Hawaii, Idaho, Illinois, Iowa, Maine, Minnesota, Mississippi, Missouri, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Washington State

Example

The Minnesota Department of Transportation has experience with cost plus time procurement. Two projects are presented below that used Cost plus time during procurement of the construction team (*7*).

Project 1) MnDOT State Project #1809-55: Major Highway Expansion of Highway TH 371

- Project Letting: March 14, 2003
- Road User Cost (RUC) per day: $10,000
- Incentives per day: $10,000 with a max of 25 days
- Disincentive per day: $10,000
- Project Awarded to Bid 1 with the lowest combined A+B of $17,589,834
- Actual Project Duration: 170 Days
- Incentives Paid: $250,000
- Incentives Paid as Percent of Bid: 1.6%
- Disincentives Charged: None

Project 1 Bid Results

Eng. Est.	$17,436,246	Eng. Est.	227 Days	Total A+B (Bid + Duration x $10,000)
Bid 1	$15,569,834	Bid 1	202 Days	$15,569,834 + 202*$10,000 = $17,589,834
Bid 2	$15,602,319	Bid 2	206 Days	$15,602,319 + 206*$10,000 = $17,662,319
Bid 3	$16,457,663	Bid 3	202 Days	$16,457,663 + 202*$10,000 = $18,477,663
Bid 4	$17,108,075	Bid 4	227 Days	$17,108,075 + 227*$10,000 = $19,128,075
Bid 5	$17,431,114	Bid 5	227 Days	$17,431,114 + 227*$10,000 = $19,701,114
Bid 6	$17,797,742	Bid 6	215 Days	$17,797,742 + 215*$10,000 = $19,947,742
Bid 7	$17,837,766	Bid 7	227 Days	$17,837,766 + 227*$10,000 = $20,107,776
Bid 8	$18,200,639	Bid 8	227 Days	$18,200,639 + 227*$10,000 = $20,470,639
Bid 9	$18,430,000	Bid 9	227 Days	$18,430,000 + 277*$10,000 = $20,700,000

Project 2) MnDOT State Project #2006-21: Detour Project – Reconstruction of TH 56

- Project Letting: December 16, 2005
- Road User Cost (RUC) per day: $28,000
- Incentives per day: None
- Disincentives: $5,000
- Contract Awarded to Bid 1 with a lowest Total A+B of $1,523,692
- Actual Project Duration: 5.5 Days
- Incentives Paid: Not Applicable
- Incentives Paid as Percent of Bid: Not Applicable
- Disincentives Charged: None

Bid Results

Eng. Est.	$1,259,572	Eng. Est.	15 Days	Total A+B (Bid + Duration x $28,000)
Bid 1	$1,355,692	Bid 1	6 Days	$1,355,692+ 6*$28,000 = $1,523,692
Bid 2	$1,394,017	Bid 2	7 Days	$1,394,017 + 7*$28,000 = $1,590,017
Bid 3	$1,449,919	Bid 3	10 Days	$1,449,919 + 10*$28,000 = $1,729,919
Bid 4	$1,512,212	Bid 4	5 Days	$1,512,212 + 5*$28,000 = $1,652,212
Bid 5	$1,522,081	Bid 5	15 Days	$1,522,081 + 15*$28,000 = $1,942,081
Bid 6	$1,619,712	Bid 6	15 Days	$1,619,712 + 15*$28,000 = $2,039,712

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2. Anderson, S.D. and G.L. Ullman. *NCHRP Synthesis 293: Reducing and Mitigating Impacts of Lane Occupancy during Construction and Maintenance*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, 2000.

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6. Washington Department of Transportation (WSDOT). *A+B Bidding*, 2014, http://www.wsdot.wa.gov/Projects/delivery/alternative/ABBidding [Accessed October 23, 2013].

7. Minnesota Department of Transportation (MnDOT), *Innovative Contracting Guidelines*, Office of Construction and Innovative Contracting, St. Paul, MN, Dec. 2008.

B.5 Sole Source

What is it?

Sole source is a procurement procedure used on projects with a single bidder for specialty work or in emergency situations (*1*) where the STA can select any firm based on any selection factor (*2*). Selection factors range from qualifications-based to relationship-based. Sole source does not include a competitive price factor and limits full and open competition, which is required on most public transportation projects (*1*), but it is not required for emergency situations and extenuating circumstances.

Why use it?

In special conditions, sole source procurement helps the STA to select a contracting firm in an accelerated fashion or to select a vendor/manufacturer that produces a product, material, or equipment that no other vendor/manufacturer can supply.

What does it do?

Sole source contracting allows STAs to by-pass federal regulations requiring a competitive bidding process for construction projects and instead procure a single source (*3*). This occurs when STAs are limited to one specified product or one particular vendor and obtaining additional bids would be impossible. Sole source procurement is also used when a project must be started immediately due to emergencies and performing a full procurement process would be detrimental to the general public.

How to use it?

Sole source procurement works in the same fashion as obtaining bids for work except that only one source is contacted by the STA to provide a bid for that service and/or materials. Most STAs provide guidelines for justification of sole source and the maximum amounts a sole source bid can reach before the STA will not consider the bid. Refer to the examples below for an example of a justification worksheet from the California Department of Transportation.

When to use it?

STAs use sole source procurement when specifications are so narrow that only one specific product can be bid to meet the requirements or when the specified product or material can only be supplied by one vendor/manufacturer. STAs also use sole source procurement in emergency situations where work that needs to be done immediately as the current conditions pose a threat to the general public (*3*).

The following list provides circumstances that could necessitate the use of sole source procurement *(4)*:

- The compatibility of equipment, accessories, replacement parts, or service is a paramount consideration during development and procurement of a project
- A sole supplier's items are needed for trial use or testing
- A sole supplier's item is to be procured for commercial resale
- Procurement of public utility regulated services
- Procurement of copyrighted or patented item/service that is only available from the holder of the copyright or patent
- Procurement of media for advertising
- Procurement of art or entertainment services
- Changes to existing contracts

Limitations?

Sole source procurement can only be used in specific special situations and is not used on a regular basis. Therefore, it is possible that STA staff will have limited experience with sole source procurement. Further, sole source procurement can result in higher cost due to the select one source for procuring a service or material. Finally, STAs require justification for the use of sole source procurement must be in writing and approved by STA management before it can be used.

Who uses it?

Alabama, Arizona, California, Connecticut, Delaware, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Massachusetts, Minnesota, New Jersey, Ohio, Texas, Utah, Virginia, Washington State, West Virginia, Wisconsin, Wyoming

Examples

California Department of Transportation

The California Department of Transportation (Caltrans) uses a specific worksheet to document and justify the use of sole source procurement. A copy of this worksheet is provided below as an example.

Contract Number:

SOLE SOURCE
NON-COMPETITIVE BID CONTRACT JUSTIFICATION
Rev. December 3, 2009

Grant Program:
Contract Award Date:
Federal Fiscal Year of Grant Award:

Agency:
Department:

Contact Name:
Title:
Phone:
Email:
Fax:

Street address:
Mailing address (if different):

Contract type (select one):
- IT (Information Technology) Goods
- IT Services
- IT Goods & Services
- Non-IT Goods
- Non-IT Services

Procurement Schedule:

Beginning and ending dates of contract:

Contract Amount for current request (discuss if this is a proposed amendment, and provide original contract number):

History with this contractor (list any earlier contracts, contract amounts, and types of procurement methods with this contractor):

Has work commenced? Yes or No
Have goods been acquired? Yes or No
(Attach explanations for any "Yes" answers)

Responses must be provided for all of the following items.
Incomplete documents will be returned to applicant.

Page 1 of 3

Contract Number:

BRIEF NEEDS ASSESSMENT:

- Define the purpose and need for this sole source request.
- Provide history/background of the problem.

RESEARCH:

What market research was conducted to substantiate whether there was no competition, including evaluation of other items or service providers considered?

- Please print and attach a copy of the "search terms" used, *e.g.*, in an internet search engine search, and the responses you received.
- Provide a narrative of your efforts to identify other similar or appropriate goods/services.
- Include a summary of how the agency concluded that such alternatives are either inappropriate or unavailable.
- The names and addresses of suppliers contacted, and the reasons for not considering them, must be included **OR** an explanation of why the survey or effort to identify other goods/services was not performed.

  Alternatives considered:
  For each alternative considered:
    - Pros
    - Cons
    - Costs.

What are the consequences of not purchasing the goods/service from, or not contracting with, the proposed sole source supplier?

JUSTIFICATION:

[See *FTA Circular 4220.1 F, Third Party Contracting Guidance*, Chapter VI]

Why is the acquisition restricted to this good/service/supplier?
(Explain why the acquisition cannot be competitively bid; are other distributors available; is the supplier the only source for the acquisition)

1. Describe the unique capability or availability of these goods or services:
    - Is this a unique or innovative concept? (goods)
    - Is the knowledge/skills/experience unique to the provider of the service?
    - Are there patents or restricted data rights? (goods or services, i.e., intellectual property)
    - Is there a need for compatibility with an existing item (please provide enough detail to demonstrate that compatibility is indeed necessary)? (goods)

Page 2 of 3

Contract Number:

- Are there substantial duplication costs? If so, how much in comparison to the total project costs? (goods or services)
- Have you completed a Request for Information (RFI) that indicates limited availability? (goods or services)

2. Is there unusual and compelling urgency? (explain) (goods or services)

3. Other comments:

COST ANALYSIS FOR GOODS OR SERVICES:

1. How was the offered price determined to be fair and reasonable? (Explain the basis for comparison and include price analyses completed to determine "best value" to your agency)

2. Describe any cost savings realized or costs avoided by acquiring the goods/services from this supplier.

Responses must be provided for all of the following items.
Incomplete documents will be returned to applicant.

To the best of my knowledge and belief, the information in this sole source justification form is true and correct, and the person whose signature appears below has been duly authorized by the governing body of the subrecipient to file this sole source request.

Prepared by/date: ____
Phone number: ___________________________________

Agency Director or designee/date________________________________
(Certifying Representative -- Signature authority as authorized by resolution)
Phone number: ___________________________________

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<u>*Minnesota Department of Transportation*</u>

The Minnesota Department of Transportation provides a specific clause that addresses methods of procurement for special situations *(5)*. Under FTA C 4220.1F, VI, 3.i, (3), (c) – Other than Full and Open Competition:

> "(1)(b). Sole Source. When the recipient requires supplies or services available from only one responsible source, and no other supplies or services will satisfy its requirements, the recipient may make a sole source award. When the recipient requires an existing contractor to make a change to its contract that is beyond the scope of that contract, the recipient has made a sole source award that must be justified."

References

1. Federal Acquisition Regulation (FAR). *Subchapter C – Contracting Methods and Contract Types.* General Services Administration, Washington, DC, 2014.

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3. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

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5. Minnesota Department of Transportation (MnDOT).

B.6 Job Order Contracting (Indefinite delivery / indefinite quantity)

What is it?

A competitively bid, firm fixed price and indefinite quantity procurement contract that lasts for a specified duration of time *(1)*. Firms bid per unit of specific work for which the STA guarantees a minimum amount of work over the life of the contract. The location, scope, and duration of the work is determined under future work orders as a part of the job order contract *(2)*.

Why use it?

Job order contracting (JOC) helps STAs when the quantities of supplies or services are unknown but will be needed during the duration of the contract. Its main advantage is that they accelerate work order processes *(4)*. This is because JOC provisions expand the total contract volume without the need to re-procure or negotiate contract modifications. In addition, another advantage is the flexibility offered to the STAs as it can be modified to meet the requirements of almost any situation *(3)*. Finally, a case study on four highway projects *(3)* using this provisions found that IDIQ contracts can:

- Reduce preconstruction cost,
- Accelerate project delivery period,
- Provide flexible delivery scheduling,
- Promote price competition, and
- Reduce the risk of contractor default

What does it do?

JOC provisions put a contractor or multiple contractors "on hold" to perform construction services to be determined in the future *(3)*. Under this provision compensation to the contractor is only due if the IDIQ contract has been activated *(3)*.

How to use it?

The JOC provision is based on a competitive bid, indefinite delivery/indefinite quantity contract. The contract usually predefines the basic units of work as well as the basic unit prices for each of the expected construction line items. A JOC usually includes

- A minimum and maximum amount of work per year per site *(5)*
- A maximum limit on the size of a job order *(5)*
- A provision that allows for negotiation of construction tasks not included in the initial construction line items *(5)*

- A provision that allows the STA to extended a performing JOC *(5)*

When to use it?

JOC can be used in situations when the contracting process needs to be streamlined and to accelerate the service delivery duration. JOC is most appropriate for small and repetitive projects; however, the military has used it on large projects with broad scopes *(4)*. Examples of potential projects suited for JOC are *(6)*:

- Bituminous mill and overlay
- High tension cable guardrail
- Concrete pavement repair
- District-wide projects (e.g. pavement striping)
- Contaminated soil disposal
- Combining multiple noise wall maintenance contracts
- Combining small chip seal projects
- Culvert lining
- Re-lamping maintenance

Limitations

JOC is not to be used on all projects. In most cases, JOC is used for maintenance and repair contracts. When using JOC, it is imperative of the STA to state the minimum quantity of work that the contractor will be required to perform for the life of the JOC agreement. This minimum quantity should not exceed the amount the STA is guaranteed to order. Also, if the STA decides to order additional quantities for the contractor to furnish and install, then that additional work must not exceed the state maximum quantity *(6)*.

Who uses it?

Arizona, Delaware, Florida, Maryland, Michigan, Minnesota, Missouri, Montana, New Jersey, New York, Ohio, Washington State, West Virginia

Example

The Missouri Department of Transportation (MoDOT) has developed a detailed and formal process for procuring using JOC for traditional on-call maintenance repair contracts, including asphalt and concrete pavement repair, guardrail and guard cable repair, bridge repair, and fence repair (7). The JOC process allows for MoDOT to award fixed price construction contracts with indefinite delivery and indefinite quantity at individual work locations based on the limits of the project contract.

A fixed unit price list that contains unit prices for various items of work for each job order is to be included in the JOC bid proposal. The fixed unit prices are for complete and in-place construction and it includes all labor, equipment, and materials required to complete the construction task. The list of unit prices is a catalog of pre-established fixed unit prices for materials, equipment, and labor for various items of work. Then, interested contractors provide bids in the form of adjustment factors for expected overhead and profit along with any additional business and construction related costs for performing the various types of work identified in the JOC agreement. Using this bidding process allows for contractors to bid the adjustment factors without knowing the actual quantities, schedule, or timing of the work orders and it also helps the STA avoid receiving unbalanced bids. The lowest responsive bidder is then awarded the JOC project.

Bidding firms are allowed to provide adjustment factors for three different working conditions:

- Normal work adjustment factor – work conducted from 6:00am to 7:30pm Monday through Friday
- Nighttime work adjustment factor – work conducted from 7:30pm to 6:00am Monday through Thursday
- Weekend work adjustment factor – work conducted from 7:30pm on Friday through 6:00am on Monday, night or day, or a holiday

Each bid adjustment factor needs to include any business related costs, construction related costs, and any additional general costs.

References

1. Rizk, Tarek and Nancy Fouad. Alternative Project Delivery Systems for Public Transportation Projects. *International Journal of Construction Education and Research*, Vol. 3, 2007, pp. 51-65.

2. American Association of State Highway and Transportation Officials (AASHTO). *Primer on Contracting for the Twenty-First Century*. 5th ed., AASHTO Subcommittee on Construction, Washington, DC, 2006.

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7. Missouri Department of Transportation (MoDOT). Job Order Contracting (JOC), MoDOT Innovative Contracting, April 2014. http://epg.modot.org/index.php?title=147.3_Job_Order_Contracting_(JOC) [Accessed May 14, 2014].

B.7 Alternative Technical Concepts (ATCs)

What is it?

ATCs is a procedure for procurement where the STA issues a request for proposal that contains basic project configurations, design and construction criteria. Proposing firms then develop and submit alternative ideas, or concepts, based on their industry expertise. The STA then reviews the received proposals and the concepts. The concepts gain approval on a pass-fail basis. If a concept is accepted, then the proposing firm can incorporate this concept into the technical and price proposal. This approach fosters a best-value solution that allows firms to submit innovative concepts and solutions that increases the value to the public (*1*).

Why use it?

The main advantage of ATC provisions is that they allow for innovation and flexibility during the procurement process *(2, 3)*. Additionally, ATCs help STAs to determine the true best-value proposals.

What does it do?

ATCs help STAs finding the best-value proposals. This is a result of the general requirement that an ATC needs to be deemed to provide a project that is “equal or better” on an overall basis than the project would be without the proposed ATC *(4)*.

How to use it?

First, the STA needs to set up the ATC process in the request for proposals (RFP). Here, important specifications are setting deadlines for ATC requests as well deadlines for the STA to issue a decision on the ATC requests. ATCs are confidential requests *(4)*, and the STA should secure mechanisms to secure confidentiality of the requests such as one-on-one meetings.

The ATC process starts after the STA issues the RFP. Upon issuance of the RFP the STA generally holds one-on-one meetings with proposers to discuss potential ATCs *(3, 4)*. Proposers submit ATC requests to the STA before submitting their technical proposals. These requests should include at a minimum a narrative of the description and conceptual drawings of the of the technical approach is applicable *(5)*. Upon receipt, the STA reviews each ATC and responds. The Minnesota Department of Transportation (MnDOT) for instance, issues one of the following responses *(3)*:

- ATC is approved
- ATC is not approved
- ATC is approved with conditions

- ATC does not qualify as an ATC, but may be included in the design-build team technical proposal
- ATC does not qualify as an ATC and may not be included in the proposal

When to use it?

The Federal Highway Administration reports that ATCs have been cost effective on large design-build projects where the scope is significant and the STA believes that a best-value selection depends on the degree of innovation in the solutions offered by the proposers *(1)*.

The Code of Federal Regulations title 23 636.209(b) allows for the use of ATCs in design-build projects. It establishes that STAs "may allow proposers to submit alternative technical concepts in their proposals as long as these alternative concepts do not conflict with criteria agreed upon in the environmental decision making process. Alternative technical concept proposals may supplement, but not substitute for base proposals that respond to the RFP requirements". However, there are no corresponding regulations for the use of ATCs in design-bid-build projects *(1)*.

Limitations?

According to Missouri Department of Transportation's ATC website *(6)*, the ATC process can create potential issues, such as:

- Increase in the overall design costs for the project as the number and complexity of submittals may create multiple suitable alternatives, all of which could require additional design expense.
- The ATC process must be accounted for in the timeline for project delivery, which means there is a potential for longer or more complicated delivery timeframes for a specific project.

Who uses it?

California, Colorado, Florida, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nevada, Texas, Utah, Virginia, and Washington

Examples

<u>Example 1) Maryland State Highway Administration</u>

The Maryland State Highway Administration (SHA) used the ATC process in its procurement of multiple design-build contracts for the $2.5 billion, 19-mile, InterCounty Connector (the ICC) highway in the Maryland suburbs north of Washington, D.C.*(7)*. The SHA obtained a formal waiver of the requirement in connection with its procurement, under FHWA's Special Experimental Program 14 (SEP-14).

The SHA used a best value procurement process to select its design-builders. As a part of procurement process, the SHA offered proposers the opportunity to ask the SHA to pre-approve proposed deviations from certain design requirements and performance specifications, with the goal of encouraging proposers to incorporate innovation and design flexibility into their proposals. The ATC was only approved if the SHA determined that the proposed end product with the proposed deviation was equal to or better than the end product without the proposed deviation. Proposers were permitted to incorporate any pre-approved ATCs into their final proposals.

Seven proposers submitted a total of 130 ATCs, with almost half of which were approved. The approved ATCs minimized the impact on the environment, improved the overall technical quality of the final product, and helped decrease the cost of the project. In addition, approval of ATCs allowed proposers to develop their project design and construction schedules. By maintaining the confidentiality of the ATCs submitted during the proposal process, the SHA encouraged proposers to differentiate their proposals by developing creative and innovative ATCs. Proposers received innovation credit for approved ATCs, which improved their technical ratings in the best value evaluation. ATCs also allowed proposers to decrease their costs.

Specific ATCs included:

- Reconfiguration of an interchange on the western end of the project, which required additional environmental approvals and the purchase of additional right of way. The reconfiguration helped to reduce the successful proposer's price proposal and improved the proposal's technical rating. The revision also provided several benefits to the project, including:
    - Reducing the interchange from a three-level interchange to a two-level interchange, which minimized the visibility of the interchange to neighboring communities;
    - Reducing the number of bridges in the interchange, thereby decreasing future maintenance costs; and
    - Improving lane continuity on the InterCounty Connector.
- Reduction of the mainline median width within the most environmentally sensitive area of the ICC, which was conditionally approved, pending design verification that the RFP requirements and commitments could be met and permitting agency approvals could be obtained. The successful proposer had to demonstrate that the reduced median meets these commitments, the reduction in median will lead to a reduction in costs due to earthwork and constructability, as well as several environmental benefits, including reduced forest, stream and wetland impacts and movement of the highway further from adjacent homes.

Additional ATCs included replacing long bridges over wash ponds with at-grade roads on improved soils, thereby removing over 300,000 square feet of bridge deck from the RFP plans, eliminating the need to relocate an existing electric transmission main crossed by the ICC, and relocating many of the planned storm water ponds to eliminate impacts to existing streams, tributaries and wetlands in the area. These and other ATCs helped to reduce the estimated cost of one of the contracts by approximately $20 million, which represented a cost savings of nearly 5 percent.

Example 2) Missouri Department of Transportation

The Missouri Department of Transportation has devised a process to use ATCs on Design-Bid-Build projects. The following example is a replication taken from http://epg.modot.org/files/4/4d/147.3.1.pdf. This outlines the guidelines and procedures for the ATC process used in the replacement of the Hurricane Deck Bridge *(8)*.

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Guidelines and Procedures for Hurricane Deck ATC Process

Description

This project will allow contractors the opportunity to include in their bid proposal, pricing for a pre-approved Alternate Technical Concept (ATC) that differs from the Commission-furnished bid proposal. ATCs allow for innovation, project schedule reduction and cost savings to obtain the best value for the project that meets or exceeds the project goals, and which provides a product, which is equal to or better than the concept it replaces. ATCs may address, but are not limited to, specifications, materials, products, design standards, design solutions, staging or traffic control.

For this request-for-bid, the contractor may submit a bid for the Commission-furnished proposal, including the Commission-furnished design solution or a bid that includes pricing for the pre-approved ATC.

General Conditions

The Commission-furnished proposal documents contain all of the proposed work for the project to be bid. The contractor may propose an ATC to do the work. The minimum requirements for the finished project are listed below. If an ATC is pre-approved by the Commission, the contractor has the option of submitting a bid for the pre-approved ATC proposal or the Commission furnished proposal. The contractor will only be allowed to submit one bid for this project.

The Commission will be responsible for completing all roadway and structural design plans for approved ATCs.

Process for Submittal of Alternate Technical Concepts

Submittal and evaluation of ATCs will include the following three step process:

Step 1: This will consist of one-on-one confidential meetings between the contractor and the Hurricane Deck ATC team to discuss what portion of the project their ATC impacts. If the Commission confirms this portion of the design has been finalized, then the ATC process proceeds to Step 2.

The Commission warns that any idea submitted by the contractor, in which the Commission design has not yet been completed, may possibly be the design direction that was intended for the Commission-furnished plans. To avoid discussing concepts on portions of the design that have not been completed; the contractor will be asked to describe which portion of the design their ATC will impact. If the ATC proposal impacts an incomplete portion of the base design, the contractor will have the option of delaying their ATC submittal until after the final design solution has been selected. If a contractor chooses to proceed with submitting an ATC on an incomplete portion of the base design that ends up being the same solution as the base design, the contractor shall have no ownership or right to that specific ATC. The contractor will be informed of this situation if it occurs.

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Step 2: The ATC team will be available to review contractor's Conceptual Alternate Technical Concepts (CATC). CATCs will require minimal engineering and are intended to allow contractors to present their ideas to the ATC team in a confidential environment prior to investing time and resources into detailed engineering of their concept.

The Commission will review submitted CATCs and respond back to the contractor as soon as possible, but not to exceed 2 weeks. Yet, the Commission reserves the right to take longer depending on resources and evaluation needs of the specific CATC. The contractor will be notified prior to completion of the 2 week time period if more time will be required.

Although there is not a limit to the number of CATC submittals, the Commission reserves the right to limit the number of CATC submittals if in its own determination it feels that a contractor is abusing the process by not limiting their submittals to reasonable concepts. The contractor will receive a written warning from the Commission before being limited on the number of CATC submittals.

Step 3: Once a CATC is approved, the contractor may choose to pursue the ATC in more detail and submit it for final approval and inclusion in the bidding documents.

All inquiries regarding ATCs for this project should be directed to the contact as listed below:

Nicole Kolb Hood, PE
Transportation Project Manager
Missouri Department of Transportation
1511 Missouri Blvd.
Jefferson City, MO 65102
Email: Nicole.hood@modot.mo.gov

Hurricane Deck ATC Process Schedule	
February 10, 2011	An informational meeting will be held at the MoDOT District 5 Office to explain the ATC process.
March 1, 2011	Commission confirms direction for base design.
March 18, 2011	30% base plans will be posted to the Project website.
March 21, 2011	Start date of confidential one-on-one contractor meetings. CATCs will be accepted for review.
May 27, 2011	60% base plans will be posted to the Project website. Guidelines for Hurricane Deck ATC Process and Procedures finalized and posted to website.
August 15, 2011*	Last day to submit ATCs.
November 10, 2011*	ATC biddable set of plans available to contractor.
December 16, 2011	Bids due.
* Dates subject to change depending on the number and complexity of ATC design.	

Requirements for Step 2 Conceptual Alternate Technical Concept Submittal

Requirements for the CATC submittal shall include at a minimum:

a) Detailed narrative of the CATC being proposed (detailed to at least enough information for the Commission to estimate cost and time savings).
b) Estimate of cost savings.

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c) Estimate of time savings.
d) Impact to the environment, utilities and right of way and any previous permits or approvals.
e) A description of any previous use or submission of similar technical concepts or value engineering proposals, including dates, job numbers, results, and/or outcome of the ATC/VE if previously submitted, as known by the contractor. This would include ATCs/VEs from any state DOT.

CATCs may propose specifications and design standards that differ from MoDOT standard practice. MoDOT understands that, at times, MoDOT manuals, specifications and standards do not allow for maximum flexibility. Contractors are encouraged to propose Additional Applicable Standards (AAS) as part of the CATC/ATC process. The proposed manuals, specifications and standards, shall be limited to those already reviewed by FHWA, for example, standards from other state departments of transportation. The Contractor shall provide the Additional Applicable Standards including but not limited to construction specifications, special provisions, design requirements (by discipline), standard drawings, materials and testing requirements, and manuals for review and approval with CATC and ATC submittals. MoDOT will have sole authority to approve or disapprove any AAS. If an AAS is disallowed, the contractor will be notified as to why.

Evaluation of <u>Step 2</u> - Conceptual Alternate Technical Concepts

The minimum basis of acceptance for a CATC shall adhere to the project specific minimum requirements, general requirements and submittal requirements. Any CATC failing to include the required submittal information or one that fails to meet the project minimum requirements will be rejected and returned to the contractor.

If a CATC is accepted, the Commission will provide written approval of the CATC. The Commission will estimate a cost to develop the CATC into a biddable set of plans. **A CATC proposal must produce an estimated net savings after design costs are deducted greater than $100,000 to be considered for design.** Approval of the CATC to the contractor will include the Commission's maximum redesign cost and redesign time for the ATC.

If a CATC is disallowed, the contractor will be notified as to why.

Requirements for <u>Step 3</u> Alternate Technical Concept Submittals

ATC submittals will only be considered if accompanied with a pre-approved CATC. The contractor shall request and submit four copies of the ATC form with the following information:

a) All original CATC submittal documents with a copy of the approval letter acknowledging the Commission's acceptance.
b) Deviation: Reference all requirements of the Commission-furnished proposal that are inconsistent with the proposed ATC, an explanation of the nature of the ATC deviations from said requirements, and impacts to other design elements.
c) Description: Provide a detailed description of the ATC including specifications and conceptual drawings, and a description of where and how the ATC would be used on the Project.
d) Justification: An analysis justifying the ATC and demonstrating why modifications or revisions to requirements of the Commission-furnished proposal should be allowed. Include information on how the ATC meets the project goals.

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e) Cost Savings: A detailed statement of the cost savings associated with the implementation of the ATC. Include an itemized list of impacted bid items and quantities supporting the cost savings for the ATC.
f) Schedule Impact: A discussion of the effect the ATC will have on the contract completion time including design, construction, right of way, utility relocation and permitting issues.
g) Certification that the ATC meets all applicable federal and state design standards, or conforms to a pre-approved AAS.
h) Utilities: A discussion of utility (public and private) impacts.
i) Permits: A discussion of permit changes, additional permits and/or agency approvals that may be required for the ATC.
j) Right of Way: A discussion of the right of way requirements (both temporary and permanent) for the ATC.
k) Traffic and Safety Impacts: A discussion of the impacts the ATC will have on maintenance of traffic during construction.
l) Environmental Impacts: A discussion of the ATC environmental impacts as compared to the approved project Environmental Document including impacts to environmental commitments and community impacts.
m) Maintenance: A discussion of the maintenance impacts over the 75 year life of the project.
n) History: A detailed description of other projects on which the proposed ATC has been used including contact information (name, title, phone number, address and email) for project owners that can confirm ATC implementation.
o) Inspection: Any additional testing and construction inspection requirements.
p) Risks: A discussion of added risks to MoDOT and other parties associated with implementing the ATC.
q) A description of both the existing contract requirements for performing the work and the proposed ATC (if more information has become available since CATC narrative).

ATC submittals shall include enough roadway and structural design details to determine acceptance of the ATC which shall include if applicable, but not limited to: geometrics, hydraulic calculations, profiles, typical sections, and traffic control concepts; and structures to include type, size and location superstructure information, substructure information, and any other significant information. Where different from the Commission-furnished bid proposal, the ATC submittal shall also identify the contractor's specific approach to the following, as applicable:

a) Mechanically stabilized earth (MSE), the contractor shall define the MSE system to be used and its associated application criteria.
b) Describe the corrosion protection measures for structural steel and concrete reinforcing steel subject to chloride exposure, such as decks, elements under joints and locations within splash zones. The definition of splash zone shall be included if utilized.
c) The application limits and material requirements for structures for protective coatings such as graffiti protection to be used.
d) The specifications for the application of proposed coatings for bridge superstructure, signs, message boards, steel piling and miscellaneous steel.
e) The types of bridge expansion joints and bearings to be used.
f) Specify what materials will be used for drainage pipes in various applications.
g) For traffic related items the proposer shall define how they will interpret the 'guidance' recommendations in MUTCD.

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Evaluation of <u>Step 3</u> - Alternate Technical Concepts

ATCs will be evaluated based on compliance to the requirements of these guidelines. ATCs that do not meet these requirements will fail and not be considered for bid. The Commission and FHWA shall be the sole judges in determining compliance with these requirements. If a CATC is proposed and approved based on the requirements, but does not fulfill these requirements when it is submitted as an ATC, it will not be considered for bid.

ATCs will be evaluated using the following criteria. If any of the following criteria are not met, the ATC request fails.

a) The ATC meets or exceeds the minimum requirements and engineering standards listed in these guidelines. The ATC was first evaluated and accepted as a Conceptual ATC (CATC).
b) The ATC does not adversely affect the long-term maintenance of the project.
c) The ATC is consistent with the overall project goals, which include but are not limited to the following:

    a. Deliver the project on budget
    b. Minimize public impact by keeping regional and local traffic flowing efficiently and safely through the impacted area
    c. Incorporate innovative design including faster/better construction techniques, quality control & inspection
    d. Coordinate with all partners and the local community resulting in a project that is viewed as successful
    e. Demonstrate quality construction, encourage green techniques and provide a long lasting facility that complies to ADA requirements.

d) The ATC is equal to or better than the original design proposal. The ATC shall not cause a decrease in engineering standards for any safety related items, including but not limited to: reduction in shoulder widths, reduction in lane widths, decrease in design speed, decrease in clear zone, ~~reduction in clear distance to piers and/or abutments, reduction in vertical clearance,~~ or reduced traffic control performance, etc. To be considered for approval, all safety related elements of the ATC must meet or exceed the MoDOT design. Evaluation of ATC proposals may, at MoDOT's discretion, take into account the overall project design including increases and decreases in safety related items throughout the project. For example a decrease in engineering standard may be allowed in one area if, in MoDOT's and FHWA's sole discretion, it is determined that the overall safety of the project, as compared to the original MoDOT baseline design, is increased by increasing the engineering standard of other parts of the project.

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e) Direct or secondary cost and/or delay related to utility conflicts.

The Commission will make every effort to evaluate the ATC within 10 working days of submittal, and give the contractor a pass or fail decision. The Commission will, in writing, notify the contractor of the ATCs pass/fail status. If an ATC with a promising concept is submitted with insufficient information, it will be rejected. A rejected ATC response will include a list of one or more of the criteria listed above as to why the ATC failed. The contractor will be allowed to address the Commission's cause for rejection and resubmit the ATC prior to the ATC submittal deadline. All specific ATC discussions shall be written or in-person with minutes recorded by the contractor, and approved by the Commission. In no way will the Commission discuss specific ATCs without documentation. The Commission and Federal Highway

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Administration will be the sole judges of acceptability of the ATC. The Commission and Federal Highway Administration reserve the right to reject any ATC request for any reason.

A request from the Commission for additional information from the contractor will be considered a response and allows for extension of the evaluation period.

If the proposed ATC is given a "pass" recommendation the concept is considered pre-approved and may be submitted by the contractor along with bids for the other items of work contained in the request for proposal. If the ATC is given a pass recommendation the Commission will provide a date for completion of the final re-design, i.e. construction plan set, with the ATC approval letter. The contractor shall notify the Commission in writing within 5 calendar days of approval of the ATC their intent to pursue the ATC. An approved ATC which is comprised of multiple elements must be bid as a whole, selective implementation of less than all the elements will not be accepted.

The contractor will have no claim for additional costs or delays, including development costs, loss of anticipated profits, or increased material or labor costs, if the ATC is rejected.

An approved ATC that is not submitted with the bid will not be considered a pre-approved value engineering change proposal (VECP). The awarded contractor may submit their approved ATC as a VECP, however, the fact that it was approved as an ATC shall have no bearing on potential approval as a VECP, and it will be reviewed independently in accordance with Sec 104.6.

In the event that the awarded contractor utilized a sunshine request to obtain information about approved ATCs submitted by other bidders, these ideas shall not be considered eligible for submittal as a VECP, unless the awarded contractor has an agreement letter from other bidders stating it is permissible.

Confidentiality

The Commission expressly reserves the right to adopt any specific CATC or ATC as standard practice for use on other contracts administered by the Commission, whether the CATC or ATC is accepted or rejected. The CATC or ATC shall not be used by the Commission until after the award of the Hurricane Deck bridge project.

Other than as listed above, all CATC and ATC submittals are considered confidential and will not be shared with other bidders. All members of the review team (except FHWA) will be required to sign a confidentiality agreement before reviewing any submittals. A copy of the form to be used for this purpose may be requested.

Design Requirements

The Commission will be responsible for completing all roadway and structural design plans for approved ATCs. The Commission will work with the contractor on any ATC that requires design and/or plan changes. If necessary, weekly meetings will be held. The plans will be developed to a degree such that the Commission and contractor are satisfied that biddable quantities are established. If the successful low bidder's proposal contains an ATC, their ATC will be developed into a finalized set of construction plans.

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Plans shall be complete before any construction related to the ATC can begin. The Commission will not be responsible for any cost associated with project delays due to the redesign and production of plans, specifications and quantities as needed for implementation of the ATCs or any additional construction cost not foreseen prior to the ATC design completion.

Bidding Requirements

If the successful bidder's pre-approved ATC is abandoned by the contractor or fails to be constructed for any reason, the contractor is obligated to complete the project utilizing the original design at the awarded cost.

Basis of Payment

The proposal documents contain all of the proposed work for the project to be bid as designed by the Commission. Contractors choosing not to participate in the ATC process must bid the base set of plans furnished by the Commission.

Contractors submitting an ATC bid will receive modified bidding documents with separate pay items for the pre-approved ATC and other applicable bid items. If the contractor elects to bid the project with pre-approved ATCs, the contractor shall enter the unit prices in the modified bidding document. If the successful contractor's pre-approved ATC is abandoned by the contractor or fails to be constructed for any reason, a no cost change order will be processed to re-adjust the bid items to the original design quantities. The contractor is obligated to complete the project utilizing the original design at the awarded cost.

No direct payment will be made for any change in quantity of pay items not included in the ATC that are affected by the contractor's decision to use an ATC on this project.

No direct payment will be made for delay of schedule due to the use of an ATC, including but not limited to delay resulting from the design, review, implementation or construction of an ATC. Additionally, if the ATC causes conflicts with utilities that were not previously identified in the original ATC submittal, the contractor's sole remedy for the effects of the presence of utilities, delay in their relocation or any other effects they have on delivery of the project shall be a non-compensable, excusable delay as provided in Section 105.7.3 of the Missouri Standard Specifications for Highway Construction. No time delay will be granted for any utility conflicts identified in the original ATC submittal.

The following are requirements and limits that will be placed on the Alternate Technical Concepts for this project.

General Design Specifications – Minimum Requirements

1. Roadway and Structural designs shall be in accordance with any state and all federal requirements, unless otherwise specified elsewhere in these contract documents.

2. Utilities shall not be disturbed except at the contractor's expense.

3. There are many factors that limit the options in altering the horizontal alignment. Prior to investing an extensive amount of time in any Conceptual ATC proposal that would affect the horizontal geometry of the base design; the contractor is strongly encouraged to contact MoDOT to discuss these limitations as noted in Step 1 of submittal process.

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4. ATCs proposing changes in maintenance of traffic should maintain traffic as good as or better than the Commission base design. Closures exceeding that of the base plan will be considered depending upon impacts to the traveling public and local input.

5. If a proposed ATC is beyond the limits of the Commission's existing right of way, it is the contractor's responsibility to coordinate with property owner's to obtain the necessary right of way. The contractor shall comply with all applicable federal laws, rules and regulations, including 42 U.S.C. 4601-4655, the Uniform Relocation Assistance and Real Property Acquisition Act, as amended and any regulations promulgated in connection with the Act, and with Chapter 523 of the Revised Statutes of Missouri. MoDOT will audit and review the contractor's right of way acquisition process and will in its sole discretion determine if a right of way acquisition has been obtained in accordance with all applicable federal laws, rules and regulations. If MoDOT determines that right of way was not purchased in accordance with all applicable federal laws, rules and regulations, the contractor is obligated to complete the project per the original design at the awarded cost or complete the approved ATC within the existing right of way.

6. ATCs may not result in a net increase in the acreage of disturbed wetlands.

7. ATCs requiring new Design Exceptions must receive both MoDOT and FHWA approval. Any new design exceptions must be offset by elimination or reduction of existing design exceptions elsewhere in the project. Any combination of existing and new design exceptions must produce a design that is judged to be equal to or better than the existing design as determined by MoDOT and FHWA. MoDOT in its sole discretion may reject any design exception proposal that it feels does not provide a suitable or safe design prior to FHWA's review.

8. Any proposed ATCs requiring modifications to previously approved actions for this project (ie NEPA, Design Exceptions, Conceptual Reports, permits, etc.) must receive MoDOT and FHWA approval. This information is available upon specific request to the MoDOT contact person. MoDOT in its sole discretion may reject any proposal that will require modifications to previous approvals. Any work required for modification of previously approved actions shall be the responsibility of the Commission.

Bridge Design Specifications – Minimum Requirements

1. Alternate bridge designs shall be in accordance with the 2010 - AASHTO LRFD 5th Edition and 2010 Interims, Load and Resistance Factor Design, for Seismic Performance Category A, as modified and interpreted by the MoDOT Engineering Policy Guide (EPG). Bridge deck drainage design shall be in accordance with the 1986 FHWA Report *"Bridge Deck Drainage Guidelines"*, and the May 1993 FHWA Report "*Design of Deck Drainage, Hydraulic Engineering Circular No. 21.*"

2. Alternate designs shall meet the following LRFD loading requirements:
   - HL-93
   - 35-lb/sf future wearing surface

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3. Drainage spread shall be limited to the shoulder width plus 3 ft. The design storm event shall be a 25-year (8.5" per hour) frequency and five-minute time period. Draining water directly over the edge of the bridge (i.e. curb outlets) is not allowed.

4. Minimum vertical clearance for finished structure shall be 45'-0" clear over normal pool elevation of 660.0 ft. for a minimum distance of 200'.

5. Design life for finished structures shall be 75 years minimum.

6. The minimum number of lanes and shoulder widths for finished structures, as shown on the contract plans, shall not be reduced from the original design.

7. A reinforced concrete overlay is required for prestressed voided slab or prestressed box girder superstructures.

8. If drilled shafts are used for intermediate bents, all requirements in the MoDOT Engineer Policy Guide or equivalent drilled shaft requirements contained in a pre-approved AAS shall be met.

Structural Wall Design Specifications – Minimum Requirements

These minimum Bridge Design Specification requirements apply to alternate wall designs.

1. Alternate wall designs shall be in accordance with the 2002 – AASHTO 17th Edition Load Factor Design, as modified by MoDOT Bridge Design Manual Section 3.6.2.

2. An aggregate shear key shall be used below MSE Walls.

Roadway Design Specifications – Minimum Requirements

1. This project has a Traffic Management Plan (TMP) that has been approved by FHWA. ATCs that impact the Traffic Control Plan or the TMP will require the preparation and approval, by MoDOT and FHWA, of a revised TMP. The revised TMP and Traffic Control Plan shall provide an equivalent impact to traffic during construction when compared to the one described for the base plans. The determination of equivalent impacts or acceptable impacts to traffic shall be at the sole discretion of the Commission and FHWA.

2. Alternate pavement designs must be consistent with the AASHTO Mechanistic-Empirical Design guidelines. Any alternate pavement designs must be determined, by the Commission, to provide an equivalent design and performance to the design included in the base Commission plans.

References

1. Federal Highway Administration (FHWA). *Construction Program Guide: Alternative Technical Concepts.* United States Department of Transportation, http://www.fhwa.dot.gov/construction/cqit/atc.cfm [Accessed Feb. 5, 2014].

2. Gransberg, Douglas D. Applying Alternative Technical Concepts to Construction Manager/General Contractor Project Delivery. *TRB 93rd Annual Meeting*, Transportation Research Board of the National Academies, Jan. 2014

3. Minnesota Department of Transportation (MnDOT). *Design-Build Manual*. Office of Construction and Innovative Contracting, St. Paul, MN, Aug. 2011.

4. Washington State Department of Transportation (WSDOT). *WSDOT Design-Build Project Delivery – Guidance Statement – Alternative Technical Concepts*. http://www.wsdot.wa.gov/NR/rdonlyres/27A54B86-9825-4E81-9DEE-138823B4ED86/74991/DesignBuildATCMOU.pdf [Accessed Feb. 5, 2014]

5. Colorado Department of Transportation (CDOT). *Design-Build Manual*. Innovative Contracting and Design-Build, Apr. 2014.

6. Missouri Department of Transportation (MoDOT). 147.1 Alternative Technical Concepts. Engineering Policy Guide for MoDOT. http://epg.modot.org/index.php?title=147.1_Alternative_Technical_Concepts [Accessed: April 5, 2014].

7. Papernik, Brian G. *Using Alternative Technical Concepts to Improve Design-Build and PPP Procurements.* March 2009. http://www.nossaman.com/using-alternative-technical-concepts-improve-designbuild-ppp [Accessed: April 5, 2014].

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B.8 Additive Alternates

What is it?

Additive alternates are used when it is necessary to keep the contract amount within a budget and lets the industry compete on the largest scope that fits within the budget. The STA provides the base bid package that includes most of the required scope for the project. The STA also provides a list of possible alternates for the project that could be incorporated based on the STA's decision and budgetary constraints. Bidding firms are typically required to submit prices for all bid items. However, the STA may prioritize the alternates so the bidders know what alternates carry more weight (*1*).

Why use it?

When using additive alternates, competition can increase among bidding firms to not only provide the lowest price for the base bid package, but also provide optimal pricing for alternate items that may be added to optimize the scope of the project. The most optimal price will allow for the most alternates to be added to the scope of work (*1*). Additive alternates also help when projects need to adhere to a strict budget and would like to include as much work as possible, but knows there is a minimal scope that needs to be completed (*2*).

What does it do?

Competition can increase during procurement due to the additive alternates as responsive bidding firms will provide the most optimal price that allows for the most additive alternates to be included in the scope. This then maximizes or enhances the work that is within the defined budget as well as minimizes the costs that could be added through the change order process.

How to use it?

When using additive alternates as part of the procurement process, the following items need to be considered (*1*, *2*):

- An STA will need to decide early enough in the project development stage to allow time and resources to develop additional alternate items that are included in the ITB or RFP.
- The ITB or RFP must clearly distinguish between the base work items and the associated quantities from the additional items and the additive associated quantities. Each additive item needs to be unique in its own right. Further, each additive item needs to include any general work requirements such as traffic control, mobilization, erosion control, etc.
- The STA must clearly define the scope in the base bid package so that it fulfils the basic purpose and need of the project. None of the additive alternates can be defined as items critical to fulfilling the purpose and need.

- To avoid subjectivity in the evaluation of bids, the additive alternates need to clearly specify the bidding procedure and the basis for contract award.
- The additive alternates should be listed in order of preference and will be added by priority to the base bid package only if the sum of the base and additive bids does not exceed the project budget or contract award limit. The additive alternates are considered for the project based on the priority determined by the STA.
- The common basis for award is the bidding firm that submits a bid with the most additive alternates along with the base bid package that does not exceeding the project budget or contract award limit. If more than one bidder submits a bid with the same number of additive alternates, the bidding firm that has the lowest price for the base bid package and the additive alternates should be awarded the project.
- The contract will need to clearly identify the contract time for the base work and the additional time allocated for each additive alternate. The actual contract time is determined by adding the base time to each additive alternate time included in the contract.
- If considering the use of cost-plus-time or lane rental provisions with additive alternates, the contractor may be required to bid a separate time or lane rental component for each additive alternate. The determination of contract time would include the base bid plus the selected alternates. This could result in a somewhat complicated bid analysis if there are multiple alternates and the cost of time is factored into the award decision.
- STAs may limit the amount of additive alternates to a certain percentage of the base bid package. For instance, Caltrans (*1*) does not allow additive alternates to exceed 10% of the base bid package.
- STAs may also limit the number of additive alternates. Limiting the number of alternates can increase the likelihood that one or more of the additives can be awarded.

When to use it?

Additive alternates are useful when the project scope is designed to be well within the project budget while providing additional items that can be awarded if the budget allows. Further, Caltrans (*1*) provides the following guidelines to use additive alternates for:

- Ensuring the scope of the project is maximized for limited and tight-budget projects.
- Projects that include uncertainty regarding the cost of the project can price different features that can be incrementally added to the project scope to maximize the use of available funds
- Project scope that can be tailored to include add-ons based on priority of importance
- Obtaining the best options for the funds available when substitutions are specified that improve the quality or performance based on the defined budget

Limitations?

The decision to use additive alternates needs to be made by the STA early in the project design process. Deciding to use this method in conjunction with a common procurement procedure can result in additional design costs and delays in completing the design (*1*).

Who uses it?

California, Louisiana, Michigan, Missouri, Pennsylvania, Federal Lands Highway Division

Example

The Iowa Department of Transportation used additive alternates for a highway project that was not to exceed the contract award limit of $2,000,000. The project Contracting Authority desired to maximize the scope of the project for the $2,000,000 that it had available for this project. The proposal form has defined a base set of items, added option 1, added option 2, added option 3, and designated $2,000,000 as contract award limit.

Bidder	$ Bid on Base Set of Items	$ Bid on Added Option 1	$ Bid on Added Option 2	$ Bid on Added Option 3
A	$1,500,000	$300,000	$150,000	$300,000
B	$1,600,000	$250,000	$50,000	$300,000
C	$1,700,000	$200,000	$80,000	$200,000
D	$1,800,000	$150,000	$150,000	$50,000

The first basis for award is the bidder submitting a bid with the most Added Options (in order of preference) while not exceeding the contract award limit of $2,000,000. Bidders A, B, and C submitted bids for the base set of items along with options 1 and 2 while not exceeding the $2,000,000 contract award limit. Bidder D was not further considered because they submitted a bid that included the base set of items and only option 1 while not exceeding the contract award limit. (i.e. Bidder D submitted a bid with fewer options while not exceeding the contract award limit).

The next basis for award is the lowest bid submitted that did not exceed the contract award limit with the base set of items and the same added options. Bidder B's bid of $1,900,000 for the base set of items with options 1 and 2 was the low bid. Bidder A's bid for the base set of items and options 1 and 2 was $1,950,000. Bidder C's bid for the base set of items and options 1 and 2 was $1,980,000.

It made no difference that Bidder A was the low bidder on just the base set of items because options could be added to the contract that would not exceed the contract award limit, which then maximizes the project scope. Further, it did not matter that Bidder C was the low bidder on the base set of items and option A (because Option 2 could be added to the contract and not exceed the Contract Award Limit when using Bidder A's low bid). Bidder D was the low bidder on the Base Set of Items and all added options, but adding all three options was not possible since the (because Bidder D's bid would exceed the contract award limit).

References

1. California Department of Transportation (Caltrans). *Alternative Procurement Guide.* Trauner Consulting Services, Inc., San Diego, 2008.

2. American Association of State Highway and Transportation Officials (AASHTO). *Primer on Contracting for the Twenty-First Century*. 5th ed., AASHTO Subcommittee on Construction, Washington, DC, 2006.

B.9 Alternate Design

What is it?

A bidding technique in which bidding firms are presented two or more designs for the same project in the bid documents or when the STA allows bidders to submit alternate designs that are equivalent in form and function to the design specifications/criteria presented in the bid documents. Bidding firms 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 (*1*).

Why use it?

The use of alternate design has helped to stimulate innovation, promote competition based on current market rates, and provides at least equal or even improved performance at lower costs when considering initial and life-cycle costs of alternate designs. An alternate design that is highly innovative might prove to cost more upfront, but can save an STA on operation and maintenance of the project over the long run. Alternate design can also lower initial costs in some cases.

What does it do?

STAs use alternate design procurement when more than one alternate is judged equal over the design life and there is a reasonable possibility that for the STA to obtain the least costly design approach will depend in competitive bidding (*2*). Projects that are mostly standardized and do not require large design efforts can use alternate design and obtain competitive pricing for the project (*1*).

How to use it?

Caltrans (*1*) developed a list of items to consider when using alternate design as part of the procurement process for a project. The following information provides direction to STAs on how to use alternate design properly:

- When using alternate design as part of the procurement process, the STA will need to require the submission of design calculations and drawings completed by a Professional Engineer. The alternate design must be equivalent to the specified design and meet the applicable design criteria for strength, serviceability, or other key criteria.
- The STA can preclude the use of experimental designs, or products, structures, or elements that are not from approved STA or AASHTO standards or are not included on the pre-approved lists in the RFP or ITB.
- The alternate design should comply with the design requirements of the STA, AASHTO standards, and other applicable material or product requirements.

- The contractor must provide a tabulation identifying the differences between the specified design and the alternate design to aid in establishing the equivalency of the design.
- Special provisions in the RFP or ITB should state that a delay in review and acceptance of alternate design submissions or a delay in revisions to required permits or any other delays related to alternate design will not extend the contract duration.
- If an alternate design is bid and the design is not accepted by the STA within a set number of calendar days (e.g. 30 days), a special provision should state that the contractor must construct the specified design at no additional cost to the STA.

When soliciting alternate pavement designs, the STA needs to consider the following (*1*):

- Examine issues that make only one type of pavement desirable to determine the feasibility of using alternate bids. These may include circumstances such as:
    a. Compatibility with existing pavements or total amount of new pavement compared to existing pavement.
    b. Safety and durability issues of differing pavement types in the driving lanes on urban construction.
    c. Consideration of how the pavement type effects the major item of work for the project (e.g. if a major item of work for the project is bridge work, the life cycle costs may be insignificant to the total project cost).
    d. Project staging and project scoping with regard to long-range transportation goals.
- For projects less than a specific number of lane miles (e.g. 2 lane miles), alternate pavement bidding is not recommended because the life cycle cost differential is insignificant, but the project development team should look at pavement options that bring the best value to the project. Full depth paved shoulder widths that have the same pavement type as the mainline should be proportionally included when calculating total lane-miles. Consideration should also be given to impacts to local residents and businesses along the route.
- The application of alternate designs for pavements requires the development of scenarios for future pavement rehabilitation for the project type and potentially a life-cycle cost analysis to be included as a cost element to the alternate design, which can have a lesser design life. The additive cost is determined by the STA and is reflected in the appropriate bid schedule as a lump sum cost increase to the bid amount.

STA engineers and third-party designers should consider including the following in the plans for projects with alternative pavement designs (*1*):

- Plans should contain typical sections for both alternates, including station limits and all side road connections.
- All pay items for full depth alternate pavements should be based on the area (e.g. yd_2) of the entire pavement surface.
- Provide separate sheets for the items associated with each alternate.

- If the design results in different base quantities to maintain the profile grade, include the appropriate quantities in the respective sections for each pavement alternate.
- For shoulder rumble strips, include the bituminous rumble strip pay item with the asphalt alternate, and the concrete rumble strip pay item with the concrete alternate.
- Crossroad structures should be designed to accommodate a minimum cover based on the thicker pavement design.

The NCHRP report 561 (4) provides a list of general alternate design criteria that can be included in the RFP or ITB:

- Proposed design alternate and experience
- Mix designs and alternatives
- Environmental protection and considerations
- Site plan
- Innovation and aesthetics
- Site utilities plan
- Coordination
- Cultural sensitivity

When to use it?

Alternate design procurement is useful for receiving proposals that provide an alternate for a structural or pre-engineered component, or an alternate pavement design. The California Department of Transportation *Alternative Procurement Guide* (*1*) states the following circumstances in which a project would be a good candidate to use alternate design:

- Project involving the construction of alternate structures or devices, especially when the contractor has more experience than the STA in constructing these structures
- Standardized projects that do not require a large design effort, such as retaining walls, bridges or other structural components, traffic signs, and traffic control devices
- Alternate design has been used by STAs as part of a multi-parameter/best value procurement process in which the “A” component is “cost”, the “B” component is “time” and the “C” component is the “alternate design”.

Limitations?

Alternate design is not a primary procurement procedure. It is to be used in conjunction with one of the primary procurement procedures as a supplement. Also, alternate design is not a recommended procurement procedure for complex and/or high risk design projects. Projects that benefit from the use of alternate design as a supplementary procurement procedure are projects with general and pre-engineered components that potential firms can easily bid a more economical yet matching design.

Who uses it?

Alabama, California, Kentucky, Louisiana, Maryland, Michigan, Missouri, Pennsylvania, Federal Highway Administration, Federal Lands Highway Division

Example

During the 1980s, Pennsylvania Department of Transportation (PennDOT) began allowing optional alternate design submissions by contractor during the bidding process. The alternate design may include virtually any aspect of the bridge design such as a redesigned superstructure, substructure, span length, etc. The contractor is not allowed to change the clear span distances (horizontal/vertical clearances) or the horizontal/vertical alignments. The alternate design must be equivalent to the structure designed in the bid documents. An acceptable conceptual alternate bridge design must be approved within 30 calendar days of bid opening. If the alternate bridge design is not approved during that time, the contractor must build the “as-designed” structure at no additional cost. Another option besides providing a total new design is to perform value engineering to the “as-designed” structure. The contractor must pay for a portion of PennDOT’s cost to review the alternate design (up to $5,000). The results of instituting the alternate bridge design policy indicate a cost savings of 10 percent for major structures and 7.2 percent for nonmajor structures (*2*).

References

1. California Department of Transportation (Caltrans). *Alternative Procurement Guide*. Trauner Consulting Services, Inc., San Diego, 2008.

2. American Association of State Highway and Transportation Officials (AASHTO). *Primer on Contracting for the Twenty-First Century*. 5th ed., AASHTO Subcommittee on Construction, Washington, DC, 2006

3. Beard, Jeffrey L, Michael Loulakis, and Edward C. Wundram. *Design-Build: Planning Through Development*. McGraw-Hill, New York, 2001.

4. Scott, Sidney, Keith R. Molenaar, Douglas Gransberg, and Nancy C. Smith. *NCHRP Report 561: Best-Value Procurement Methods for Highway Construction Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington DC, 2006.

APPENDIX C. PAYMENT PROVISIONS SUPPORT DOCUMENTS

C.1 Unit Price

What is it?

Unit price is the most common payment strategy for highway projects that establishes a set monetary price for construction items in which the State Transportation Agency (STA) pays the unit price multiplied by the quantity installed *(1)*. This is useful for projects where quantities are difficult to determine before the work begins. The contractor determines the quantities, the STA verifies the quantities, and then utilizes the unit price to find the total cost.

Why use it?

A unit price agreement provides several advantages, among which are:

- The STA pays only for the actual quantities performed, supplied, or constructed on the project *(2)*. If estimated quantities result to be larger than what is actually used, the STA pays only those used quantities,
- It may help reduce some general contingency that protects the contractor from inaccurate quantity estimates *(2)*, and
- The STA saves the time that otherwise it would spend detailing plans and specifications with exact quantities for a lump sum contract *(3)*

What does it do?

This type of provision works well when the actual quantities or number of units are undetermined or unknown. With this provision, the contract establishes unitary costs for each item included in the scope of work and the STA reimburses the contractor only for the actual units of every item that the contractor provides, installs, or constructs on the project *(2)*. The work done under a unit-price contract typically is not made up of a large variety of items. Instead, this provision is adequate for projects where there is a relatively small number of items but in large quantities, such as highway projects *(4)*.

How to use it?

The first step when developing a successful unit price contract is to prepare general designs and drawings along with estimates of quantities so that bidders can get an idea of the scope of the project. Upon contract letting, supplementary drawings can be prepared far enough ahead to allow contractor to secure all the necessary information in time for obtaining materials, making detail drawings, and doing the actual work.

During the construction phase both contractor and STA need to keep detailed computations and bookkeeping of the job. Both parties usually have personnel making estimates of the amount of materials used and the work completed during the preceding period, basing their number on field measurements or data obtained from the drawings, shipping bills, and similar information. These estimates are compared and if discrepancies occur, calculations are reviewed and a quantity is determined and agreed upon as a basis of payment.

In project where there is are several small items, these are usually not included in the unit price contract. The STA should try not to include a large number of unit price items, as this makes a unit price provision impractical. The units of payment established in the contract should be definite and measurable. One issue with unit price contracts is that since quantities are not contractually defined, sometimes the initial estimates can be so far off reality, or considerable changes occur that the initial unit price set for an item becomes inapplicable. Therefore, one last consideration, is to include a contract clause that states the quantity thresholds that would allow and activate a change in the unit prices *(4)*.

When to use it?

Unit price provisions are commonly used in the highway construction industry as the items used on this type of projects are usually few and in large quantities. However, items with small quantities should be avoided as they can make the process cumbersome.

Limitations

The main risk with Unit Price provisions is in that serious errors or inaccuracies may occur in the estimating phase. Under this provision the STA retains the risk for any quantity variations and when errors or significant changes occur the STA can end up paying more than expected, and causing project delay as a result of lack of funding *(4, 5)*. In addition, considerable changes in the scope of work may lead to renegotiations with the contractor on the unit prices pre-established *(4)*.

One final issue with unit price contracting is that the overall process can be cumbersome. On large construction projects processing approvals, measuring work, and calculating quantities consumes time and resources *(5)*.

Who uses it?

All STAs have used unit price for contracting payment provisions.

Example

Every STA has their own guidelines, formats, and worksheets that are provided to contractors in order to establish the unit prices to be used in the construction of a project. The quantities are added as they become known. As an example, The Missouri Department of Transportation used the following pricing page to establish aggregate unit prices per the unit of measurement. This pricing page was used in the procurement of a job-order contract to provide aggregate on an as needed basis for MoDOT across the state of Missouri. The example document below details the pricing page for MoDOT district 1.

4. PRICING PAGE

4.1 Spring Aggregate – D1 - The bidder shall provide a firm, fixed price in the table below for providing the deliverables/services in accordance with the provisions and requirements specified herein. All costs associated with providing the required deliverables/services shall be included in the prices stated below.

SPECIFICATION DESIGNATION:	**Spec. 1**	Graded Aggregate for Bituminous Surface--**Section 1004: Grade 1.**
	Spec. 4	Aggregate for Seal Coats--**Section 1003: Grade C.**
	Spec. 8	Aggregate for Base--**Section 1007: Type 1**

STARTING AND COMPLETION DATES

Earliest Delivery Date	**Completion Date**
Upon Receipt of "Notice to Proceed"	May 17, 2007

DISTRICT 1 – ANDREW COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*
1A	4	300	Savannah	$________ *per ton*	$________ *per ton*

DISTRICT 1 –BUCHANAN COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*
2A	4	300	St. Joe Metro	$________ *per ton*	$________ *per ton*
3A	8	250	Faucett	$________ *per ton*	$________ *per ton*

DISTRICT 1 –CALDWELL COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*

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4A	8	200	Hamilton	$______ *per ton*	$______ *per ton*
5A	8	200	Kingston	$______ *per ton*	$______ *per ton*

DISTRICT 1 –CLINTON COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*
6A	8	200	Plattsburg	$______ *per ton*	$______ *per ton*

DISTRICT 1 –DEKALB COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*
7A	8	200	Cameron	$______ *per ton*	$______ *per ton*

DISTRICT 1 –HARRISON COUNTY

Item #	Specification Designation	Number of Tons	MoDOT Destination	OPTION #1 Delivered to MoDOT Price Per Ton, *Firm, Fixed Price*	OPTION #2 Picked-up at Plant Price Per Ton, *Firm, Fixed Price*
8A	1	6,500	Bethany	$______ *per ton*	$______ *per ton*

Missouri Department of Transportation
RFB 2-070123A
2

References

1. Knutson, Kraig, Cliff J. Schexnayder, Christine M. Fiori, and Richard E. Mayo. *Construction Management Fundamentals*, 2nd ed., McGraw-Hill, New York, NY, 2009.

2. Handfinger, A. *Understanding Contractual Pricing Arrangements – Fixed Price, Cost-Plus, and Guaranteed Maximum Price*. Pecker and Abramson P.C. http://www.pecklaw.com/images/uploads/communications/Client_Alert-Understanding_Contractual_Pricing_Arrangements.pdf [Accessed: March 17, 2014].

3. Dunham, C.W. *Dunham and Young's Contracts, Specifications, and Law for Engineers*. McGraw-Hill, New York, 1986.

4. Collier, K. *Construction Contracts*. Merrill/Prentice Hall, Upper Saddle River, New Jersey, 2001.

5. Scott, Sidney and Kathryn Mitchell. *Alternative Payment and Progress Reporting Methods: Task #2*. Trauner Consulting Services, Inc. FHWA Construction Management Expert Technical Group, Federal Highway Administration, Washington, DC, 2007.

C.2 Lump Sum

What is it?

Lump sum is a payment method where the contractor agrees to provide contractually specified work at a one specific price *(1–4)*. Here the State Transportation Agency (STA) agrees to pay the price upon completion of the work or according a negotiated payment schedule *(1)*. This provision is widely used by STAs as an alternative or complement to unit price contracts.

Why use it?

Lump sum payment provisions are a good alternative to the traditional unit price payment used by STAs. These provisions can have the following advantages:

- Lower the financial risks to the STA *(1)*
- Require less STA administrative resources thus resulting in reduced engineering costs *(1, 2)*
- Construction cost is defined at the bid *(1)*
- During construction, it reduces the time spent by field inspectors on measuring quantities and preparing invoices, allowing them to focus on controlling quality of the work *(2)*
- Reduced the time required to deliver a program or project to advertisement *(1, 4)*
- Creates an incentive for contractor to control costs and work more efficiently *(2)*

What does it do?

The main purpose of the lump sum payment provision is to reduce the design and administrative costs incurred with the unit price contract *(1)*. The lump sum contract is the most basic form of agreement between a contractor and the STA *(1)*. Here, the STA will estimate the project cost by breaking down the work into several construction pay items and applying current average unit prices. The contractor uses the same method when developing the bid but adds up a contingency to cover for the risks that it bears *(1)*.

How to use it?

Compared to the traditional unit price payment system, under lump sum provisions the STA does not provide quantity estimates in the bid package. The contractor is responsible for developing quantity take-offs from the plans for estimating a lump sum item or items for a project *(2)*. Within this lump sum amount the contractor includes the costs of the risks associated with this type of contract, and the STA awards the project to the contractor that proposes the lowest lump sum. During construction, the STA generally reimburses the contractor in monthly payments that are proposed by the contractor in the proposal as a percentage of the lump sum.

The STA should provide a lump sum contract changes clause to allow for scope changes or adjustments to material quantities. A good solution to deal with lump sum changes is to include a contingency price for the lump sum contract that facilitates reimbursing the contractor for additional work not initially covered by the contract *(3)*.

When to use it?

Lump sum payment provisions are adequate for:

- Projects where scope of work is well-defined *(1)*,
- Scope is unlikely to change and delays are unlikely to happen *(1)*,
- Project with few bid item and short completion duration *(1)*, and
- Projects using Design-Build delivery *(1)*.

Some of these project items can be pavement marking, bridge painting, fencing, guardrail, intersection improvements with known issues, landscaping, lighting, mill/resurfacing, minor road widening, sidewalks, signing, and signalization *(2)*.

These provisions are not suitable for urban construction/reconstruction projects, complex or unique projects, project with potential for utility delays, projects with sub-soil earthwork or underground utility work, concrete pavement rehabilitation projects, major bridge rehabilitation/repair projects with unknown quantities *(1, 2)*.

Limitations?

Some risks and disadvantages resulting from lump sum payment provisions are:

- Changes can be difficult and costly *(1)*
- Higher financial risks to the contractor may increase bids, especially when there is an uncertainty associated with the project *(1, 2)*
- STA will pay the total lump sum even when the actual quantities used under run the estimated amounts *(2)*
- For contracts with multiple lump sum items, there is the potential for front-end loading *(2)*

Who uses it?

All STAs have used lump sum/fixed price for contracting highway projects.

Example

As every STA has used lump sum for contracting, each STA has their own guidelines to reference when needed. As an example for this guidebook, the Florida Department of Transportation provides guidelines in the Plans Preparation Manual (5). Below is a summary of the lump sum guidelines from FDOT:

FDOT Lump Sum Project Guidelines

22.1 General

The purpose of Lump Sum projects is to reduce the costs of design and contract administration associated with quantity calculation, verification and measurement. This contracting technique requires the Contractor to submit a lump sum price to complete a project as opposed to bidding on individual pay items with quantities provided. The Contractor will be provided a set of bid documents (plans, specifications, etc.) and will develop a Lump Sum bid for all work specified in the contract drawings.

The decision to use the Lump Sum Contracting Technique on a project should be made by the District Design Engineer in consultation with the District Construction Engineer Lump Sum Projects should be identified during the scope development process, rather than during or after the design process. Conversion of partially complete plans and completed “plans on the shelf” that were originally developed as conventional bid item type projects to the Lump Sum Technique may require significant rework and is generally not recommended.

The contingency pay item is recommended on a Lump Sum project. This tool is used to compensate the Contractor for any additional work requested, which is not covered in the contract documents. District Construction should be consulted for the contingency amount.

A 60-day advertisement is required to allow Contractors enough time to develop quantities.

The decision to have a pre-bid conference will be determined through consultation with District Construction.

22.2 Project Selection

Lump Sum contracting should be used on simple projects. “Simple” is defined by the work activity, not by the project cost. “Simple” projects are:

1. Projects with a well-defined scope for all parties (Design and Construction)
2. Projects with low risk of unforeseen conditions (i.e., projects that do not involve such things as significant underground utilities, earthwork variations, underground drainage pipes, bricks under pavement in urban areas, etc.)

3. Projects with low possibility for change during all phases of work – Design and Construction (i.e., limited possibilities for added driveways, median modifications due to developments, changes due to political involvement, etc.)

Examples of projects that may be good Lump Sum contracting candidates:

1. Bridge painting
2. Bridge projects
3. Fencing
4. Guardrail
5. Intersection improvements (with known utilities)
6. Landscaping
7. Lighting
8. Mill/Resurface (without complex overbuild requirements)
9. Minor road widening
10. Sidewalks
11. Signing
12. Signalization

Examples of projects that may not be good Lump Sum contracting candidates are listed below. Use of Lump Sum contracting on these type projects requires written approval by the State Roadway Design Engineer:

1. Urban construction/reconstruction
2. Rehabilitation of movable bridges
3. Projects with subsoil earthwork
4. Concrete pavement rehabilitation projects
5. Major bridge rehabilitation/repair projects where there are many unknown quantities.

22.3 Plans Preparation

Plan content should conform to the requirements of Volume II, subject to the guidance provided herein. Designers should detail plans, either by detailed drawings or plan notes, to clearly describe the work to be performed by the contractor. Special care should be used to insure pay item notes and other notes and requirements such as “as directed by the Engineer” are deleted or replaced with specific direction and details that can be properly bid on by the Contractor. Following are some of the desired elements in a set of Lump Sum plans:

1. Typical Sections.
2. Milling details and Resurfacing details to show any cross slope corrections.
3. Summary Boxes to define work when work is not shown on the plan sheets (i.e., Summary of Side Drain and Mitered Ends, Summary of Guardrail/Removal, Summary of Mailbox replacement, etc.) The standard summary boxes contained in the FDOT CADD Cell Library should be used. Note -- Summary boxes should not have totals shown at the bottom of each box. Summary Boxes are not required when plan details sufficiently describe the work.
4. Plan sheets to accurately depict existing conditions and detail all work to be performed by Contractor. (i.e., show all limits of milling and resurfacing, pipe installations, limits of sod when different from typical section, all concrete work, guardrail removal/installation, etc.)
5. Details of work not covered by typical section or Design Standards (i.e., curb and gutter installation, traffic separator limits, special curb ramps, modifications to storm inlets, etc.)
6. Cross-sections when shoulder point is moved. When cross sections are provided, earthwork columns and earthwork summaries and totals should be left blank since earthwork quantities are not calculated.
7. Anticipated pile tip/drilled shaft elevations on bridge projects. Note: This is the predicted elevation to achieve axial capacity and satisfy all other design requirements and is usually deeper than the minimum tip elevation shown for piles.

No computation book is prepared.

Signing, pavement marking, lighting and signalization plan sheets shall continue to contain pay item numbers to be used for reference purposes only. Conduit lengths on conduit pay items should not be shown. A note should be placed on each sheet that states, “Pay item numbers are provided only for the purpose of describing the work to be performed. Pay item descriptions are found in the Department’s Basis of Estimates Handbook and the Project Specifications package.” Signing, Pavement Marking, and Signalization plans should NOT have any Tabulation of Quantities sheets included in the contract plans.

22.4 Preliminary Estimate

If there is only one project in the contract, the designer will code in the pay item for Lump Sum (Alternative Bidding) (999-2) and the Initial Contingency Amount (Do Not Bid) Pay item (999-25). If there is more than one project in a single contract (strung projects), the designer will code both pay items on each project.

The designer shall provide data to the District CES Coordinator to be used in the estimate process. The data necessary for preparing the preliminary estimate may differ with project type and complexity. Preliminary estimates for Lump Sum projects may be determined in a number of ways:

Data from the designer, historic data, long-range estimate (LRE), and by reviewing data from similar, current projects. The intent of Lump Sum Contracting is not to shift the responsibilities or work involved in estimating quantities from the designer to the District CES Coordinator. The cooperative effort of the designer in providing data in an electronic spreadsheet or other means acceptable to the District CES Coordinator will be helpful in improving the Lump Sum Preliminary Estimate Process. Contact the appropriate District for specific requirements.

22.5 Specifications

The Design Project Manager will provide an "Items of Work" checklist to the District Specifications Office. The Specifications Office will include the work items identified on the checklist in the "Intent and Scope" in the Specifications Package. The checklist shall include, as a minimum, the major work items shown in the sample included with these guidelines.

Lump Sum Projects require Special Provisions that modify the first nine articles of the Standard Specifications. These Special Provisions are in the Specifications Workbook and must be included as part of the Specifications package.

Article 9-2 of the Special Provisions for Lump Sum Projects shall be completed with predetermined unit prices for asphalt materials, concrete, and base when applicable. These unit prices will serve as a basis for calculating pay reductions for deficiencies accepted by the Engineer. In the case of asphalt overbuild, the predetermined unit price for the material used for overbuild will serve as a basis for pay adjustments for spread rates that differ from the spread rate shown in the plans. All predetermined unit prices should be based on an analysis of similar type projects let in the District and/or the District wide average of projects let within the six months prior to the letting date of the project.

For projects including bridges, Article 9-2 of the Special Provisions for Lump Sum Projects shall be completed with predetermined unit prices for piling and/or drilled shafts as applicable. These unit prices will serve as a basis for pay adjustments for the actual quantities installed as additions or deletions from the individual element lengths shown in the plans. All predetermined unit prices should be based on an analysis of similar type projects let in the District and/or the District wide average of projects let within the six months prior to the letting date of the project.

22.6 Contracts Administration

Contracts Administration shall include the information provided in the Specifications Package "Intent and Scope" in the job advertisement. This information can be used by the contractors/subcontractors to determine what type of work is contained in the project, in lieu of a list of pay items.

22.7 Construction Contract Administration

Monthly payments will be made based on a payout schedule mutually agreed upon by the Department and the Contractor. The payout schedule will include only major tasks similar to what has been used on design-build projects.

Lump Sum contracts are not fixed price. Changed conditions, extra work and unforeseen work must be negotiated and resolved with the Contractor utilizing Supplemental Agreements and/or Work Orders on Contingency Supplemental Agreements.

Construction inspection personnel should not be required to document quantities except for asphalt spread rates and other items subject to pay adjustments (items with predetermined unit prices). Measurement and completion of “Final” quantity for summary boxes on plan sheets is not required. Focus should be on inspection and achieving a quality final product. For example, the project engineer will not be concerned with how many square yards of sod it takes or the number of miles of final striping. The project engineer will be charged with ensuring that the sod, striping, embankment, pipe, etc., meets the lines and grades of the plans and specifications.

22.8 Materials Sampling and Testing

The Construction Quality Reporting (CQR) System relies on the pay items identified in the CES or TRNS*PORT to generate a Job Guide Schedule based on the Sampling, Testing and Reporting Guide (STRG). On Lump Sum projects, since there is no detailed pay item list to identify the various types of work, the CQR system will output a generic Job Guide Schedule that will address the 5 material areas common to most projects. These include Earthwork and Related Operations, Base Courses, Hot Bituminous Mixtures, Portland Cement Concrete, and Reinforcing Steel. Some of these materials will not actually be used depending on the project scope. Inspection personnel should use the Job Guide Schedule entries applicable to their project and input sample data and field test results into the (CQR) system in accordance with standard procedures. Materials not included on the Job Guide Schedule will be accepted in accordance with Section 6 of the Contract Specifications and/or other pertinent contract documents.

References

1. Michigan Department of Transportation (MDOT). *Innovative Construction Contracting*. Apr. 2013.

2. California Department of Transportation (Caltrans). *Innovative Procurement Practices*. Alternative Procurement and Contracting Methods Tasks 3.2 and 3.3, Trauner Consulting Services, May 2007.

3. Scott, Sidney and Kathryn Mitchell. *Alternative Payment and Progress Reporting Methods: Task #2*. Trauner Consulting Services, Inc. FHWA Construction Management Expert Technical Group, Federal Highway Administration, Washington, DC, 2007.

4. Colorado Department of Transportation (CDOT). *Innovative Contracting Guidelines*. Innovative Contracting and Design-Build, Nov. 2013.

5. Florida Department of Transportation (FDOT). Lump Sum Project Guidelines. *Plans Preparation Manual*, Vol. 1, January 2002.

C.3 Cost Reimbursable

Also known as Cost Plus

What is it?

Cost Reimbursable is a payment provision under which the State Transportation Agency (STA) reimburses the contractor for the work performed based on an agreed calculation method *(1)*. The different calculation methods can be:

- Unit price - payment based on performed quantities at set unit prices
- Cost Plus Fixed Fee - payment based on actual costs and fixed fee
- Cost Plus Incentive Fee - payment based on actual cost plus an incentive based fee
- Cost Plus Award Fee - payment based on actual cost plus performance based fee
- Time Spent - payment based on actual hours spend at set billing rates
- Time and Material - payment based on actual costs with fixed markup on costs

Why use it?

Cost reimbursable contracts can provide many advantages. By using this type of provision, STAs can save time on their projects by starting the construction phase before design reaches 100% completion *(2)*. This is because cost reimbursable contracts do not require detailed design specifications or well defined scope of work as they are not based on a fixed project cost. Another advantage is that cost reimbursable contracts can improve project quality *(2)*. This is given because this provision allows bringing in the contractor earlier during the design phase to work with the designer helping identify design and constructability issues. Finally, another benefit is that it can help saving money *(2)*. Compared to fixed price contracts, in this case the contractor bares minimum risks while the STA bares all risks. This might seem a disadvantage at first, but under these conditions the contractor does not have the need to include contingency costs and if tight control is executed by the STA, then this contingency costs become savings. Additionally, by bringing the contractor early changes in the scope of work and specifications are reduced thus reducing project costs as well.

What does it do?

The main effect of cost reimbursable provisions is that they eliminate the economic risks inherent to a project for the contractor and place them on the STA *(3)*. This happens because the project costs are not well identified at the time of the negotiations and therefore a fixed final project cost cannot be clearly defined. As a result the STA reimburses the contractor on the actual costs incurred to complete construction supported by some kind of evidence of the expenditures. This exposes the STA to growing costs if the initial estimates were poorly determined. Most cost plus contracts are open ended, this means that final construction cost are unknown until the project is completed *(4)*

How to use it?

Under this type of provision contract negotiations usually take place when drawings and specifications are incomplete. As a result the STA and contractor negotiate a "scope contract". This is done based on preliminary drawings and outline specifications which allow reaching a "target estimate" cost *(4)*. Some special considerations that should be taken into account during negotiations should be:

- Definition of the subcontract letting procedure. This is usually competitive bid subcontracting but in some cases this is not feasible or desired *(4)*.
- Clear definition of determination and payment of contractor's fees. These can be set in different ways. Here, not only the amount should be defined but also the method by which the fees will be paid to the contractor during the life of the contract. The most common methods of determining the contractor's fees are *(4)*:
    - Cost plus percentage of cost contracts - Here the fees are set a percentage of construction costs and can be fixed or variable throughout the project duration. This method is well suited for work whose scope and nature are poorly defined at the outset of operations such as emergency projects.
    - Cost plus fixed fee - Here, the contractor's fee is a fixed sum of money that does not fluctuate with the actual cost of the project. To use this method, the project needs to be of such nature that the project costs can be reasonably estimated before construction. This calculation can motivate the contractor to execute the work as diligently as possible.
    - Incentive contracts - These are mostly used with the cost plus percentage fee method, but can also be used in with cost plus fixed fee contracts in some cases. Here, the bonus and penalty provisions are applied to the determination of the final fee which are based on the costs and/or time targets. This method requires fairly defined specifications and scope of work that allow for accurate calculation of targets.
- Clear understanding of the accounting methods to be followed is also essential. This helps avoiding problems in the future and includes details of record keeping, purchasing and the reimbursement procedure.
- Finally, a list of reimbursable costs jobs should be negotiated and set forth. This list can include cost of the work, labor costs, subcontract costs, costs of materials and equipment, costs of temporary facilities, overhead costs, and other miscellaneous costs such as insurance and bond costs, permit fees, etc.

When to use it?

Cost reimbursable provisions should be used when there is variability in the scope of work as a result of lack of knowledge in the early project stages and the need to start construction early *(3)*

Limitations?

The major disadvantage with this provision is that the final costs of the project are unknown *(5)*. As a result, in cases where the project goes over the initial estimate, the STA can face severe budgetary problems. Another disadvantage of the cost reimbursable contracts is that the STA has to review and approve the all contractor claimed expenditures thus increasing the administrative costs. In addition, the STA faces the risk of contractor disputes when this expenditures are not approved.

Who uses it?

Arkansas has experience with cost reimbursable contracting to hire consultants. Currently, no STA uses cost reimbursable to hire a contractor

Example

The following is an example of a Cost Plus Fixed Feed contract from the Arkansas State Highway and Transportation Department (AHDT) *(5)*:

1. TYPE OF AGREEMENT

1.1. This Agreement is a cost-plus-fixed-fee contract. The Consultant is being hired to perform professional engineering services in connection with the Project as set forth herein. In consideration for Title I services performed, the Owner will reimburse the Consultant for allowable direct and indirect costs, as defined herein, and pay the Consultant a fixed fee. If Title II services are to be performed, the Owner will reimburse the Consultant for allowable direct costs and also pay the Consultant an amount determined by multiplying the salary rate of the individual(s) performing the Title II services, as shown on the Schedule of Salary Ranges, by the Title II Multiplier.

2. COSTS, FEES, AND PAYMENT

2.1. Allowable costs.

2.1.1. Allowable costs are subject to the limitations, regulations, and cost principles and procedures in 48 C.F.R. Part 31, which are expressly incorporated into this Agreement by reference. For the purpose of reimbursing allowable costs (except as provided in subparagraph 2 below, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term costs includes only—

2.1.1.1. Those recorded costs that, at the time of the request for reimbursement, the Consultant has paid by cash, check, or other form of actual payment for items or services purchased directly for the Agreement;

2.1.1.2. When the Consultant is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for—

- Materials issued from the Consultant's inventory and placed in the production process for use in its performance under this Agreement;
- Direct labor;
- Direct travel;
- Other direct in-house costs; and
- Properly allocable and allowable indirect costs, as shown in the records maintained by the Consultant for purposes of obtaining reimbursement under government contracts; and
- The amount of progress payments that have been paid to the Consultant's subcontractors under similar cost standards.

2.1.2. Consultant's contributions to any pension or other post-retirement, profit-sharing or employee stock ownership plan funds that are paid quarterly or more often may be included in indirect costs for payment purposes; provided, that the Consultant pays the contribution to the fund within 30 days after the close of the period covered. Payments made 30 days or more after the close of a period shall not be included until the Consultant actually makes the payment. Accrued costs for such contributions that are paid less often than quarterly shall be excluded from indirect costs for payment purposes until the Consultant actually makes the payment.

2.1.3. Notwithstanding the audit and adjustment of invoices or vouchers, allowable indirect costs under this Agreement shall be obtained by applying Indirect Cost Rates established in accordance with Subsection 3.3 below.

2.1.4. Any statements in specifications or other documents incorporated in this Agreement by reference designating performance of services or furnishing of materials at the Consultant's expense or at no cost to the Owner shall be disregarded for purposes of cost-reimbursement.

2.2. Salaries. The following schedule covers the classification of personnel and the salary ranges for all personnel anticipated to be assigned to this project by the Consultant:

2.2.1. SCHEDULE OF SALARY RANGES

[Provided by Consultant]

2.2.2. The Owner shall reimburse the Consultant for overtime costs only when the overtime has been authorized in writing by the Owner. When authorized, overtime shall be reimbursed at the rate of time and one-half for all nonexempt employees. Notwithstanding this provision, the Consultant must comply with all federal and state wage and hour laws and regulations, regardless whether the overtime is considered reimbursable under this Agreement.

2.3. Indirect Cost Rates.

2.3.1. Allowable indirect costs incurred by the Consultant shall also be reimbursed by the Owner at the Indirect Cost Rate. The Indirect Cost Rate of the Consultant for this Agreement shall be the rate as set forth in subsection 1.10. If applicable, the Indirect Cost Rate for subcontractors shall be determined in the same manner and subject to the same limitations as the Consultant, and shall be listed for each subcontractor identified in Appendix B. The Indirect Cost Rate, or any adjustment thereto, shall not change any monetary ceiling, contract obligation, or specific cost allowance, or disallowance provided for in this Agreement except as provided for in sections 3.3.4 and 3.3.5. The Indirect Cost Rate must reflect the allowable indirect costs pursuant to 48 C.F.R. Part 31 ("FAR").

2.3.2. In establishing the Indirect Cost Rate or proposing any adjustment thereto, the Consultant shall, upon request, submit to the Owner, FHWA, or their representatives an audited indirect cost rate and supporting cost data in accordance with the requirements set forth in the current Arkansas Highway & Transportation Department Indirect Cost Rate Audit Requirements.

2.3.3. During the term of this Agreement, if an audit of a subsequent accounting period of the Consultant demonstrates that the Consultant has incurred allowable indirect costs at a different rate than the Indirect Cost Rate, the Indirect Cost Rate shall be adjusted. Any adjustment is subject to the audit and documentation requirements of the FAR and the current Arkansas Highway & Transportation Department Indirect Cost Rate Audit Requirements. Except in the case of a provisional Indirect Cost Rate, as provided in the following subparagraphs, or the disallowance of cost following a subsequent audit, any adjustment to the Indirect Cost Rate shall be effective only prospectively from the date that the adjustment is accepted.

2.3.4. In order to expedite some projects, when an audited indirect cost rate has not yet been submitted and approved, the Owner may extend a temporary waiver and accept a provisional indirect cost rate. This provisional rate must be reviewed by, and receive a positive recommendation from the Arkansas Highway and Transportation Department's Chief Auditor. The provisional cost proposal must be accompanied by written assurance from an independent CPA that he/she has been engaged to audit the costs in accordance with the above requirements. The anticipated audit must be based on costs incurred in the most recently completed fiscal year for which the cost data is available, with the audit scheduled to begin within a reasonable time frame. If the date of the initial cost proposal is within the last quarter of the current fiscal year, the audit may be delayed until the current fiscal year is closed and the final cost data is available. The written assurance from the CPA that he or she has been engaged to perform the audit at an appropriate time is still required.

2.3.5. Once an audited indirect cost rate is approved, the ceiling prices provided for in the initial agreement using the provisional indirect cost rate will be adjusted with a supplemental agreement to implement the resulting increase or decrease from revising the indirect cost rate, and all amounts paid the consultant prior to receipt and acceptance of an audited indirect cost rate will be retroactively adjusted for changes in the indirect cost rate. However, no changes in hours, fixed fees, or other costs will be allowed as a result of applying the audited indirect cost rate.

2.4. Fees. The justification for the fees and costs is contained in Appendix A. In addition to reimbursement of the allowable costs as set forth above, the Owner shall pay to the Consultant a fixed fee of $__________ for Title I Services. For Title II Services, if applicable, the Owner shall reimburse the Consultant for allowable direct costs and also pay to the Consultant an amount determined by multiplying the salary rate of the individual(s) performing the Title II Services, as shown on the Schedule of Salary Ranges, by the Title II Multiplier. The Title II Multiplier shall account for all fees and indirect costs associated with Title II services.

2.5. Invoices, Reimbursement, and Partial Payments. Submission of invoices and payment of the fees shall be made as follows, unless modified by the written agreement of both parties:

2.5.1. Not more often than once per month, the Consultant shall submit to the Owner, in such form and detail as the Owner may require, an invoice or voucher supported by a statement of the claimed allowable costs for performing this Agreement, and estimates of the amount and value of the work accomplished under this Agreement. The invoices for costs and estimates for fees shall be supported by any data requested by the Owner.

2.5.2. In making estimates for fee purposes, such estimates shall include only the amount and value of the work accomplished and performed by the Consultant under this Agreement which meets the standards of quality established under this Agreement. The Consultant shall submit with the estimates any supporting data required by the Owner. At a minimum, the supporting data shall include a progress report in the form and number required by the Owner.

2.5.3. Upon approval of the estimate by the Owner, payment upon properly executed vouchers shall be made to the Consultant, as soon as practicable, of 100 percent of the allowed costs, and of 90 percent of the approved amount of the estimated fee, less all previous payments. Notwithstanding any other provision of this Agreement, only costs and fees determined to be allowable by the Owner in accordance with subpart 31.2 of the Federal Acquisition Regulations (FAR) in effect on the date of this Agreement and under the terms of this Agreement shall be reimbursed or paid.

2.5.4. Before final payment under the Agreement, and as a condition precedent thereto, the Consultant shall execute and deliver to the Owner a release of all claims which are known or reasonably could have been known to exist against the Owner arising under or by virtue of this Agreement, other than any claims that are specifically excepted by the Consultant from the operation of the release in amounts stated in the release.

2.6. Title I Services, Title II Services, and Contract Ceiling Prices. The parties agree that aggregate payments under this Agreement, including all costs and fees, shall not exceed the Contract Ceiling Price. The parties further agree that aggregate payments for Title I services under this Agreement, including all costs and fees, shall not exceed the Title I Services Ceiling Price; and that aggregate payments for Title II services under this Agreement, including all costs and fees, shall not exceed the Title II Services Ceiling Price. No adjustment of the Indirect Cost Rate or the Title II Multiplier, claim, or dispute shall affect the limits imposed by these ceiling prices. No payment of costs or fees shall be made above these ceiling prices unless the Agreement is modified in writing.

3. DISALLOWANCE OF COSTS

3.1. Notwithstanding any other clause of this Agreement, the Owner may at any time issue to the Consultant a written notice of intent to disallow specified costs incurred or planned for incurrence under this Agreement that have been determined not to be allowable under the contract terms.

3.2. Failure to issue a notice under this Section shall not affect the Owner's rights to take exception to incurred costs.

3.3. If a subsequent audit reveals that: (1) items not properly reimbursable have, in fact, been reimbursed as direct costs; or (2) that the Indirect Cost Rate contains items not properly reimbursable under the FAR; then, in the case of indirect costs, the Indirect Cost Rate shall be amended retroactively to reflect the actual allowable indirect costs incurred, and, in the case of both direct and indirect costs, the Owner may offset, or the Consultant shall repay to Owner, any overpayment.

4. RECORDS & AUDITS

4.1. Records includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

4.2. Examination. The Consultant shall maintain, and the Owner, AHTD, FHWA, and their authorized representatives shall have the right to examine and audit all records and other evidence sufficient to reflect properly all costs (direct and indirect) claimed to have been incurred or anticipated to be incurred in performance of this Agreement. This right of examination shall also include examination and audit of any records considered, relied upon, or relating to the determination of the Indirect Cost Rate or any certification thereof, including any CPA audit relied upon to establish the rate. This right of examination shall also include inspection at all reasonable times of the Consultant's offices and facilities, or parts of them, engaged in performing the Agreement.

4.3. Supporting Data. If the Consultant has been required to submit data in connection with any action relating to this Agreement, including the negotiation of or pre-negotiation audit of the Indirect Cost Rate, the negotiation of the Fee, request for cost reimbursement, request for payment, request for an adjustment, or assertion of a claim, the Owner, AHTD, FHWA, or their authorized representatives, in order to evaluate the accuracy, completeness, and accuracy of the data, shall have the right to examine and audit all of the Consultant's records, including computations and projections, related to—

- The determination or certification of the Indirect Cost Rate, including any independent CPA audit or certification thereof;

- Any proposal for the Agreement, subcontract, or modification;
- Discussions conducted on the proposal(s), including those related to negotiating;
- Fees or allowable costs under the Agreement, subcontract, or modification;
- Performance of the Agreement, subcontract or modification; or,
- The amount and basis of any claim or dispute.

4.4. Audit. The Owner, AHTD, FHWA, or their authorized representatives, shall have access to and the right to examine any of the Consultant's records involving transactions related to this Agreement or a subcontract hereunder.

4.5. Reports. If the Consultant is required to furnish cost, funding, or performance reports, the Owner, AHTD, FHWA, or their authorized representatives shall have the right to examine and audit the supporting records and materials, for the purpose of evaluating (1) the effectiveness of the Consultant's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

4.6. Availability. The Consultant shall retain and make available at its office at all reasonable times the records, materials, and other evidence described in this Section and Section 28, Disputes and Claims, for examination, audit, or reproduction, until five years after final payment under this Agreement, or for any longer period required by statute or by other clauses of this Agreement. In addition—

4.6.1. If this Agreement is completely or partially terminated, the records relating to the work terminated shall be retained and made available for five years after the termination; and,

4.6.2. Records relating to any claim or dispute, or to litigation or the settlement of claims arising under or relating to this Agreement shall be retained and made available until after any such claims or litigation, including appeals, are finally resolved.

4.7. The Consultant shall insert a clause containing all the terms of this Section in all subcontracts under this Agreement.

References

1. Construction Management Association of America (CMAA). *An Owner's Guide to Project Delivery Methods: Advancing Professional Construction and Program Management Worldwide*. McLean, Virginia. 2012.

2. Griffis, F., and F. Butler. Case for Cost-Plus Contracting. *Journal of Construction Engineering and Management*, American Society of Civil Engineers, Vol. 114, No. 1, 1988, pp. 83–94.

3. Stukhart, G. Contractual Incentives. *Journal of Construction Engineering and Management*, American Society of Civil Engineers, Vol. 110, No. 1, 1984, pp. 34–42.

4. Clough, Richard H., Glenn A. Sears, and Keoki S. Sears. *Construction Contracting: A Practical Guide to Company Management*. 7th ed., J. Wiley & Sons, New Jersey, 2005.

5. Arkansas State Highway and Transportation Department (ASHTD). *Agreement for Engineering Services – Contract Sample*. http://www.arkansashighways.com/consultant_services/sample_contracts/update_nov12_2010/consultcitycost%2011-2010.pdf [Accessed Dec. 15, 2013].

C.4 Guaranteed Maximum Price

What is it?

The Guaranteed Maximum Price (GMP) is a contract provision where a sum of money is agreed upon between the contractor and the STA for a project. This amount is a not-to-exceed total cost of the services provided during the construction phase of work including the direct costs, overhead, contingency, and fees *(1, 2)*. In the highway construction industry this payment provision is commonly used in combination with the Construction Manager / General Contractor (CM/GC) delivery method.

Why use it?

The GMP payment provision positively affects four project components: project cost, schedule, quality, and the relationship between the STA and the contractor. With respect to project cost, GMP provisions allow sharing the risks of cost overrun with the contractor *(3)* thus reducing the STA's exposure to substantial cost increases *(3, 4)*, and risks related to price changes in volatile materials *(5)*. In some cases, the STA may decide to provide incentives to the contractor for savings or penalties if it exceeds the GMP. This motivates the contractor to be efficient and to try to achieve cost savings *(6)*. With respect to the project schedule the GMP allows overlapping of the design and construction phases which reduces overall project duration *(3)*. In terms of quality, GMP provisions allow bringing in the contractor earlier in the design stage to advise on construction costs, design aspects, project programming, materials, alternative construction techniques, and constructability issues *(3)*. Finally, in terms of the working relationship GMP helps aligning STA and contractor goals and objectives, producing a better relationship between the parties *(3)*.

What does it do?

Under GMP provisions, the contractor is entitled to receive the maximum price amount only if the actual project cost, including direct costs, indirect costs, contingency, and fees, is equal to or greater than the negotiated amount. If, however, the actual cost is less than the maximum amount, the contractor receives only the actual cost, and, in some cases, an agreed upon share of any savings *(7)*. It is important to note that the term "guarantee" does not mean that the contractor will never exceed the maximum set. Rather, this term implies that the GMP amount is based on the conditions and assumptions at the time the GMP was contractually set *(2)*. Given that in most cases the GMP is negotiated before the design is finished, the contractor is usually allowed to increase compensation beyond the GMP amount if the scope of work or the quantities change substantially compared to what was assumed when the GMP was negotiated.

How to use it?

The first step when using a GMP provision is to determine the timing of the negotiation of the maximum price amount. As said before, the GMP is usually negotiated before the design of the project is completed. As a result the GMP is highly dependent on the level of completion of design at the time of negotiation. The California Department of Transportation *Alternative Procurement* Guide *(1)* provides the following guidelines to determine an adequate timing for negotiation.

- Project goals - The goals of the project are a good starting point in this regard. In projects with scheduling constraints it is more convenient to negotiate the GMP much before 100% design is completed as the contractor can begin the construction phase before design is completed. If the project goals include budget constraints, then it is more convenient to negotiate the GMP when design in closer to 100%, as this timing will provide more certainty in the project quantities and scope of work thus reducing the contingency amounts.
- Scope of project - Here, if the scope of project is complex and requires design near completion in order to avoid any risks and allow lower contingency amounts, the negotiations should take please near design completion.
- Relationship between STA and contractor manager (CM) - If the STA has a productive relationship with the CM, then it may choose to start construction before 100% design is completed. The STA has two options here. First, the GMP can be negotiated before 100% design is reached. Or, second, the STA may choose to pay the work performed on cost plus fee basis and then negotiate a GMP for the remaining work at a later date.
- Risk of Award Timing - The risks decrease as the project gets near to the end of the design phase. In this case, if the probability of risks significantly outweigh the need of early project completion, then the GMP negotiations should take place closer to design completion.

After deciding an adequate timing for GMP negotiations, the following steps consist on calculating the actual GMP. As described before, a GMP has four main components:

- Project direct costs - These consist of the actual costs for the contractor to perform the actual work including labor, personnel, equipment, materials, and subcontracted work. Project direct costs are influenced by four main issues *(2)*:
    - GMP negotiation timing - The earlier the GMP negotiations occur the more uncertainties there will be when calculating the project direct costs.
    - Subcontracting costs - This is affected by the limitations on the amount of work the CM is allowed to self-perform, and the constraints it has on its capacity to select subcontractors. Research has found for instance, that requiring competitive bidding in CMR projects does not necessarily equal to lowest possible GMP.
    - CM self-performance costs - In cases where the CM is not allowed to do any part of the work, it can still incur in some direct costs. As it is not uncommon for a CM to provide subcontractors with some materials or equipment necessary to complete the work, or to

decide to perform punch list items. In cases where the CM will perform work packages, the direct costs become those related to materials, equipment, personnel, and labor.

- Early Material Package Purchases - This deals with requiring the CMR to purchase materials early in the design phase to fix the prices of otherwise volatile materials which can heavily impact the GMP.

- Indirect costs - This consists of the contractor's overhead costs required to manage the project such as project management, supervision, quality control, and administration. It is usually divided between field overhead and home office overhead. This may also include bonding costs *(2)*.
- Profit/ Fixed Fee - This consists of the fee the contractor will be allowed to add to the costs. It can be either a lump sum or a percentage of the total project costs. In case the STA decides to use a fixed project percentage fee, it should establish a fixed fee percentage early on the life of the project as this simplifies and facilitates the GMP negotiation later *(4)*. This part of the GMP does not include the fee paid for preconstruction services.
- Contingency - As indicated above, the contingency depends on the timing of negotiations for the GMP. The earlier the negotiations take place, the higher the contingency required will be. Some important considerations to take into account when calculating the contingency amount of the GMP are to request an open book estimating process to the CM in order to fully understand the risks of the project, and to find an agreement between STA and CM on the allocation of risks.

In addition to this considerations, another contractual element that can be used is the shared savings clause. Many STAs apply this clause to provide an incentive to the CM to increase construction efficiency and provide overall costs savings. However, research *(2)* has found that this practice is counterproductive as the CM is being paid for identifying cost savings during the pre-construction phase, and this can cause a conflict of interests as the contractor may see an opportunity to gain more profit during the construction phase by "holding on" during the pre-construction stage. Finally, one precautionary contract consideration is to have a clause that permits the STA ending the contractual relationship with the GC/CM in case GMP negotiations fail.

An interesting GMP practice is the development of progressive GMP. Since GMP contingency varies with project design completion, this method divides the project into workable phases and work packages to minimize contingency costs and calculates a GMP for each individual part. The final GMP then becomes the sum of all partial GMPs.

When to use it?

The California Department of Transportation *(1)* suggests to use GMP provisions under the following three project circumstances:

- Projects where the STA has reduced management resources as more risks are transferred to the Construction Manager

- Projects with limited time or funding
- Fast-track projects

Limitations?

The following are some of the disadvantages of GMP provisions:

- Since GMP is negotiated there is the risk that GMP sum is overestimated in order to minimize and reduce contractor risks or increase the probability of a higher profit *(8)*
- There are high probabilities that the contractor and STA will disagree on the items or work that is actually included in the GMP when it is negotiated early *(8)*
- Changes in the scope of the project may affect the total costs and increase it above the GMP. The GMP provisions needs to clearly establish the terms for changes as they may cause conflict *(8)*

Who uses it?

According to the NCHRP report 402 *(2)* California, Oregon, Utah, Arizona, Florida, and Alaska use GMP provisions with the CM/GC project delivery method. Out of these, Arizona, Florida, and Utah have the most experience.

Example

The Oregon Department of Transportation (ODOT) used a CMR project delivery method with a lump sum GMP contract for the I-5 Willamette River Bridge project. It consisted on removal of the existing Willamette River Bridge and construction of a new 1,800 foot long bridge instead; replacement of the decommissioned Canoe Canal bridge; reconstruction of approximately 2,500 feet of roadway approaching and between the two bridges; and modification to the Franklin Boulevard northbound exit ramp and southbound access ramp.

The project had a cost of $150 million. The final GMP was established before 100% design completion and the CM was allowed to keep any remaining contingency as a shared savings incentive *(2)*. The following articles show the contract provisions related to the GMP and were extracted from the contract documents used by ODOT on this project *(8)*.

ARTICLE 6

FEES, CONTRACT AMOUNT, AND GMP

6.1 Fees, Pre-construction Costs, Contract Amount, GMP – …If a GMP Amendment is executed, the Agency shall pay the CM/GC, as payment for the Work, the Contract Amount which shall equal the sum of the Pre-construction Costs, the CM/GC Fee, the cost of any bonds and insurance applicable to the Work, and the Cost of the Work (lump sum) including any Early Work, but not exceeding the GMP.

The GMP shall be determined in accordance with the formula set forth below and as described in Article 6.3. Costs in excess of the GMP shall be paid by the CM/GC without reimbursement by the Agency. Changes to the GMP shall only be authorized by Amendment or Change Order.

Pre-construction Costs (*Becomes NTE***)**
\+ **CM/GC Fee (***% of Cost of the Work – becomes fixed dollar lump sum***)**
\+ **Cost of the Work (***Becomes lump sum***)**
\+ **Bonds and Insurance (***Actual, reimbursable costs)***
= **GMP**
**Formula assumes no Early Work is performed.*

6.2 Pre-construction Costs - The Pre-construction Costs shall be payable to the CM/GC based on fixed hourly rates for the CM/GC PM and additional resource personnel on an actual-hours-worked basis up to a maximum, Not-to-Exceed (NTE) sum all of which are identified in Article 17.0. The hourly rates shall cover constructability review services, cost estimating, development of GMP, and all other Pre-construction Phase Services, as described in the **CM/GC General Provisions,** Section 00141.

The NTE Pre-construction Costs are based on the fixed hourly rates for the Pre-construction Phase Services and reported as hourly rates for the CM/GC PM and additional resource personnel and identified in Article 17.0.

If the CM/GC's costs for provision of Pre-construction Phase Services exceed the maximum Pre-construction Costs, the CM/GC shall pay such additional cost without further compensation. The CM/GC shall not be entitled to any CM/GC Fee upon the Pre-construction Costs.

The Agency shall pay the Pre-construction Costs on fixed hourly rates, on an actual-hours-worked basis with each application for payment during the Pre-construction Phase. If the total actual Pre-construction Costs are less than the maximum Pre-construction Costs used for initial calculation of the GMP as provided above, the GMP shall be reduced by the difference. Except to the extent the parties may expressly agree to the contrary in the GMP Amendment, no additional Pre-construction Costs or other fee or compensation shall be payable to the CM/GC with respect to Pre-construction Services performed after execution of the GMP Amendment.

6.3 Establishment of CM/GC Fee; Adjustments to CM/GC Fee:

6.3.1 The CM/GC Fee shall be a fixed dollar lump sum to be identified in the Early Work Amendment(s) and the GMP Amendment, and shall be calculated as ___% of the Cost of the

Work at the time of execution of the Early Work Amendment and GMP Amendment. In making such calculation for the GMP, the Cost of the Work shall exclude the Pre-construction Costs, the CM/GC Fee itself, and any other cost or charge which this CM/GC Contract states is not to be included in calculating the CM/GC Fee.

The CM/GC Fee is inclusive of profit, general and administrative ("G&A") costs and home office overhead, as normally applied to projects completed by the Proposers Firm. The Agency shall pay the CM/GC Fee ratably with each application for payment during the Construction Phase.

In the case of Early Work Amendments, the CM/CG Fee shall be the above percentage multiplied by the Early Work cost (lump sum), until such time as a GMP Amendment is executed, at which time such CM/GC Fee payments shall be credited against the CM/GC Fee fixed therein.

6.3.2 Notwithstanding any provision of Subsection 00140.30 of the **CM/GC General Provisions** to the contrary, and unless the parties agree in writing to the contrary, any Amendment or Change Order that increases either the Early Work Price or the GMP shall adjust the CM/GC Fee then in effect by multiplying the percentage shown in Article 6.3.1 by the change in the lump sum Cost of the Work reflected in such approved Amendment or Change Order. In addition, if the Contract is terminated for any reason prior to full completion of the Work (including, without limitation, termination during or following performance of Early Work), the CM/GC Fee shall be limited to the total CM/GC Fee multiplied by the percentage of Work completed and accepted at the time of termination, subject to Article 7.2.4. The CM/GC Fee shall not be subject to adjustment for any other reason, including, without limitation, schedule extensions or adjustments, Project delays, unanticipated costs, or unforeseen conditions.

6.5 Determination of GMP

6.5.1 The CM/GC shall deliver to the Agency a proposed GMP and GMP Supporting Documents at any of the milestones identified on the Project Delivery Timeline described in Exhibit A to the **CM/GC General Provisions**. If any subcontracts are in effect at the time the GMP is being established, the CM/GC shall use those subcontracts in establishing the GMP.

6.5.2 As the Plans and Specifications may not be developed to completion at the time the GMP proposal is prepared, the CM/GC shall include in the GMP all remaining Pre-construction Phase Services Work and associated costs required for final development of the Plans and Specifications by the A&E that is consistent with the Contract Documents and reasonably inferable therefrom. Such final development does not include such things as changes in Work scope, kinds and quality of Materials or Equipment, all of which, if required, shall be incorporated by Change Order or Amendment with a corresponding GMP adjustment.

6.5.3 The CM/GC shall include with its GMP proposal a written statement of its basis (the "GMP Supporting Documents"), which shall include:

(a) A list of the Plans and Specifications, including all Addenda thereto and the conditions of the Contract, which were used in preparation of the GMP proposal.

(b) A list of the clarifications and assumptions made by the CM/GC in the preparation of the GMP proposal to supplement the information contained in the Plans and Specifications.

(c) The proposed Cost of the Work, including a statement of all costs organized by bid items, estimated quantities, and unit prices, rolled into a total lump sum value.

(d) The proposed GMP shall then be established using the formula set forth in Article 6.1, and shall include the Cost of the Work (lump sum), the CM/GC Fee (% of the Cost of the Work, becomes fixed dollar lump sum), and the reimbursable bond and insurance costs.

(e) The Interim and Contract Completion Dates upon which the proposed GMP is based, and a schedule of the construction documents issuance dates upon which the Interim Completion Date(s) are based.

6.5.4 The CM/GC shall meet with the Agency and A&E to review the GMP proposal and the written statement of its basis. If the Agency or A&E discovers any inconsistencies or inaccuracies in the information presented, they shall promptly notify the CM/GC, who shall make appropriate adjustments to the GMP proposal, its basis or both.

6.5.5 Prior to the Agency's acceptance of the CM/GC's GMP proposal and issuance of a Notice to Proceed, the CM/GC shall not incur any cost to be reimbursed as part of the Cost of the Work, except as specifically provided in an Early Work Amendment.

6.5.6 The Agency shall authorize and cause the A&E to revise the Plans and Specifications to the extent necessary to reflect the agreed-upon assumptions and clarifications contained in the GMP Amendment. Such revised Plans and Specifications shall be furnished to the CM/GC in accordance with schedules agreed to by the Agency, A&E and CM/GC. The CM/GC shall promptly notify the A&E and Agency if such revised Plans and Specifications are inconsistent with the agreed-upon assumptions and clarifications.

6.5.7 The GMP shall include in the Cost of the Work only those taxes which are enacted at the time the GMP is established.

6.5.8 The CM/GC shall work with the A&E and Agency to identify and confirm any Work not specifically shown but required for a complete, fully functional Project. The Agency will direct the A&E to complete the final construction documents in accordance with the Project scope agreed upon by all parties at the time the GMP is established.

6.6 Failure to Furnish an Acceptable GMP - If the CM/GC does not furnish a GMP acceptable to the Agency, or if the Agency determines at any time in its sole discretion that the parties may fail to reach a timely agreement on a GMP acceptable to the Agency, the Agency may terminate the Contract without liability, and the CM/GC shall not receive additional compensation beyond the Pre-construction Costs under the Contract, payable to the date of termination, together with amounts payable for Work completed and accepted by the Agency under an Early Work Amendment, if an Early Work Amendment has been executed, plus any applicable costs of bonds and insurance. Termination under this provision shall proceed under Subsection 00180.90(c) of the CM/GC General Provisions as a termination for the Agency's convenience. The CM/GC further agrees that the Agency shall not be liable for any damages whether actual, consequential or otherwise for termination of the Contract under this provision. The Agency may elect to complete the construction Work for this Project utilizing any alternative procurement method available.

6.7 Acceptance of GMP - Upon acceptance of the GMP by the Agency, the parties shall execute a GMP Amendment.

6.8 Agency Savings - If the Contract Amount, as defined in Article 6.1, is less than the GMP, the savings shall accrue to the Agency.

ARTICLE 7

CHANGES IN THE WORK

7.1 Price Adjustments - Adjustments to the Cost of the Work required by changes in the Work shall be determined according to Section 00140 of the CM/GC General Provisions.

7.2 Adjustments to the GMP - Adjustments to the GMP after execution of the GMP Amendment may be made only (a) in the event of changes to the scope of Work, or (b) as otherwise expressly provided in this CM/GC Contract, and then only in accordance with the following procedure:

7.2.1 The CM/GC shall review subsequent iterations of the Plans and Specifications as they are prepared to determine whether, in the opinion of the CM/GC, they result in a change in the scope of the Work so that it can be determined if an adjustment to the GMP is warranted.

7.2.2 Changes to the GMP shall be initiated by written notice by one party to the other ("GMP Change Request"). The CM/GC shall deliver any such GMP Change Request to the A&E and the Agency promptly after becoming aware of any scope or assumption change if, in the CM/GC's opinion, it constitutes grounds for adjustment of the GMP. Any GMP Change Request shall include a proposal as to the appropriate GMP adjustment with respect to the scope change at issue.

7.2.3 The CM/GC shall submit its GMP Change Requests as soon as possible, and the CM/GC shall not be entitled to claim a GMP increase unless the CM/GC submitted a GMP Change Request to the Agency and A&E within the earlier of (a) 30 Calendar Days after the CM/GC has received the information constituting the basis for the claim, or (b) as to Work components which are part of an Early Work Package not yet awarded, prior to submission of subcontracts for such Work and as to Work already subcontracted, prior to commencement of the portion of the Work for which the CM/GC intends to claim a scope change; and (c) in any event, prior to the CM/GC's signing of a Change Order for the scope change.

7.2.4 The Agency may, at any time, submit a GMP Change Request requesting a reduction of the GMP, which shall include the Agency's basis for such request. For any individual Agency submitted GMP Change Request, or the aggregate of all Agency submitted GMP Change Requests, which result in a reduction of the GMP by 10% or more, will result in the CM/GC Fee being reduced correspondingly.

7.2.5 The CM/GC shall work with the A&E to reconcile all differences in its GMP Change Request within seven (7) Calendar Days from the date of submission of the GMP Change Request. "Reconciled" means that the CM/GC and A&E have verified that their assumptions about the various categories are the same, and that they have identified the reason for differences in the GMP Change Request and the A&Es position. The CM/GC shall submit the Reconciled GMP Change Request to the Agency, which submission shall be a condition to any CM/GC claim for a GMP increase.

7.2.6 If the Reconciled GMP Change Request is not acceptable to the Agency, the CM/GC agrees to work with the Agency and the A&E to provide a GMP Change Request that is acceptable to the Agency.

7.2.7 The CM/GC agrees to make all Project Records, including but not limited to calculations, drawings and similar items relating to the GMP Change Request, available to the Agency and to allow both the A&E and Agency access and opportunity to view such documents at the CM/GC's offices. Upon the Agency’s reasonable notice, the CM/GC shall deliver two (2) copies of such documents to both the Agency and the A&E at any regular meeting or at the Project Site.

7.2.8 GMP increases, if any, shall not exceed the increased Cost of the Work arising from the scope change reconciled in accordance with the above provisions, as arising from the incident justifying the GMP increase, plus the CM/GC Fee applicable to such increase in the Cost of the Work, adjusted in the same manner as described in Article 6.4.4. GMP reductions which are submitted by the CM/GC and accepted by the Agency shall not affect the previously fixed CM/GC Fee.

7.2.9 Except as provided in this Article 7.2, adjustments to the GMP shall be reconciled in accordance with Section 00140 of the CM/GC General Provisions.

7.3 Execution by the Agency - Notwithstanding any provision in the Contract to the contrary, the A&E has no authority to execute Change Orders or Amendments on behalf of the Agency, and only duly authorized personnel of the Agency may do so.

References

1. California Department of Transportation (Caltrans). *Alternative Procurement Guide.* Trauner Consulting Services, Inc., San Diego, 2008.

2. Gransberg, Douglas D. and Jennifer S. Shane. *NCHRP Synthesis 402: Construction Manager-at-Risk Project Delivery for Highway Projects*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, 2010.

3. Chan, D., A. Chan, T. Lam, W. Lam, and J. Wong. *An investigation of guaranteed maximum price (GMP) and target cost contracting (TCC) procurement strategies in Hong Kong construction industry*. Hong Kong Polytechnic University, Department of Building and Real Estate, 2007.

4. Minnesota Department of Transportation. *Guaranteed Maximum Price*. White Paper, http://www.dot.state.mn.us/const/tools/docs/CMGC_WhitePaperTopic2.pdf [Accessed Nov. 15, 2013].

5. Shane, J., K. Molenaar, S. Anderson, and C. Schexnayder. Construction Project Cost Escalation Factors. *Journal of Management in Engineering*, American Society of Civil Engineers, Vol. 25, No. 4, 2009, pp. 221–229.

6. Boukendour, S., and R. Bah. The guaranteed maximum price contract as call option. *Construction Management and Economics*, Vol. 19, No. 6, 2001, pp. 563–567.

7. Cantirino, J., and S. S. Fodor. Construction delivery systems in the United States. *Journal of Corporate Real Estate*, American Society of Civil Engineers, Vol. 1, No. 2, Apr. 1999, pp. 169–177.

8. Oregon Department of Transportation (ODOT). *Willamette River Bridge*. http://www.oregon.gov/ODOT/HWY/OPL/pages/Willamette-River-Bridge.aspx#CM_GC_Procurement_Documents [Accessed Nov. 18, 2013].

C.5 Contract Force Account

Also known as Extra Work Force Account

What is it?

Force account is a payment method used for extra work when the contractor and the State Transportation Agency cannot agree on a unit price or lump sum amount, or if either of those methods are impracticable *(1)*. Force account payments are based on established hourly rates and the quantities of labor, materials, and equipment that are used to complete the work.

Why use it?

Some of the advantages of force account work provisions are:

- Permits fast track start of construction in critical schedule areas *(2)*
- Saves staff time and overhead costs required for the preparation of contract packages and the bidding, evaluation and award of contracts *(2)*
- Reduces costs and enhances flow of engineering design concepts and drawings through eliminations of engineered contract packages and contract drawings *(2)*

What does it do?

This method reimburses the contractor the actual costs of labor, equipment and materials incurred in the performance of the work including allowable overhead and markup *(3)*. This provision can be included in the contract when the quantities and scope of work are unknown at the time of bid letting. At the same time, force account provisions can also be used for extra work that is identified after the project has started *(4)*.

How to use it?

Force account work that is not included in the contract is usually authorized through change orders. Here, the Project Engineer becomes responsible for directing the work for the force account items, not the Contractor. The Colorado Department of Transportation provides the following guidelines for Project Engineers to discuss with the contractors *(4)*:

- Scope of work – This includes the work to be accomplished, limits, expectations, and acceptance
- Construction methods – Most efficient methods and procedures available to complete the work
- Efficiency Improvements – Project Engineer and the contractor should continually monitor the progress of the work and determine whether better methods are available to improve efficiency and reduce costs.

- Labor Issues – Most efficient use of manpower available to complete the work. Try to utilize manpower that is available but ensuring not to negatively affect the progress of other contract work.
- Materials – Define the required types of materials, available sources, quantities and rate of use, pricing, and acceptance criteria
- Equipment – Define the most efficient use of the equipment available to complete the work. Similarly to labor, try to use equipment that is available on the site but making sure that it does not negatively affect the progress of contract work.

A majority of the DOTs that use force account provisions reimburse the contractors in the following categories:

- Labor – Includes the costs of labor and foreman at the rate of wage paid shown on the payroll and for every hour that the workers are actually engaged in the work *(5)*. In addition, STAs also include subsistence and travel allowances, health and welfare benefits, pension fund benefits, and other benefits required by collective bargaining agreements or other employment contracts *(6)*. Finally, STAs usually add a percentage of the labor costs to be paid as an overhead or profit.
- Materials – Includes the costs of all materials used on the work *(5)*, supplies and consumables, as well as freight and handling charges *(6)*. STAs may require contractor to provide multiple quotations from different vendors with the prices and terms, so the most advantageous options can be chosen. Here, the STA should set up adequate procedures for reporting and approval of usage of materials on force account work.
- Equipment – This includes the costs of any work performed by the contractor's equipment. Here, the STA should define what constitutes contractor owned equipment and how rented equipment should be treated including rental rates. Equipment force account costs should include a percentage for overhead, profit, bonding, insurance and taxes.
- Services – Services are usually accounted for through invoices *(6)*. Under this category, STAs may require contractor to obtain multiple quotations from difference vendors in order to select the most advantageous options. This costs also include a percentage for project overhead, company overhead, profit, bonding, and any other costs incurred.
- Mobilization – This category includes any preparatory work performed by the contractor including procurement, loading and transportation of tools and equipment, and personal travel time *(6)*. Mobilization also includes the costs of "demobilization". The STA needs to contractually define the procedures to follow when mobilization is made not only for the force account work but also for other contract work.

When to use it?

This type of provisions should be used for extra work not covered in the contract documents when the STA and contractor cannot agree on a unit price or lump sum amount, or if those methods are impracticable *(1)*.

Limitations?

Force account work provisions can have the following risks and disadvantages:

- STA bares the risks for the costs of correcting installation errors and poor workmanship *(2)*,
- STA bares the risks of cost overruns as a results of poor productivity, and any labor related problems *(2)*, and
- There are no incentives for the contractors to control cost and schedule *(2)*.

Who uses it?

Many STAs have force account provisions in their standard specifications including California, Colorado, Minnesota, New Mexico, North Carolina, Ohio, Oregon, and Washington.

Example

The following are the force account work standard provisions used by the American Association of State Highway and Transportation Officials *(5)*:

> 109.04 Extra Work and Force Account Work
>
> If the agency revised the contract under subsection 104.02, the agency will pay for the work by one of the following methods:
>
> A. Contract Unite Prices. The engineer will use the contract unit prices if they are representative of the work to be performed
> B. Negotiated Prices. The Engineer and the Contractor may negotiate new unit or lump sum prices before the work is performed.
> C. Force Account. The Agency may direct the Contractor to perform work on a force account basis, which will be compensated as follows:
>   1. Labor. For the actual time labor and foremen are engaged specifically on force account work, the Agency will pay the cost of those employees' wages at the rates agreed to in writing prior to beginning work. The Agency will not pay for general superintendence.
>
>   The Agency will include the actual costs paid for, subsistence and travel allowances, health and welfare benefits, pension fund benefits, or other benefits required by a collective bargaining agreement or other employment contract applicable to the class of labor employed.
>   The Agency will apply an additional [35] percent of the above sum for project overhead and profit.
>
>   2. Bond, Insurance, and Tax. The Agency will pay the actual cost, plus [10] percent, for property damage, liability, and worker's compensation insurance premiums, unemployment insurance contributions, and social security taxes. Furnish evidence of the actual rate(s) paid.

3. Materials Costs. For materials accepted by the Engineer and used in force account work, the Agency will pay the actual invoiced delivery costs plus [15] percent.

4. Equipment and Plant. For the approved use of Contractor-owned machinery or special equipment other than small tools, obtain the hourly rates from the latest edition of the identified equipment rental rate guide.

The Contractor shall apply, and the Agency will confirm, rental rates identified in the guide as follows:

a. Use hourly rates, determined by dividing the monthly rate by 176
b. The number of hours to be paid for on a force account activity is the number of hours that the equipment or plant is actually used
c. Use the rates in the guide in effect on the first day work is performed on the force account activity throughout the performance period of the force account work.
d. Do not apply an area adjustment. Use rate adjustment tables to correct for equipment life.
e. Base overtime calculations on Subsection 109.04(C)(4)(a).
f. Include estimated operating costs for each hour the equipment or plant is in operation. Do not include idle time, regardless of cause, except as provided for in Subsection 109.04(C)(4)(g).
g. For equipment that remains on a standby basis at the request of the Engineer, the Agency will pay for idle time at one-half the rate established in Subsection 109.04(C)(4)(a). The Agency will not pay for standby time on a day that the equipment operates for eight or more hours. For equipment operating less than eight hours on a normal workday, the Agency will limit standby payment to the hours that, when added to the operating hours for that day, equals eight hours. The Agency will not make standby payment for days not normally considered a work day.
h. Calculate transportation costs to move equipment or plant to or away from the site.
i. Include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs, overhaul and maintenance, depreciation, storage, overhead, profits, insurance, and all incidentals in the rates established above.

Obtain the Engineer’s approval for rates exceeding those outlined above.

The Agency will not pay for (1) time lost for equipment breakdowns, (2) time spent to repair equipment, or (3) time exceeding 24 hours after Engineer notification that equipment is no longer needed.

Obtain written agreement before using equipment not included in the rental rate guide.

These provisions only apply to equipment and plant owned directly by the Contractor or by entities associated with the Contractor or its parent company.

Before using the rented equipment on the work, inform the Engineer of the need to rent the equipment and of the rate to rent that equipment. The Agency will reimburse the Contractor for rental equipment based on actual work time and transportation to and from the work site, provided the Contractor submits a copy of a paid invoice for the rental expense incurred.

The Agency will reimburse the Contractor for transportation charges to and from the work site provided (1) equipment is obtained from the nearest approved source, (2) return charges do not exceed delivery charges, (3) haul rates do not exceed established rates of licensed haulers, and (4) equipment units are unavailable on or near the project.

Submit invoices for all charges by individuals or firms other than the Contractor.

5. Subcontracting. If a subcontractor performs force account work, the Agency will pay the approved Subcontractor invoice plus [5] percent for administrative costs.

6. Cost Records. Obtain Engineer's daily approval of cost records.

7. Statements. Furnish a weekly itemized cost statement to the Engineer. Detail as follows:

    a. Name, classification, date, daily hours, total hours, rate, and extension for each laborer and foreman.
    b. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of equipment.
    c. Quantities of materials, prices, and extension.
    d. Materials transportation costs.
    e. Property damage, liability, and workers' compensation insurance premiums, unemployment insurance contributions, and social security costs.

Support statements with accompanying certified payrolls and invoices for all materials used and transportation charges. Furnish an affidavit for materials taken from the Contractor's stock and not specifically purchased for the work; certify origin, quantity used, price, and transportation cost.

Accept the total payment as provided for above as full compensation for the work.

References

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3. Ohio Department of Transportation (ODOT). *Construction Inspection Manual of Procedures*. Columbus, Ohio, 2009.

4. Colorado Department of Transportation CDOT). *General Provisions*. Denver, CO, 2012.

5. American Association of State Highway and Transportation Officials (AASHTO). *Guide Specifications for Highway Construction*. Washington, DC, 2008.

C.6 Price Adjustment Clause

Also known as Economic Price Adjustment, Cost Adjustment, Escalation Clauses, Price Indexing

What is it?

Economic Price Adjustment consists of providing contractors with protection against materials, and fuel price increases that may occur during the execution of the work through the use of Price Adjustment Clauses (PACs). Under these provisions, the STA accepts the risk for increasing prices by offering a PAC that will compensate the contractor for any increase above the bid price or a trigger amount of a specific material *(1)*.

Why use it?

According to *Price Indexing in Transportation Construction Contracts (2)*, a NCHRP research study on the use of PACs in the transportation construction industry, this type of provision has the following benefits:

- Lower bid prices
- Increased number of bids and fewer bid retractions
- Better market stability
- Increased reliability in the supply chain
- Consistent contractor profit margins

What does it do?

PACs help in addressing the issues caused by commodities with volatile prices. The uncertainty about future costs bring large risks to the construction contracting industry. As a result, under regular payment provisions, contractors try to include risk premiums to their bids to ensure profitability through unforeseen circumstances causing overall higher bid prices. In addition, for the case of long term projects, changing prices result in much higher risks as the changes increase with time resulting in unrealistic bid prices *(1)*. By transferring the risks from the contractor to the DOT, the need for these contingency costs is eliminated resulting in better bid prices. In addition, by eliminating the risks, PACs shield construction firms from large losses on single contracts. PACs help reduce the number of firms that exit the market and provide better market stability *(2)*.

How to use it?

The NCHRP report 20-07/274 *(2)*, provides guidelines for the implementation of a PAC program in STAs, which includes the following four sections:

- **Criteria for Implementing a PAC Program -** In this stage, the STA should perform a risks and benefits analysis to assess the need of a PAC program. Among the benefits are improved market stability, better bid prices, increased number of bidders, less bid retractions, and a reduced risks for contractors. Among the risks are political barriers, increased power of suppliers in the supply chain, start-up costs, and increased administrative costs.
- **Criteria for selecting materials to include in a PAC program** – Here, the STA should analyze which materials are adequate to combine with PACs. The Price Indexing in Transportation Construction Contracts *(2)* provides the following material selection framework:
  - Availability of price index – Find a material specific price index that can be used to monitor price changes. Materials with readily available price indices are more suitable for PACs.
  - Validity of the chosen index – Assess the reliability of the price index chosen. Materials for which the prices are easily accessible at any time have better price indices and are therefore better for PACs.
  - Method for measuring material quantities used - Determine the method for measuring and calculating the material quantities (e.g. An STA can use fuel usage factors for the case of diesel fuel, and pounds for structural steel). In this case, materials that can be easily measured are preferred.
  - Impact of changing prices - The impact of the changing prices on the overall project cost comes from the volatility of the material price and the quantity of material to be employed in the project. Materials that are required in larger quantities and have very volatile prices will have larger impacts on overall project cost and are more suitable for PACs.
  - Contractor's ability to control price - For some materials contractors can secure constant prices from suppliers for the duration of a project, or they can store large material reserves. However, other materials are hard to procure at a constant rate or store for long periods of time. This last type of material is preferred for PACs.
  - Program setup and administration - Assess the cost of implementing and maintaining a PAC program for the material.

STAs use PACs for a variety of materials such as fuel, liquid asphalt, cement, structural steel, aggregates, and pipes. However, based on this framework the two materials that get the most benefits from PACs are fuel (Gasoline and Diesel), and liquid asphalt as they have very volatile prices, and can have large impacts on overall project costs.

- **Criteria for selecting a PAC program method -** At this point, the STA should select how it will compute the cost difference. Methods used by the STAs are indexed material use per unit, percent of cost method, bid item method, invoice method, and specified total fuel requirement. The most used method is the indexed material use per unit, as it is hard to manipulate to the advantage of the contractor or STA, and it only requires one input, the material quantity.
- **Criteria for selecting the attributes of a PAC program** – Here, the STA needs to define attributes of the PAC program such as:

- Trigger value - This defines how much the prices can change before the PAC applies. It is important to consider that the lower the trigger value the higher the risk the STA is assuming, but the bid price will be lower as the contractor's contingency to cover for material price changes will be reduced as well. The opposite is true for higher trigger values. Usual values range from 0% to 10%.
- Opt in/opt out option - STAs can provide the option to opt out of a PAC provision if the contractor can secure pricing from a supplier or storage material for the duration of the project.

When to use it?

PACs are heavily dependent on project duration. In shorter duration projects it is easier to forecast the price of materials until the end of the project as there will be small variations in time. In longer duration projects however, it is harder to forecast these prices as they can vary greatly over time resulting in higher risks. The NCHRP report 20-07/274 *(2)* suggests that PACs should be used in projects with a duration of 6 months or longer.

Limitations?

Some of the risks of using PACs are:

- Accuracy of indices *(1)* – Can affect the overall performance and effectiveness of PACs
- Program Start-up costs *(2)* – Cost of purchasing indexes, setting up resources and procedures, and developing computer programs among others.
- Price adjustment payouts *(1)* – If prices change considerably the STA may be forced to pay more through PACs than it would by using non-adjusted prices.
- Increased power of suppliers in the supply chain *(2)* – Suppliers have increased power as contractors do not have any motivation to negotiate lower prices.
- Increased administrative costs *(2)* – The STA may incur in higher administrative costs when maintaining a PAC program.

Who uses it?

The American Association of Highway and Transportation Officials (AASHTO) conducted a survey on the use of PACs in 2009. According to this survey only Arkansas, Michigan, and Texas do not use PACs. Furthermore, fuel and asphalt cement are the two most used material with 41 STAs and 40 STAs respectively *(3)*.

Examples

<u>Example 1) Tennessee Department of Transportation</u>

The following is an example of a fuel price adjustment clause from the Tennessee Department of Transportation special provisions using the fuel use per unit method *(4)*:

SP109A **SP109A**

Page **1** of **4**

STATE OF TENNESSEE

(Rev. 10-01-06)
(Rev. 11-03-08)
(Rev. 01-03-13)

March 1, 2006

SPECIAL PROVISION

REGARDING

PAYMENT ADJUSTMENT FOR FUEL

This special provision covers the method of payment adjustment for fuel price increases or decreases. Payment adjustments will be made in monthly increments based on the estimated fuel consumed on major items of work, the estimated price per gallon of fuel at the time of letting, and the percentage change of the Producer Price Index for Light fuel oils, Series ID Number WPU0573, published by the U.S. Department of Labor, Bureau of Labor Statistics.

The estimated price per gallon of fuel for this contract is $______.

The ____________ Price Index (Ib) for light fuel oils shall be used for this contract. Adjustments will be based on the price index in effect for the month in which the item was installed.

Fuel consumption for payment adjustment shall be based on the following:

Item Number	Description of Work	Gallons per unit	Unit of measure
203	Any Road and Drainage Excavation	0.25	Cubic Yard
203	Any Borrow Excavation (Rock)	0.36	Cubic Yard
203	Any Borrow Excavation (Other than Solid Rock)	0.25	Cubic Yard
203	Any Borrow Excavation (Rock)	0.16	Ton
203	Any Borrow Excavation (Other than Solid Rock)	0.11	Ton
203-05	Undercutting	0.25	Cubic Yard
203	Any Embankment (in-place)	0.25	Cubic Yard
303, 309, 312	Any Aggregate Base	0.79	Ton
313, 501	Treated Permeable Base or Lean Concrete Base	0.10	Square Yard
307	Any Bituminous Plant Mix Base (HM)	2.98	Ton
411	Any Bituminous Concrete Surface (HM)	2.98	Ton
501	Any Portland Cement Concrete Pavement		
	≤ 10 in. thickness	0.25	Square Yard
	> 10 in. thickness	0.30	Square Yard

No payment adjustment for fuel shall be made on any item of work which is not listed above.

No payment adjustment for fuel shall be made unless the price index varies 5% or more from the index indicated in this Special Provision.

Where the price index varies 5% or more, the payment adjustment will be made as follows:

$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$

Where:

PA =Payment Adjustment (may be plus or minus)
Ic =Index for Current Month
Ib =Index for Bidding
Fe =Estimated Fuel in Gallons used based on above table and work paid for during adjustment month. [$\sum$ (Pay quantity x Gallons per unit)= Fe]
Fp = Fuel Price for Bidding

The Project Engineer will compute the payment adjustment for fuel on work sheets similar to the one attached and will furnish a copy of the calculations upon request to the prime contractor and approved subcontractors.

Upon the expiration of the allocated working time, as set forth in the original contract or as extended by Change Order, payment adjustments for fuel will continue to be made only when the "Index for Current Month" is **less** than the "Index for Bidding" and varies 5% or more.

Payment adjustment, for fuel provided after the expiration of the allocated working time and where the "Index for Current Month" **exceeds** the "Index for Bidding", will **not** be made until after the contract records have been approved by Final Records (FR)/Materials & Tests (MT) and a Final Estimate is ready to be processed. Upon contract record approval by FR/MT, fuel payment adjustments shall be calculated for each month where the allocated working time has expired, the "Index for Current Month" **exceeds** the "Index for Bidding", and the indices vary 5% or more. The calculation of the fuel payment adjustment shall be made using the "Index for Current Month" or the "Index for Contract Completion Date" in accordance with the following formulas:

The "Index for Contract Completion Date" is the fuel index in effect on the allocated Contract Completion date or the completion date as extended by Change Order.

"Index for Current Month" is **less** than "Index for Contract Completion Date"

$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$

"Index for Current Month" is **greater** than "Index for Contract Completion Date"

$PA = [(Icd \div Ib) - 1] \times Fe \times Fp$

Where:

PA = Payment Adjustment (may be plus or minus)

Ic =	Index for Current Month
Ib =	Index for Bidding
Icd=	Index for Contract Completion Date (or as extended by Change Order)
Fe =	Estimated Fuel in Gallons used based on above table and work paid for during adjustment month. [∑ (Pay quantity x Gallons per unit)= Fe]
Fp =	Fuel Price for Bidding

Payment Adjustment for fuel will be made under:

Item No.	Description	Pay Unit
109-01.01	Payment Adjustment for Fuel	Dollar

SP109A **SP109A**

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Monthly Payment Adjustment for Fuel Worksheet

Project No.______________________ Contract No.__________________

County___________________________

Fuel Price (Fp)_______Price Index Bidding (Ib)_________Current Price Index (Ic) _____

Index for Contract Completion Date (or as extended by Change Order) (Icd)________

Estimate Period: Work Performed_______________Adjustment Paid________________
(Month/Yr)

Item	Unit	Quantity		Fuel Factor		Total Fuel
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________
________	____	________	x	________	=	______________

Total Fuel for Month (Fe)____________________

$PA = [(Ic \div Ib) - 1] \times Fe \times Fp$
$PA = [(Icd \div Ib) - 1] \times Fe \times Fp$

Example 2) Federal Highway Administration

The Office of Federal Lands from the Federal Highway Administration has the following price adjustment clauses for asphalt cement and fuel *(5)*:

ASPHALT CEMENT PRICE ADJUSTMENT PROVISION

GENERAL The Asphalt Cement Price Adjustment Provision provides for a price adjustment in the form of a payment to the Contractor or a rebate to the Government for fluctuations in the cost of asphalt cement used in the performance of applicable construction work. The price adjustment provisions are applicable only to the asphalt cement, as defined in Subsection 702.01, and incorporated in the following eligible contract pay items:

- 40101 Superpave pavement
- 40102 Superpave pavement, wedge and leveling course
- 40201 Hot asphalt concrete pavement, Marshall or Hveem test
- 40202 Hot asphalt concrete pavement, Marshall or Hveem test, wedge and leveling course
- 40301 Hot asphalt concrete pavement
- 40302 Hot asphalt concrete pavement, wedge and leveling course
- 40501 Open-graded asphalt friction course

Select appropriate eligible pay items and delete those that do not apply. For each of the eligible contract pay items chosen above, a corresponding statement should be added to the applicable SCR payment subsection, which indicates that "A price adjustment will be made for fluctuations in the cost of asphalt cement used in the performance of any eligible pay items according to Subsection 109.06 Pricing of Adjustments Asphalt Cement Price Adjustment Provision." See end of provision for additional direction.

The price adjustment provisions are also applicable when the Government adds extra work to the eligible pay items already existing under the Contract.

The provision will remain in effect throughout the duration of the contract. Enactment of the Asphalt Cement Price Adjustment Provision will only be considered when the **increase or decrease** in the price of asphalt cement as defined herein exceeds 10 percent.

The Asphalt Cement Price Adjustment Provision is intended to reduce but not eliminate the cost effects of price uncertainty to the Contractor and the Government for asphalt cement used in the construction of this contract. It provides for sharing by the Government in a portion of the Contractor's risk, which could result from unusual price fluctuations. The provision is not intended to compensate the Contractor for normal day-to-day fluctuations and seasonal changes or to serve as a guarantee of full compensation for asphalt cement price fluctuations.

<u>EFLHD will revise the following policy/procedures.</u>

The Construction Branch is responsible for (1) purchasing the Asphalt Weekly Monitor (AWM) newsletter; (2) selecting the applicable region and states; (3) calculating and posting price indexes on an accessible web page and; (4) calculating and paying price adjustment compensations. In order to establish a reference for the base and monthly performance price indexes, the Poten and Partners, Inc newsletter (i.e. Asphalt Weekly Monitor) should be surveyed and an applicable region and state inserted below. A website address must also be inserted below where the Contractor and other interested parties can check Government postings of monthly price indexes. There could potentially be one web page for each project unless projects are in the same state. The Base and Monthly Performance Price Indexes for Asphalt Cement must also be calculated using weekly high and low selling price data obtained from the Asphalt Weekly Monitor for the applicable state. Weekly high and low selling price data from four consecutive reports will be averaged to obtain a Base Price Index as well as a Monthly Performance Price Index. The Base Price Index (BPI) must be inserted below by Acquisitions in the conformed set. The Monthly Performance Price Index must be posted monthly by Construction on the website.

<u>**PRICE INDEXES**</u> The Government will generate a monthly performance price index for asphalt cement using price data obtained from Poten and Partners, Inc. (PPI), which publishes a weekly report (Asphalt Weekly Monitor) on high and low selling prices for states in five regions throughout the United States including the East Coast/Northeast, the Mid-Continent/Midwest, the Gulf Coast/Mid-South, the Rocky Mountains and the West Coast/Northwest. Weekly high and low selling price data reported for (insert the applicable region and states) will be averaged and used to establish a base price index, BPI, for this project and a monthly performance price index, MPPI, for the duration of the contract. These indexes are defined as follows:

- **BASE PRICE INDEX** The base price index, BPI, is the price index determined by the arithmetic average, as specified above, shown in the four weekly publications immediately preceding the bid opening. The BPI will be provided by the Government after contract award. It is as follows:

BASE PRICE INDEX (BPI) FOR ASPHALT CEMENT

PER SHORT TON (TON) (or PER METRIC TON) = $______________

- **MONTHLY PERFORMANCE PRICE INDEX** The monthly performance price index, MPPI, is the monthly price index at the time of performance of applicable work as determined by the arithmetic average, as specified above, shown in the four weekly publications issued prior to the last Wednesday of the month (i.e. the monthly performance price index during which asphalt cement is used in the performance of applicable construction work).

PRICE ADJUSTMENTS Price adjustments are calculated by the Government for average conditions and are not intended to reflect the Contractor's actual purchase price. The ratio of the monthly performance price index and the base price index (MPPI/BPI) is calculated and used to determine price adjustments for eligible pay items as follows:

- **No Price Adjustment** – When the ratio MPPI/BPI falls within the range of 0.90 to 1.10, no price adjustment will be made for any asphalt cement used in construction work performed during the relevant month.

- **Government Rebate** – When the ratio MPPI/BPI is calculated to be less than 0.90, the Government is due a rebate determined in accordance with the following formula:
  Government Rebate = [0.90 – (MPPI/BPI)] (BPI) (Q)

- **Contractor Payment** – When the ratio MPPI/BPI is calculated to be greater than 1.10, the Contractor is due additional payment determined in accordance with the following formula:
  Contractor Payment = [(MPPI/BPI) – 1.10] (BPI) (Q)

The following definitions are applicable to both the Government Rebate and the Contractor Payment formulas:

MPPI = Monthly Performance Price Index for the month during which asphalt cement is used in the performance of applicable construction work.

BPI = Base Price Index that is established immediately preceding the bid opening.

Q = Quantity in tons of asphalt cement for eligible pay items that were used on the project during the progress payment period. The quantity will be calculated using the asphalt content of the approved mix design and the following formula:

Q = Asphalt Concrete Pavement tons placed x (% Asphalt/100)

PRICE ADJUSTMENT COMPENSATION Monthly adjustments will be accrued. The final price adjustment will be paid, or rebated, after completion of all work for eligible pay items. The Contractor may request in writing a partial price adjustment payment once every 12 months, or when the unpaid accrued increase exceeds $10,000. The Government will take a rebate when the deductive accrual exceeds $10,000.

No price adjustments will be made for work performed beyond the Government-approved Contract completion date.

The maximum allowable monthly and final price adjustment to the Contractor or rebate to the Government is limited to a (MPPI/BPI) ratio of 1.6 and 0.4, respectively.

401.19. 402.19. 403.19. 405.13. Add the following:

A price adjustment will be made for fluctuations in the cost of asphalt cement used in the performance of any eligible pay items according to Subsection 109.06 Pricing of Adjustments Asphalt Cement Price Adjustment Provision.

FUEL PRICE ADJUSTMENT PROVISION

GENERAL The Fuel Price Adjustment Provision provides for a price adjustment in the form of a payment to the Contractor or a rebate to the Government for fluctuations in the cost of diesel fuel consumed in the performance of applicable construction work. The price adjustment provisions are applicable only to those contract items listed as eligible pay items in Table 1 below, if diesel is used as the primary fuel in the production of the affected items.

The price adjustment provisions are also applicable when the Government adds extra work to the eligible pay items already existing under the Contract.

The provision will remain in effect throughout the duration of the contract. Enactment of the Fuel Price Adjustment Provision will only be considered when the **increase or decrease** in the price of diesel fuel as defined herein exceeds 10 percent.

The Fuel Price Adjustment Provision is intended to reduce but not eliminate the cost effects of price uncertainty to the Contractor and the Government for diesel fuel consumed in the construction of this contract. It provides for sharing by the Government in a portion of the Contractor's risk, which could result from unusual price fluctuations. The provision is not intended to compensate the Contractor for normal day-to-day fluctuations and seasonal changes or to serve as a guarantee of full compensation for diesel fuel price fluctuations.

EFLHD will revise the following policy/procedures.

The Construction Branch is responsible for (1) purchasing the Oil Price Information Service (OPIS) newsletter; (2) selecting the applicable region and city; (3) calculating and posting price indexes on an accessible web page and; (4) calculating and paying price adjustment compensations. In order to establish a reference for the base and monthly performance price indexes, the Oil Price Information Service (OPIS) newsletter should be surveyed and an applicable region and city inserted below. If possible, the city should be a large metropolitan area (i.e. a state capital) near the project site. A website address must also be inserted below where the Contractor and other interested parties can check Government postings of monthly price indexes. There could potentially be one web page for each project unless reference cities can be strategically selected to serve more than one project site. The Base and Monthly Performance Price Indexes for Low Sulfur No. 2 Diesel Fuel must also be calculated using weekly average rack price data obtained from OPIS for the applicable city. Weekly average rack price data from four consecutive reports will be averaged to obtain a Base Price Index as well as a Monthly Performance Price Index. The Base Price Index (BPI) must be inserted below by Acquisitions in the conformed set. The Monthly Performance Price Index must be posted monthly by Construction on the website.

PRICE INDEXES The Government will generate a monthly performance price index for Ultra Low Sulfur, No. 2 Diesel Fuel using price data obtained from the Oil Price Information Service (OPIS), which publishes a weekly report on gasoline and distillate reseller prices for major cities in five regions throughout the United States including the East Coast (PADD 1), the Midwest (PADD 2), the Gulf Coast (PADD 3), the Rockies (PADD 4) and the West Coast (PADD 5). Weekly average rack price data reported for (insert the applicable region and city) will be averaged and used to establish a base price index, BPI, for this project and a monthly performance price index, MPPI, for the duration of the contract. These indexes are defined as follows:

- **BASE PRICE INDEX** The base price index, BPI, is the price index determined by the arithmetic average, as specified above, shown in the four weekly publications immediately preceding the bid opening. The BPI will be provided by the Government after contract award. It is as follows:

BASE PRICE INDEX (BPI) FOR ULTRA LOW SULFUR, NO. 2 DIESEL FUEL

PER GALLON = $________________________

- **MONTHLY PERFORMANCE PRICE INDEX** The monthly performance price index, MPPI, is the monthly price index at the time of performance of applicable work as determined by the arithmetic average, as specified above, shown in the four weekly publications issued prior to the last Wednesday of the month (i.e. the monthly performance price index during which diesel fuel is consumed in the performance of applicable construction work).

PRICE ADJUSTMENTS Price adjustments are calculated by the Government for average conditions and are not intended to reflect the Contractor's actual purchase price. The ratio of the monthly performance price index and the base price index (MPPI/BPI) is calculated and used to determine price adjustments for eligible pay items as follows:

- **No Price Adjustment** – When the ratio MPPI/BPI falls within the range of 0.90 to 1.10, no price adjustment will be made for any diesel fuel consumed in construction work performed during the relevant month.
- **Government Rebate** – When the ratio MPPI/BPI is calculated to be less than 0.90, the Government is due a rebate determined in accordance with the following formula:
  Government Rebate = [0.90 – (MPPI/BPI)] (BPI) (Q) (FUF)

- **Contractor Payment** – When the ratio MPPI/BPI is calculated to be greater than 1.10, the Contractor is due additional payment determined in accordance with the following formula:
  Contractor Payment = [(MPPI/BPI) – 1.10] (BPI) (Q) (FUF)

The following definitions are applicable to both the Government Rebate and the Contractor Payment formulas:

MPPI = Monthly Performance Price Index for the month during which diesel fuel is consumed in the performance of applicable construction work.

BPI = Base Price Index that is established immediately preceding the bid opening.

Q = Quantity of work on the project during the progress payment period for eligible pay items shown in Table 1 below. The Government will convert work quantities, as necessary, to agree with the units associated with the applicable Fuel Usage Factor.

FUF = Fuel Usage Factor shown in Table 1 below applicable to both diesel and gasoline.

Table 1 – Eligible Pay Items For Price Adjustments and Associated Fuel Usage Factors		
Eligible Pay Items	Fuel Usage Factor U.S. Customary Units	Fuel Usage Factor Metric Units
Earthwork:		
Section 204 – Excavation and Embankment 20401 Roadway excavation 20402 Sub-excavation 20403 Unclassified borrow 20410 Select borrow 20411 Select borrow 20415 Select topping 20416 Select topping 20420 Embankment construction 20421 Rock excavation	0.30 gallons per cubic yard	0.39 gallons per cubic meter
Aggregate Courses:		
Section 301 – Untreated Aggregate Courses 30101 Aggregate base 30102 Aggregate base* 30103 Aggregate base* 30105 Subbase 30106 Subbase* 30107 Subbase* 30110 Aggregate Surface Course 30111 Aggregate Surface Course*	0.70 gallons per ton	0.77 gallons per metric ton
Section 302 – Treated Aggregate Courses 30201 Treated aggregate course 30202 Treated aggregate course*	0.70 gallons per ton	0.77 gallons per metric ton
Section 304 – Aggregate Stabilization 30401 Aggregate stabilization imported aggregate 30402 Aggregate stabilization imported aggregate* 30405 Aggregate stabilization in-place aggregate* 30410 Aggregate stabilization imported surface course aggregate* 30411 Aggregate stabilization imported surface course aggregate*	0.70 gallons per ton	0.77 gallons per metric ton
Section 309 – Emulsified Asphalt Treated Base Course 30901 Emulsified asphalt treated aggregate base 30902 Emulsified asphalt treated aggregate base* 30903 Emulsified asphalt treated aggregate base*	0.70 gallons per ton	0.77 gallons per metric ton
Asphalt Pavements:		
Section 401 – Superpave Hot Asphalt Concrete Pavement 40101 Superpave pavement 40102 Superpave pavement wedge and leveling Course	2.40 gallons per ton	2.65 gallons per metric ton
Section 402 – Hot Asphalt Concrete Pavement by Hveem or Marshall Mix Design Method 40201 Hot asphalt concrete pavement, Marshall or Hveem test 40202 Hot asphalt concrete pavement, Marshall or Hveem test, wedge and leveling course	2.40 gallons per ton	2.65 gallons per metric ton

Table 1 – Eligible Pay Items For Price Adjustments and Associated Fuel Usage Factors		
Eligible Pay Items	Fuel Usage Factor U.S. Customary Units	Fuel Usage Factor Metric Units
Section 403 – Hot Asphalt Concrete Pavement 40301 Hot asphalt concrete pavement 40302 Hot asphalt concrete pavement, wedge and leveling course	2.40 gallons per ton	2.65 gallons per metric ton
Section 405 – Open-Graded Asphalt Friction Course 40501 Open-graded asphalt friction course	2.40 gallons per ton	2.65 gallons per metric ton
Section 408 – Cold Recycled Asphalt Base Course 40801 Cold recycled asphalt base course 40802 Cold recycled asphalt base course*	0.70 gallons per ton	0.77 gallons per metric ton
Section 416 – Continuous Cold Recycled Asphalt Base Course 41602 Continuous cold recycled asphalt base Course	0.15 gallons per square yard	0.18 gallons per square meter
Section 418 – Foamed Asphalt Stabilized Base Course [not in FP - called out by Special Contract Requirements] 41801 Foamed asphalt stabilized base course	0.30 gallons per square yard	0.36 gallons per square meter
Concrete Pavements:		
Section 501 – Rigid Pavement 50101 Reinforced rigid pavement 50102 Plain rigid pavement	0.60 gallons per square yard	0.72 gallons per square meter
* The Government will convert work quantities, as necessary, to agree with the units associated with the applicable Fuel Usage Factor.		

Select appropriate eligible pay items and delete those that do not apply. For each of the eligible contract pay items chosen above, a corresponding statement should be added to the applicable SCR payment subsection, which indicates that "A price adjustment will be made for fluctuations in the cost of diesel fuel consumed in the performance of any eligible pay items according to Subsection 109.06 Pricing of Adjustments Fuel Price Adjustment Provision." See end of provision for additional direction.

PRICE ADJUSTMENT COMPENSATION Monthly adjustments will be accrued. The final price adjustment will be paid, or rebated, after completion of all work for eligible pay items. The Contractor may request in writing a partial price adjustment payment once every 12 months, or when the unpaid accrued increase exceeds $10,000. The Government will take a rebate when the deductive accrual exceeds $10,000.

No price adjustments will be made for work performed beyond the Government-approved Contract completion date.

The maximum allowable monthly and final price adjustment to the Contractor or rebate to the Government is limited to a (MPPI/BPI) ratio of 1.6 and 0.4, respectively.

204.17. 301.10. 302.11. 304.12. 309.10. 401.19. 402.19. 403.19. 405.13. 408.10. 416.12. 418.xx. 501.17. Add the following:

A price adjustment will be made for fluctuations in the cost of diesel fuel consumed in the performance of any eligible pay items according to Subsection 109.06 Pricing of Adjustments Fuel Price Adjustment Provision.

References

1. Newcomb, David E., Russel Lenz, and Jon Epps, *Price Adjustment Clauses: Report*, Texas A&M Transportation Institute, Texas Department of Transportation, Federal Highway Administration, June 2013.

2. Skolnik, Jonathan, *Price Indexing in Transportation Construction Contracts*, AASHTO Standing Committee on Highways, Transportation Research Board, Jan. 2011.

3. American Association of State Highway and Transportation Officials (AASHTO). *Survey on the Use of Price Adjustment Clauses*, Fall 2009. http://www.fhwa.dot.gov/programadmin/contracts/aashto.cfm [Accessed: November 4, 2013].

4. Tennessee Department of Transportation. Special Provision Regarding Payment Adjustment for Fuel, Mar. 2006. http://www.tdot.state.tn.us/construction/Special%20Provisions/109A.pdf [Accessed: November 4, 2013].

5. Eastern Federal Lands Highways. Library of Specifications. Federal Highway Administration. http://www.efl.fhwa.dot.gov/contracting/library-specs.aspx [Accessed: February 16, 2014].

6. Pierce, Charles E., Nathan N. Huynh, and Paulo Guimaraes, *Cost Indexing and Unit Price Adjustments for Construction Materials*, South Carolina Department of Transportation, Federal Highways Administration, Oct. 2012.

C.7 Shared-Risk Pool

Also known as Contingency Fund Management, Shared-Risk Contingency Management

What is it?

Shared-risk pool is a process that consists of identifying potential project risks that may cause cost and schedule growth, estimate the cost of such risks, create a contingency fund, and use management strategies to minimize the risk impacts on cost and schedule *(1)*. Under this provision, the STA sets aside a contingency fund and the contractor is allowed to spend the fund according to its unit rates; however, the provision also establishes that the STA will share the savings of the unused contingency funds with the contractor at the end of the project *(2, 3)*. This serves as an incentive to the contractor to minimize expenditures from the contingency fund.

Why use it?

According to the Federal Highway Administration (FHWA) report, *Alternative Payment and Progress Reporting Methods* (1), the main advantage of a shared-risk contingency provision is that it motivates the contractor to reduce the expenditure of the contingency fund and to control schedule growth. As a result, this provision gives the contractor an incentive to use innovative construction methods.

Other advantages of contingency fund management are that:

- It gives the owner assurance about the certainty of the project cost and schedule estimates *(1)*, and
- Assures that funds are available to resolve issues in a timely manner *(4)*.

What does it do?

Under normal payment provisions, the owner sets aside an amount of contingency to cover probable occurrence of events for which it is responsible that can cause a cost increase in the project budget. Likewise, the contractor includes a certain amount of money within its proposal as a contingency to cover the risks that it bears under the contract terms. The main function of the shared-risk contingency provision is to reduce these contingency amounts, and provide assurance to both the contractor and the STA that there are enough funds to cover project costs not included in the project budget. As a result, the provision works as a tool for assuring cost certainty to the STA, as well as helping contractors to prepare proposals based on their ability to do the work efficiently rather than on their willingness to assume risks without charging for it *(3)*.

How to use it?

The most important step when developing a shared-risk contingency provision is to determine an adequate contingency amount. *A Risk-Based Approach to Contingency Estimation in Highway Project Development (5)* provides guidance for the appropriate calculation of contingency costs according to the complexity level of a project. This approach consists of three steps: project complexity assessment, risk analysis type selection, and contingency calculation. The project complexity assessment step divides projects in three categories:

- Major or Most Complex Projects,
- Moderately Complex Projects, and
- Minor or Non-Complex Projects.

The NCHRP report 574, *Guidance for Cost Estimation and Management for Highway Projects During Planning, Programming, and Preconstruction (6)* provides definitions of project complexity for different project elements according to these three categories of complexity. Some of the elements to consider are roadway, traffic control, structures, right-of-way, utilities, environmental, and the stakeholders. The risks analysis type selection and the contingency calculation is made according to the level of project complexity identified. The authors *(5)* identify three types of risk assessment methods.

- Type I - Risk identification and percentage contingency - Applies only to minor projects, and includes only a list of probable risks and the use of a percentage of project costs to estimate the contingency amount.
- Type II - Qualitative Risk Analysis and Identified Contingency Items - Applies to moderately complex risks and involves the use of more rigorous risk identification tools and specific contingency items to complement the percentage-based estimate from the previous case. The authors suggest the use of a probability-impact matrix analysis, and the calculation of risk costs for the highest ranked risk which should be added to the percentage-based contingency.
- Type III - Quantitative Risk Analysis and Contingency Management - Applies to major projects, and involves a full quantitative risk analysis process as well as the implementation of a risk register to continuously monitor and update the risks and the associated contingency.

Once the contingency amount is defined, the next step is to determine the distribution of the remaining contingency upon project completion. A common arrangement is to give 50 percent to each party but the STA is free to determine different quantities. Two important considerations when defining this amount are: first, that the amount given to the contractor should be enough to incentivize the contractor, and second, that the amount does not need to be static (i.e. the incentive amount can be tied to other project events such as completion dates) *(3)*.

The California Department of Transportation *Alternative Procurement Guide (3)* discusses the following contract considerations to be considered when using shared-risk contingency provisions:

- Treatment of overruns – The contract should clearly establish what will happen if risk costs exhaust the contingency fund. In this case, the STA should decide whether to cap the contingency fund or allow for an increase. For the former, the result is that it provides the STA with increased protection against costs increases. The latter will result in an increased exposure to such cost increase but the original price will be lower as the contractor will not have the need to account for any costs that may overrun the contingency in its proposal.
- Eligible costs – The contract must define which costs are eligible for reimbursement out of the pool and which are not. If the contingency is capped, then the STA can allow a broader access to the contingency funds. Conversely, if the STA allows for contingency fund increases, then it should strictly limit the uses of the contingency fund.
- Process for accessing funds – The contract should set up the requirements for accessing the contingency funds. In contracts with lump-sum price, change orders are usually required. In contracts with guaranteed maximum price, the contractor is allowed to invoice directly from the risk contingency pool.

When to use it?

Shared-risk contingency provisions are most applicable with major projects as these face major risks. Furthermore, design-build delivery projects get more benefits from this type of provision as these projects:

- Have a greater level of uncertainty associated with estimating construction costs and schedule before completion of design (1);
- The design-build contractor has more influence over the impact of risks given that its scope of work includes design and construction (3); and
- There are limited number of firms that have the financial capacity to undertake design-build projects which results in fewer proposals and helps to affirm the accuracy of the STA estimate (1).

Additionally, projects involving environmental mitigation, utility or other third party issues, and underground issues are good candidates for shared-risk contingency provision *(3)*.

Limitations?

Some major disadvantages of shared-risk contingency are that:

- It can be difficult to establish an appropriate contingency amount *(4)*, and
- The existence of a contingency fund may be seen as a "cushion", which causes a relaxed approach towards cost increase management *(4)*.

Who uses it?

California, Colorado, New Jersey, Washington State

Example

In May 2010, the Washington State Department of Transportation (WSDOT) issued a request for proposals for the SR 99 Bored Tunnel Alternative Design-Build Project. The contract included three types of incentives: a shared contingency allowance, a deformation mitigation and repair fund, and a completion incentive. The shared consistency allowance provision was established as follows:

> "WSDOT has established a Shared Contingency Allowance in the amount of $40,000,000. Design-Builder will be entitled to receive 75 percent of any amount remaining in the Shared Contingency Allowance following Physical Completion of the Work and WSDOT's determination of all amounts owing to Design-Builder under Change Orders payable from the Shared Contingency Allowance. WSDOT will retain the remaining 25 percent. Design-Builder's share of the unused funds in the Shared Contingency Allowance shall be added to the Total Compensation by a Change Order and shall be due and payable at the same time as the Final Payment." *(7)*

Another example is the $330 Million Atlantic City-Brigantine Connector design-build project, a four-lane connector highway and tunnel project in New Jersey which included the following shared-risk contingency provision:

> "The contingency is intended to be available to cover any and all unanticipated costs incurred by Contractor in completing the Work directly attributable to the following (and only the following) events ("Contingency Events") and for no other purpose: [list of eligible items]
>
> If upon achievement of Final Acceptance and resolution of all Claims of Contractor and all claims, Liens and stop notices of Subcontractors and laborers, funds remain available in the Contingency, the Contract Price shall be increased by an amount equal to xx% of such remaining Contingency amount, and the Contingency shall thereupon be reduced to zero; provided, however, that if Contractor fails to achieve Substantial Completion on or before the Guaranteed Completion Date, Contractor's share of such remaining Contingency amount shall be reduced as follows: if Substantial Completion is late by one week or less, Contractor's share shall be reduced by 5% to equal xx%, and for each week (or portion of week) of delay thereafter, Contractor's share shall be reduced by an additional 5%"*(3)*

References

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C.8 Payment by Plan

What is it?

Payment by plan quantities is an alternative payment provision where contractor's reimbursement is based on measurement of quantities derived from plans and schedule instead of field measurements *(1)*.

Why use it?

According to the Construction and Materials Manual of the Wisconsin Department of Transportation *(2)* a payment by plan quantity provision can have the following benefits:

- Reduces the time needed for taking measurements on the field,
- Eliminates the need of resolving minor quantity variations, and
- Provides for quicker payment to the contractor.

What does it do?

The purpose of payment by plan provisions is to streamline contract administration by eliminating field measuring and time spent resolving small quantity variations *(1)*. Under this provision the contract specifies the list of items that will be paid according to planned quantities. These items are usually items that can be estimated accurately, are not expect to vary significantly from the specifications, and can be easily measured after payment *(1)*.

How to use it?

The first step when using payment by plan provisions is to select the items that will be reimbursed to the contractor according to this provision. This provision works best on items that *(3)*:

- Can be estimated accurately
- Are not expected to vary beyond specification thresholds during construction
- Are measured linearly or by area
- Can be easily measured once built

The next step is to determine the payment exceptions used for these items. Under normal conditions the STA would reimburse the contractor for the items periodically according to the scheduled quantities; however, in some cases changes to the project design or miscalculations can result in different quantities than those on the plans and specifications when the contract was signed. In order to avoid paying short or in excess the contract must include criteria that will allow for readjustments. According to the WisDOT Construction Materials Manual, a STA can use two types of exceptions:

- Adjustments for Contract Revisions - This occurs when changes to contract occur that can increase/reduce the quantities, or eliminate a specific item. If an increase occurs the contract should specify how the addition will be reimbursed. Options can be whether it will be measured or if it will be paid as a planned quantity as well. In case a decrease occurs the contract should specify whether the payment provision for the item will change to a measured one, or the quantity will be adjusted and paid by planned quantities. Finally, if the item is eliminated, the contract should specify what type of reimbursement the contractor will receive if he/she has already made an expenditure to procure or build the item.
- Adjustment for Quantity Variations - Here, the STA should set up threshold limits for when the engineer or contractor identify items with a variation in quantity from what was planned and what was built. When the variations are larger than the threshold the contract should specify whether the item can be adjusted by measuring, and whether the entire quantity will be adjusted or only the portion where the variation occurred.

When to use it?

Pay by plan quantities should be used on items that can be estimated accurately, are not expected to vary beyond specification thresholds during construction, are measured linearly or by area, and can be easily measured once built *(2)*. Common items are concrete, excavation, backfill, structural and reinforcing steel, pipe culverts and storm sewers, and guardrails *(1)*. Other less used items are asphalt, retaining walls, fencing, timber structures, sound barriers, traffic management and signals, demolition, and manhole and inlet covers *(1)*.

Limitations?

One of the main risks of payment by plan quantities is that the planned quantities are sensible to human mistake, which ultimately can lead to conflict with the contractor.

Who uses it?

This provision is used by the following state departments of transportation: Colorado, Florida, Indiana, Iowa, Michigan, Minnesota, North Carolina, Pennsylvania, Texas, and Wisconsin *(1)*.

Examples

<u>Example 1) Washington Department of Transportation</u>

The Washington Department of Transportation uses Payment by Plan Quantity provisions on every project that involves bridge substructure or retaining walls. Currently, this provision is being used at the Bridge replacement project over Rock Creek on SR-6. This project will replace two concrete bridges built on 1924 with two wider structures that accommodate 12-foot lanes and 6-foot shoulders. As of February 2014, the project was on design phase and construction was scheduled to be complete by Fall 2015 *(4)*.

The following is the general payment by plan quantity contractual provisions used by the Washington Department of Transportation *(5)*. This specifications are used on retaining walls, and bridge substructure items for steel reinforcing bars, epoxy-coated steel reinforcing bars, and concrete, expect shafts and seals.

> The quantity of the following items to be paid for on this project shall be the quantity shown in the Proposal, unless changes are made in accordance with Section 1-04.4 which affect this quantity. The quantity shown in the Proposal will be adjusted by the amount of the change and will be paid for as specified in Section 1-04.4.
>
> *** $$1$$ ***
>
> The quantities in the Proposal are listed only for the convenience of the Contractor in determining the volume of work involved and are not guaranteed to be accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the quantity even though the actual quantities required may deviate from those listed.
>
> The unit contract price for these items shall be full pay to construct and complete this portion of the work.

<u>Example 2) Maine Department of Transportation</u>

The Maine Department of Transportation has the following payment by plan quantities provisions:

> SECTION 108 – PAYMENT
>
> <u>108.1 Measurement of Quantities for Payment</u>
>
> <u>108.1.1. Use of Plan Quantities</u> Payment for all items labeled in the Bid Documents as “Plan Quantity” will be based upon the estimated quantity. The Contractor shall accept such payment as full and complete compensation for that item without physical measurement. Upon mutual written Agreement by the Department and the Contractor, the estimated quantity of any item of Work may be used as the final quantity for that item without physical measurement.

References

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C.9 Incentives / Disincentives

What is it?

Incentives is a contracting provision that compensates the contractor a specific amount of money for each day that critical work is completed ahead of schedule or for achieving set goals. Disincentives is a contracting provision that can assess a fee for each day identified that the contractor overruns the specified time or for failing to achieve set goals *(1–3)*.

Why use it?

The Caltrans Project Delivery Acceleration Toolbox *(4)*, which focuses on improvements to the project delivery process, states that incentives/disincentives (I/Ds) encourages a contractor to meet the specific schedule stated in the project's contract. Some benefits of I/Ds, as stated in the Minnesota Department of Transportation (MnDOT) *Innovative Contracting Guidelines (1)* include:

- Potentially lower construction administration costs;
- Reduced construction time; and
- Better control of project acceleration when compared to A+B

The MnDOT *Innovative Contracting Guidelines (1)* also states I/Ds provide the opportunity for better public relations with businesses and residents because it reflects the agency's commitment to a quick project completion. The National Cooperative Highway Research Program (NCHRP) Report 652 *(5), Time-Related Incentive/Disincentive Provisions in Highway Construction Projects,* describes I/Ds as provisions that have been used widely by State Transportation Agencies (STAs) and the majority has been successful at reducing delays to the traveling public by accelerating construction work. Additionally, the NCHRP Report also states that I/D provisions are beneficial because they provide an adequate consideration of the true cost of delays or expediting project to contractors and the public *(5)*.

What does it do?

The principle concept of I/Ds, as stated previously, is to encourage contractors to finish a project on or before the schedule stated in the project's contract *(4)*. The NCHRP Report 652 *(5)* provides a summary of the impact I/Ds have on six primary project factors; 1) cost, 2) innovation, 3) contract administration, 4) staffing, 5) quality, and 6) safety.

- **Cost** – Increased costs may be noticed by the agency as a result of accelerating construction to achieve an earlier completion. Although these costs depend on many factors, the agency's procurement provisions have usually the most influence.

- **Innovation** – The use and incorporation of innovative methods and materials are a common result of I/D provisions. Contractors can recoup additional costs put forth to incorporate innovation through the incentives received with early project completion.
- **Contract administration** – Utilizing I/Ds requires focus from the agency to monitor how contract time and impacts associated with excusable delays are measured. Inefficiencies in this area can negate the effectiveness and benefits offered through I/D provisions.
- **Staffing** – Incorporating accelerated work schedules often requires an increase in the amount of hours worked per week - for both contractors and the agency. Failure to address and prepare for extra strain may lead to a "burn out" on staff.
- **Quality** – I/D provisions do not have negative impacts on quality.
- **Safety** – Safety practices, when considering contractors and agencies, are unaffected with I/Ds. Safety risks to the traveling public are decreased as exposure is decreased with shorter construction schedules.

How to use it?

The Oregon Department of Transportation (ODOT) Report SPR630 Establishing Guidelines for Incentive/Disincentive Contracting at ODOT (2) provides a flowchart (figure 3) on the implementation process of I/Ds. The process identifies six major project components where the I/D provision have a crucial role: 1) Project Initiation, 2) Design Acceptance, 3) Advanced Plans, 4) Final Plans and PS & E Submittal, 5) Documentation Requirements, and 6) Construction.

- **Project Initiation** – Even though I/D provisions can be implemented at later project stages, the decision to use I/D provisions is most effective at this stage. Here, the agency must identify the project goals and needs finding the elements that could benefit from having a "date certain" completion requirement and/or an accelerated project schedule.
- **Design Acceptance** – The agency should make and document the final decision regarding the use of I/D provisions at this stage. However, the agency should continuously review the suitability of the project for the use of I/D provisions as the project development progresses.
- **Advanced Plans** – At this stage, the agency should determine key contract parameters related to the I/D provisions. The NCHRP report 652 *(5)*(Fick et al. 2010) identifies the following variables:
    - Contract Time – Definition of contract length and milestone dates.
    - Units of Time – Clear specification of how time is measured in the project (e.g. calendar days, modified calendar day, working days, what constitutes a day, etc)
    - I/D Amount – This represents how much early or late completion is really worth. It is generally obtained using Road User Costs (R.U.C.).
    - I/D Accrual and Capping – The agency should establish how the incentives and disincentives are calculated (e.g. daily rate or lump sum), and what the maximum amount for each is.

  - Disincentive – The specific amount that the contractor will be charged by failing to meet the milestone date
  - Incentive – The specific amount that the contractor will be awarded by completing the work before the milestone date.
  - Substantial Completion – Specific criteria that defines substantial completion of a project milestone.
  - Time Adjustments – Provides under what circumstances will the I/D milestone date be adjusted.
- **Final Plans and PS & E Submittal** – At this stage, the agency should perform a final check review of the I/D amounts and specifications.
- **Documentation -** When documenting the project, Federal Highway Administration (FHWA) requires that the decision process, rationale and justification, and variable values behind the I/D provisions is maintained within project files for audit purposes.
- **Construction** – During this stage, an I/D project requires prompt decision making, approvals, problem solving, and conflict resolution.

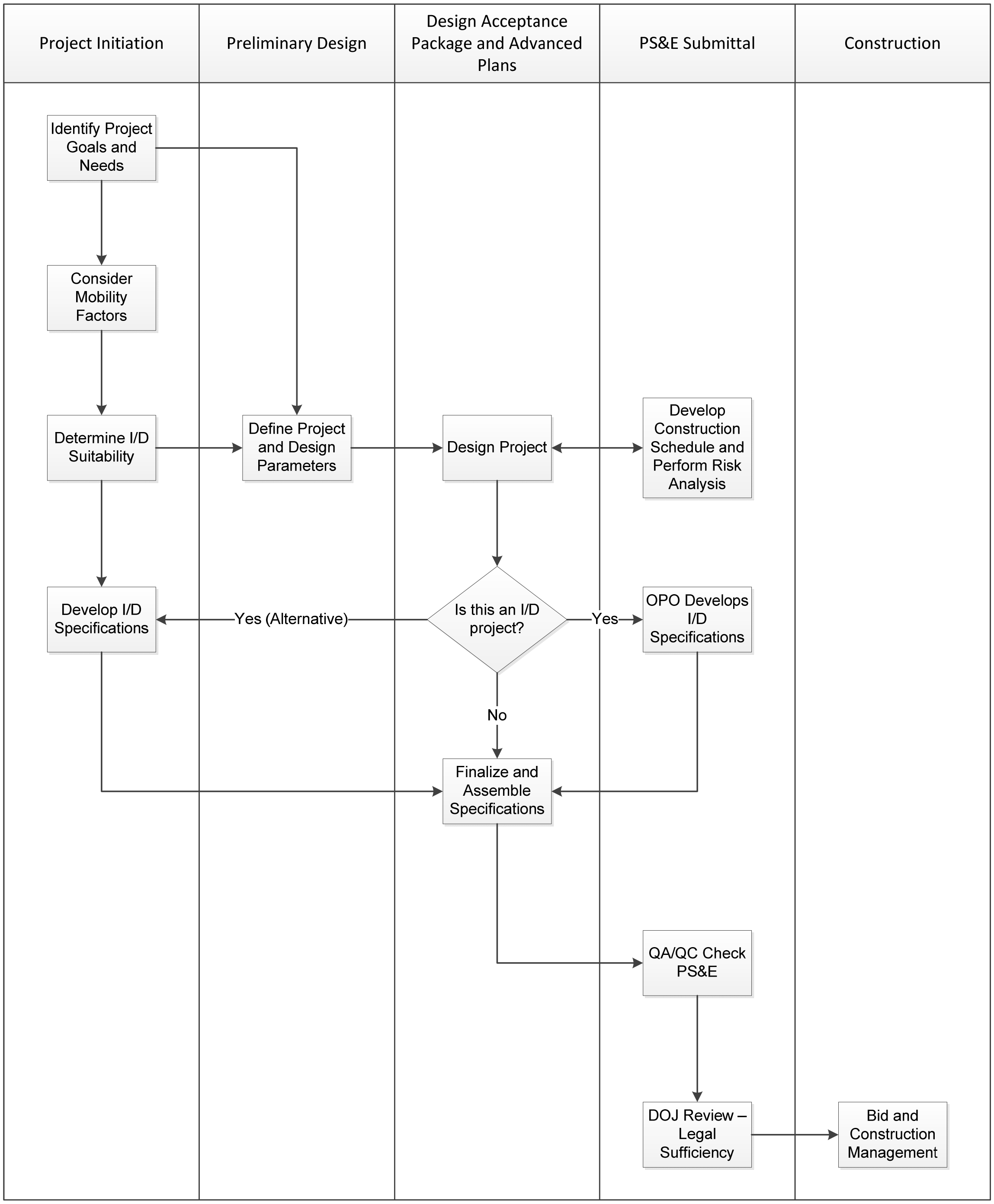

Figure 3: ODOT I/D Implementation Process

When to use it?

According to the NCHRP report 652 *(5)*, FHWA considers five characteristics to evaluate the appropriateness of a project for the use of I/D provisions.

- Projects on high traffic volume facilities, generally in urban areas;
- Projects that will complete a gap in a significant highway system;

- Major reconstruction or rehabilitation on an existing facility that will severely disrupt traffic;
- Major bridges out of service, and;
- Projects with lengthy detours.

Additionally, other characteristics used by STAs are *(5)*:

- Construction requires temporary traffic barrier on both sides of a lane and/or a lack shoulder area;
- Special events (school openings, holidays, etc.);
- Environmental or political commitment requiring work to be completed;
- Agreements requiring completion within a given time frame;
- Disruption of emergency services, and;
- Adjacent neighborhoods or businesses would be impacted significantly.

Limitations?

When deciding on the appropriateness of I/D provisions for a project the following drawbacks should be considered:

- Additional funding may be required *(1)*;
- Contract changes can lead to disputes regarding the incentive payments *(1)*;
- There is a risk for increased costs for construction oversight *(6)*; and
- Incentive amount or disincentive rate may not be enough to motivate the contractor to accelerate construction *(6)*.

Who uses it?

The NCHRP Report 652 *(5)* states that at least 46 states have had experience with contracts involving some variation of I/D provisions. Between the years 2008 and 2010, Florida, South Carolina, Ohio, New York, California, and Virginia had at least 50 documented projects that used I/D provisions *(5)*.

Example

The Minnesota Department of Transportation (MnDOT) used early completion I/Ds on several projects executed on the I-35 corridor between 2012 and 2013 *(7)*. The Sandstone to south of Willow River road section for instance, was a $20.7 million project which consisted in the concrete overlay of 24 miles (12 mi northbound and 12 mi southbound) of highway and reconstruction of ramps. The MnDOT offered a daily incentive of $10,000/day up to 25 days or $250,000 for early completion and equal disincentive for late completion on this project. Another of these I-35 projects was the $30.1 million concrete overlay and bridge rehabilitation project between Scanlon and Boundary Avenue. Here, MnDOT offered a similar early completion incentive of $10,000/day up to 25 days or $250,000 with equal disincentive for late completion. Finally, on the $22.6 million concrete overlay of I-35 between Moose Lake and Barnum project (northbound) MnDOT offered an incentive of 10,000/day up to 9 days or $90,000 for early completion with equal disincentives for late completion.

The following is the actual contract language used on the Sandstone to south of Willow River road section project.

S-38.7 **Intermediate Completion Time (A) Incentive**

The Contractor will be paid $10,000 (ten thousand dollars) for each Calendar Day the work required in this Contract, as indicated in Section S-9.1 (CONSIDERATION OF PROPOSALS (A+B METHOD) – Intermediate Completion Time (A)), is completed prior to the number of Calendar Days stated by the Contractor on the Proposal Site Page of the Schedule of Prices, in the # of Days column. The total number of Calendar Days for incentive payment will not exceed twenty (25) days or $250,000 (two hundred and fifty thousand dollars). Payment of the incentive will be made on the first partial estimate voucher processed after the Completion of Work has concluded.

S-39.3 The Department will assess the Contractor a disincentive for failure to complete the work, indicated in Section S-9.1 (CONSIDERATION OF PROPOSALS (A+B METHOD) - Intermediate Completion Time (A)) of these Special Provisions, within the established number of Calendar Days (the number entered as Item 2016.621 (Intermediate Completion Time (A)) on the Proposal Site Page of the Schedule of Prices, in the # of Days column). The disincentive will be $10,000 (ten thousand dollars) for each Calendar Day the work remains incomplete after the expiration of the work days established by the Contractor. The assessment will be deducted from any monies due or to become due the Contractor.

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C.10 No Excuse Incentives

Also known as No Excuse Bonus, Locked Date Incentive

What is it?

No Excuse Incentives (NEI) is a monetary incentive for early completion, where the contractor receives the bonus by completing the work on or before a "drop-dead date" that cannot be adjusted for any reason *(1, 2)*.

Why use it?

According to the Federal Highway Administration (FHWA) report *Work Zone Road User Costs: Concepts and Applications (3)*, NEI provisions:

- Shorten project/phase completion time,
- Encourage contractor efficiency and productivity, and
- Reduce construction engineering inspection and traffic control costs.

Additionally, as stated in the Minnesota Department of Transportation *Innovative Contracting Guidelines (4)*, NEI provisions offer the possibility for better coordination between the owner, contractor, and subcontractors and the development of more realistic bids.

What does it do?

A NEI provision states a completion due date for a project or portion of a project. In order to win the bonus, the contractor must finish work on or before such date. Furthermore, A NEI provision establishes that the due date cannot be modified for any reason including: permitting, utilities, weather delays, change orders, or any other cause short of a natural catastrophe *(1)*. By providing such clause, the NEI provision allows agencies to meet critical dates (e.g. major sporting events or the beginning of winter season) *(5)*. In case the contractor does not meet the required milestone date, no disincentives are applied and the delay costs are recovered assessing regular liquidated damages to the contractor *(2, 6)*.

How to use it?

The process used to apply NEI provisions is similar to the one used for incentives/disincentives provisions (I/D). Some of the most important aspects are:

- Developing clear project goals and objectives *(7)*,
- Accurately calculating the incentive amount, generally obtained using Road User Costs (RUC) *(1)*, and

- Setting up aggressive but realistic project schedule requirements *(8)*.

The California Department of Transportation *Alternative Procurement Guide (1)* establishes the following additional contracting considerations for the use of NEI provisions:

- Plans and specifications must be complete, accurate, and conflict-free to facilitate a contractor's understanding of the project. They should indicate any unusual conditions or restrictions under which the contractor may be required to work.
- The NEI provision must clearly state the incentive amount, all the relevant work items, a substantial completion definition, the unit of time used, and the "no excuse" completion date.
- During construction, job-site progress meetings should be held to review and update the project schedule, assess project progress, and adjust the work sequence and resources.
- Cooperation and coordination between the contractor and the agency are extremely important. The agency should quickly respond to any decision-making questions or requests for approval. Both parties should have well defined time limits for submittals, reviews, and any other administrative issues within the contract and the project schedule.

In addition, it is important to consider that this payment provision remains as a non-traditional contracting technique under the FHWA's *Special Experimental Projects No 14 (SEP-14)* program and requires FHWA approval before being used *(2)*.

When to use it?

NEI provisions are useful for projects where time plays a key role and/or where there are significant road user costs that impact the community and local businesses *(5)*. The California Department of Transportation *Alternative Procurement Guide (1)* provides the following list of appropriate projects:

- **Projects with a fixed date or sequential contracts.** These are projects where finishing early would provide some benefit but finishing late would cause severe damages. (e.g. projects with an arrangement of multiple construction contracts where finishing late would cause collateral impacts to subsequent contractors, or a road opening to accommodate major traffic events)
- **Projects with high user impacts.** These are projects that require traffic restrictions, lane closures, or detours that if delayed would result in increasing road user costs and impacts.
- **Projects with impacts to local community.** Projects where there are severe impacts to the residential or business community.
- **Projects with public or political interests.** Projects where public or political interests may require completion by a certain date to minimize user impacts.

Limitations?

Using this payment provision has the following disadvantages, as identified in the FHWA report *Work Zone Road User Costs: Concepts and Applications (3)*:

- Requires additional agency resources
- Increases construction costs
- Makes contract changes negotiations difficult
- Requires more planning than usual provisions

Who uses it?

A survey performed by the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Construction in 2010 showed that 14 STAs (Alabama, Florida, Georgia, Iowa, Massachusetts, Minnesota, Missouri, North Carolina, Pennsylvania, South Carolina, Virginia, Wisconsin, and Wyoming) use NEI provisions *(9)*. The Florida DOT developed this provision, also called "No Excuse Bonus" and has used it to a greater extent than other DOTs *(6)*.

Examples

Example 1) Minnesota Department of Transportation

The Minnesota Department of Transportation executed several projects testing the NEI provisions *(10)*. One of these was the construction of two five-lane bridges (northbound and southbound) over the Mississippi River as part of I-35W in 2008. The previous bridge, collapsed on 2007, was a vital transportation link between Minneapolis and the University of Minnesota which forced MnDOT to reestablish the link with a design-build fast tracked project with an approximate bid price of $230 Million.

MnDOT identified several potential risks with the project that could delay the project from fall 2008 to spring or summer 2009, these were:

- Contaminated Materials – Soils and groundwater;
- Utilities – High pressure gas lines, fiber optic lines, sanitary sewer, water-main, and telecommunication lines;
- Geotechnical Conditions – Limited geotechnical investigation
- Collapsed Bridge – Removal of collapsed bridge performed by third party which could have been delayed and impacted project
- Weather – Harsh winter conditions
- RFP – Large comprehensive complex document written in three weeks which probably had potential for claims due to ambiguities.

The NEI excuse was used in order to ensure that the project was finished in the fall 2008 and to reduce the potential for claims. The NEI consisted of a lump sum of $7 million if the contractor met the completion date and waived all the claims. This incentive was combined with an early completion incentive of $2 million for every 10 days the bridge was open to traffic earlier. The contractor completed the project 90 days before the due date and waived all the claims earning a total $25 million incentive.

The MnDOT uses the following specifications for NEI or locked incentive date (LID) provisions:

A "Locked Incentive Date (LID)" Payment is made available to the Contractor under the following conditions:

1. Subject to the conditions set forth below, the Department shall pay the Contractor a lump sum incentive of $XX if the work specified above in this Section is completed on or before , 20 (hereinafter the "Locked Incentive Date or "LID")
2. The LID shall not be adjusted for any reason, cause or circumstance whatsoever, regardless of the cause of the delay, and even though it may have been caused by Mn/DOT, Contractor acknowledges and agrees that delays may be caused by or arise from any number of events during the course of the Contract. Such delays or events and their potential impacts on the performance by the Contractor are specifically contemplated and acknowledged by the parties in entering into this Contract and shall not result in an extension of the LID set forth above. Any and all costs or impacts incurred by the Contractor in accelerating the Contractor's work to overcome or absorb such delays in an effort to complete the work by the LID, regardless of whether the Contractor successfully meets the LID or not, shall be the sole responsibility of the Contractor in every instance.
3. If the Contractor fails to complete the work by the LID, the Contractor reserves the right to submit claims for additional compensation in accordance with Mn/DOT 1517, or for time extensions in accordance with Mn/DOT 1806, for work performed prior to the LID. The Contractor shall not, however, make a claim for any acceleration costs associated with attempting to meet the LID date.
4. The Contractor shall provide proper notification of all claims in accordance with MN/DOT 1517 to allow Mn/DOT the option of mitigating or documenting the extra costs, excluding acceleration costs.
5. If the Contractor completes the work by the LID, the following shall apply:
    a. The Contractor must promptly request written verification from the Engineer that the required work was completed on or before the LID. The Contractor shall request this verification from the Engineer in writing on or before the LID.
    b. The Contractor shall elect to either:
        1) Accept payment of the LID incentive; or
        2) Reject payment of the LID incentive and instead reserve the right to submit claims for additional compensation or time extensions (in which the Contractor shall not have the right to make a claim for any acceleration costs associated with attempting to complete Work on or before the Locked Incentive Date).
    c. The Contractor must provide written notice to the Engineer of its election to either accept or decline the LID incentive payment within 30 days of receiving the Engineer's verification that work was completed by the LID. If the Contractor does not notify the Engineer of its election within 30 days, the Contractor shall be

deemed to have waived its right to accept the incentive, and shall retain the right to submit claims as specified above.

6. If the Contractor elects to accept the LID incentive payment, the following shall apply:
    a. The Contractor agrees that the incentive payment shall constitute full and final settlement of all claims for additional compensation or time extensions that the Contractor has submitted, could have submitted, or might otherwise hereafter submit, on behalf of itself or any subcontractor or supplier, for work performed up to and including the Locked Incentive Date. This includes all claims that may already be pending with the Department, or in any alternative dispute resolution process such as mediation or arbitration, or before a Dispute Review Board.
    b. The Contractor releases and covenants not to sue the State based upon any claims, demands, charges or causes of action, accruing to the Contractor (including its subcontractors and suppliers) up to and including the Locked Incentive Date. This waiver of claims covers all known or unknown damages, losses, charges, expenses, delays or compensation of whatever nature or kind based upon or in any way arising out of any work performed or materials provided by the Contractor (including its subcontractors and suppliers) for this Project.
    c. Payment of the incentive shall be made on the first partial estimate voucher processed after the Engineer receives the Contractors written request to accept the incentive.
7. Payment of the LID incentive is intended to insure to the Department and the public the benefits of early completion of the specified work and to eliminate claims disputes. Should this provision conflict with any other provision of the Contract, this provision shall prevail and the Contract shall be interpreted in accordance with it.

Example 2) Virginia Department of Transportation

The Virginia Department of Transportation (VDOT) used the NEI provision on the Springfield Interchange Project also called "The Mixing Bowl." VDOT and FHWA offered a No Excuses Incentive for phases two and three of the eight-year project in September 1998. The project consisted of redesigning a complicated and historically congested interchange in the vicinity of Springfield, Virginia, involving I-495, I-95, and I-395. The interchange handles approximately 430,000 vehicles per day.

The incentive amounted to $10 million if the work was completed on or before August 18, 2001, with the amount dropping to $5 million if completed on or before November 17, 2001, and with the contract fixed date for completing these project phases being June 1, 2002. The project planners chose to use a NEI provision because they wanted to begin construction even though certain preparations typically made prior to construction had not been completed. 55 right-of-way parcels still needed to be procured by the bid date, September 1998, and much of the utility relocation work had yet to be completed. The contractors bidding on the project would need to work around the utilities and un-procured lots.

The incentive worked even though the contractor did not have full access to the construction site until right of entry had been obtained for the final ROW parcel in March 1999, and many utilities had to be relocated during construction. The project phases were completed on schedule and the contractor received the full $10 million incentive.

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C.11 Interim / Milestone Completion Dates

What is it?

Interim/Milestone Completion Dates (ICD) are a payment provision method designed to expedite completion of specific portions of a contract by providing contractors with incentives for milestone completion on or before a specified date. This type of provision also includes a disincentive amount if the milestone is not completed by the given date *(1, 2)*.

Why use it?

ICD provisions have two main advantages. The first is that they provide opportunities to open critical portions of a project on time. This helps agencies to maintain the overall project schedule, which is important in cases where there are sequential contracts *(3)*. The second is that ICD provisions can reduce user costs. This occurs when critical project segments that are sensitive to traffic are concluded early *(4)*.

In addition, the NCHRP study, *Selection and Evaluation of Alternative Contracting Methods to Accelerate Project Completion (3)*, identified the following list of advantages as perceived by the different STAs that use this provision.

- Allows project acceleration;
- Encourages the contractor to strive in order to complete the project on time;
- Provides better owner control to structure the timing of the work;
- Helps in meeting critical dates for environmental controls;
- Enhances safety;
- Encourages proactive and creative approaches by contractors;
- Reduces user inconvenience;
- Keeps the focus on the impact to the traveling public; and
- Reduces interference of traveling public.

What does it do?

ICD provisions provide milestone incentives to the contractor for completing a portion of the work on or before a target completion date. The payments can be made in two ways, as an incentive added to the total lump sum items related to the milestone or with scheduled partial standard payments and the incentive paid at the end *(4)*.

How to use it?

Interim/Milestone Completion Date provisions should be implemented in the early stages of the project and throughout the whole project duration, similar to I/D provisions. .

- The agency should identify the project objectives and goals. The STA must determine whether accelerating the schedule will provide an advantage or not *(4)*. The agency should continuously review the adequacy of the project for the use of ICD provisions throughout the development process.
- The agency should determine the following key contract parameters as determined in the Interim Completion Date guidelines provided by the Washington State Department of Transportation *(6)*:
    - **Contract time -** Definition of milestone dates taking into account probable changes such a weather, third party delays, or plan errors. STAs usually report that contractors often meet or beat the milestone, which may be caused by poorly defined milestone dates. The agency should evaluate the project schedule under normal conditions and then base the milestone completion date on a more aggressive schedule.
    - **Identifying the actual cost -** Identifying the actual cost of obtaining a contractor under interim completion time and deciding whether the investment is worth it or not *(4)*.
    - **Incentive and disincentive amounts -** These are generally obtained using road user costs (RUC) *(5)*.
    - **Time adjustments** – Determine and document under which circumstances will the STA accept requests for time extensions for the milestone date.
    - **Restricting unworkable days -** The agency should clearly define the circumstances for when a day can be deemed unworkable.
- During the construction stage this type of provision requires prompt agency response to approvals, problem solving and conflict resolution.

When to use it?

ICD provisions should be used on functional elements of larger projects such as ramps, intersections, or bridges *(6)*. Interim completion dates are effective when the intermediate phases are critical for the whole project *(7)* and when there are significant road user costs and/or negative impacts to the community and local businesses *(8)*.

Limitations?

ICD provisions have similar limitations and risks as incentive/disincentive provisions (I/D). As identified in the NCHRP report 652 *Time-Related Incentive/ Disincentive Provisions in Highway Construction Projects (5)*, ICD provisions:

- May increase agency costs as a result of accelerated construction.

- Require the use of innovative methods and materials.
- Require more focus from the agency to monitor how contract time and impacts associated with excusable delays are measured. If not done properly, this can eliminate all the benefits offered by this provision.
- Often requires the agency and contractor to work more hours per week.
- Have limited negative impact on quality.
- Have little to no impact on safety for both contractors and agency, and reduced traveling public safety risks as a result of reduced construction schedule.

Who uses it?

A survey performed by the NCHRP revealed that 70% out of the 30 respondent STAs used some form of Interim Completion Date provisions. Among these where California, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Minnesota, Mississippi, Missouri, Nebraska, Nevada, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, and West Virginia *(3)*. ICD is also used by federal highways division of the FHWA.

Examples

<u>Example 1) Texas Department of Transportation</u>

An example of using ICD provisions is presented in *Strategies for Planned Project Acceleration (9)*. Katy Freeway, a 23-mile section of Interstate 10 in Texas, was originally constructed in the 1960s. By the mid-1990s the highway presented high traffic 11 hours per day with an average daily traffic of 280,000 vehicles per day. Aging of pavement and flooding of the mainline during heavy rain escalated maintenance costs to about $8 million per year. In 1995, Texas Department of Transportation (TxDOT) began a full reconstruction program with an approximate cost of $2.64 billion. The original configuration included two three-lane mainlines, two two-lane frontage roads, and one reversible high occupancy vehicle (HOV) lane. The proposed configuration included two four-lane mainlines, two three-lane frontage roads, and two managed toll lanes.

This was one of the largest highway construction projects in the state's history. TxDOT divided the project in nine major construction contracts with a design-bid-build delivery approach awarding six contracts to one contractor and three to another. Design started in 2001 and the TxDOT decided to apply an accelerated construction approach during the detailed design phase. Construction began in 2003 and the nine contracts were awarded over a 2-year period.

The TxDOT defined strategic milestones and associated them with I/Ds in two ways:

- Project Milestones - Finishing and operational acceptance of a major part of the project (e.g. opening of the mainlines, or opening of the frontage roads), and
- Interim Milestones - Finishing of a section and/or particular task to improve commuter's time (e.g. opening of a direct connector or connector).

In addition, project completion milestones were used for some contract packages combined with "no-excuse" clauses. Lane rental fees were also included to minimize lane closures. The total project duration was significantly reduced. Using ICD provisions contributed to successfully managing separate and sometimes overlapping contract packages.

Example 2) Michigan Department of transportation

The Michigan Department of Transportation used the Interim/Milestone Completion Dates provision on the M-52 and US-223 resurfacing and reconstruction project in Lenawee County in 2012. The following is the special interim completion date incentive provision was used on stage 2 of the project *(10)*.

MICHIGAN
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR

M-52(SOUTH MAIN STREET) INTERIM COMPLETION OF WORK INCENTIVE

a. Description. This specification describes the “Interim Completion of Work Incentive” and pay item. The Contractor may earn an incentive of $25,000 per day not to exceed $250,000 for the completion of work items required to complete Stage 2 of JN 87522A. The Contractor is entitled to the incentive if Stage 2, as described in the contract, is complete with traffic shifted onto the western most three lanes (Stage 3 traffic configuration including one lane of traffic in each direction with a continuous center turn lane) as stated in the Progress Clause and herein. For every calendar day the Contractor attains the “Interim Completion of Work” on M-52 prior to August 17, 2012 a $25,000 per day incentive will be given. Approved extensions of time will not change the Interim Completion of Work date as specified in the contract Progress Clause or be considered when calculating the incentive.

Should the Contractor fail to complete Stage 2 as called for in the Progress Clause, liquidated damages will be assessed in the amount of $25,000 per calendar day until all required work to complete Stage 2 as called for in the contract is complete and M-52 traffic is shifted onto the western most three lanes (Stage 3 traffic configuration including one lane of traffic in each direction with a continuous center turn lane).

The Interim Completion of Work date of August 17, 2012 will not be adjusted for any reason, cause, or circumstance whatsoever, regardless of fault, save and except in the instance of a catastrophic event (i.e. natural disaster or a declared state of emergency).

The parties anticipate that delays may be caused by or arise from any number of events during the course of the contract. These include, but are not limited to, work performed, work deleted, change orders, supplemental agreements, delays, disruptions, differing site conditions, utility conflicts, design changes or defects, time extensions, Extra Work, right-of-way issues, permitting issues, actions of suppliers, subcontractors or other Contractors, actions by third parties, shop drawing approval process delays, expansion of the physical limits of the project to make it functional, weather, weekends, holidays, suspension of the Contractor’s operations, or other such events, forces, or factors sometimes experienced in highway construction work.

Such delays or events and their potential impacts on performance by the Contractor are specifically contemplated and acknowledged by the parties entering into this contract, and are not to be grounds for extending the Interim Completion of Work date of August 17, 2012, or be considered when calculating the incentive.

Extensions of time for impacts to the contract and the contract completion date will be allowed per subsection 108.09 of the Standard Specifications for Construction, but no extensions will be allowed for the Interim Completion of Work date of August 17, 2012.

Additional compensation for costs incurred by the Contractor required to keep the project on schedule to meet the Interim Completion of Work Date of August 17, 2012 may be allowed for schedule delays, increased quantities, and Extra Work subject to the following conditions.

For the purpose of the following, the term “Major Item of Work” is defined in subsection 101.03 of the Standard Specifications for Construction.

1. <u>Cost Increases due to Schedule Delays</u>
   Cost increases due to schedule delays will be considered if the delays relate to a Major Item of Work, affect completion of the controlling operation as defined in the Contractor’s approved Critical Path valid at the time of the delay, the delays are not the fault of the Contractor, the increased costs are necessary to meet the Interim Completion of Work date of August 17, 2012 and one or more of the following conditions are met:

   a. Right-of-way or right-of-entry required to perform the controlling operation was not available when stipulated in accordance with the contract.

b. Utilities were not moved as indicated in the contract and the presence of these utilities created a delay in the controlling operation.

c. Other related contracts were not completed to a point where construction on the controlling operation could proceed.

d. Suspension of the work ordered by the Engineer for reasons not provided for in the contract.

The Contractor must also fully justify the additional costs required to keep the project on schedule without any adjustment in the Interim Completion of Work date of August 17, 2012. Only actual direct costs above those which would be necessary to complete the work will be considered.

These cost increases must also be fully justified by the Contractor and approved by the Engineer prior to performing the work involving the alleged delay. No cost increase will be allowed for overhead. Failure of the Contractor to meet any of the above requirements and provide the required justification will result in no payment being made for additional costs incurred to keep the project on schedule because of the alleged delay.

2. <u>Cost Increases for Increased Quantities</u>
Cost adjustments for quantity increases required to meet the Interim Completion of Work date of August 17, 2012 will be considered if the increases are to a Major Item of Work, the increase affects completion of the Contractor’s controlling operation(s) as defined in the Contractor’s approved Critical Path valid at the time the quantity increase occurs, the quantity increase is required to meet the Interim Completion of Work date of August 17, 2012, and the quantity increase qualifies as a Significant Change as defined in subsection 103.02.B of the Standard Specifications for Construction.

The Contractor must demonstrate that the quantity increase meets the Significant Change criteria as it relates to the controlling operation. The Contractor must also fully justify the adjusted unit price due to the quantity increase relative to keeping the project on schedule without any change in the Interim Completion of Work date. Only actual direct costs above that which would be necessary to complete the work will be considered.

These cost adjustments must be fully justified by the Contractor and approved by the Engineer prior to performing the work involving the quantity increase. No cost adjustment will be allowed for overhead. Failure of the Contractor to meet these requirements and provide the justification as stated herein will result in no additional payment of any cost adjustment related to increased quantities to meet the Interim Completion of Work date of August 17, 2012.

1. <u>Cost Increases for Extra Work</u>

   Extra Work is defined in subsection 101.03 of the Standard Specifications for Construction. Cost increases for Extra Work will be allowed if the Extra Work is required to complete a Major Item of Work, the Major Item of Work is shown to affect the controlling operation as defined in the Contractor's approved Critical Path valid at the time the Extra Work is to be done, and the Extra Work is required to meet the Interim Completion of Work date of August 17, 2012.

   The Contractor must bear the burden to fully justify the cost of any Extra Work prior to performing the Extra Work, including additional cost relative to keeping the project on schedule without any adjustment in the Interim Completion of Work date.

The Contractor has no right to any payment whatsoever under this special provision, if the Interim Completion of Work date of August 17, 2012 in the contract Progress Clause is not met.

Measurement and Payment. Any incentive earned as described above will be paid for using the following pay item:

Pay Item	**Pay Unit**
Incentive, Completion of Work (Stage 2)	Dollar

The Contractor may earn incentive up to $250,000 for completing all Stage 2 items of work prior to August 17, 2012.

References

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C.12 Material and Workmanship Warranty

What is it?

Under a materials and workmanship warranty the contractor is responsible for correcting defects in work elements that are within the contractor's control during the warranty period including defective material and workmanship *(1)*.

Why use it?

The main advantage of materials and workmanship warranties is that they reduce the State Transportation Agency's (STA) exposure to risks by providing assurance that the contractor will correct early failures due to materials and workmanship that may have passed unnoticed during construction *(2)*. However, this is not the only advantage as this type of warranty also provides opportunities for enhanced performance, as a result of improved materials and workmanship, and for reduction of agency personnel time required for testing and inspection during construction *(3)*.

What does it do?

This type of provisions are generally implemented along with the standard specifications. They require the contractor to correct early defects caused by elements within the contractor's control, usually the materials and the workmanship, at no cost to the STA. Under this provision the contractor assumes minimal performance risk in comparison to Performance Warranties. These warranties have relatively short-terms, typically three years or less *(4)*.

How to use it?

The following are some of the main elements to consider when using a materials and workmanship warranty.

- **Project selection –** Some of the criteria to consider on this category are project size, existing conditions within the project limits, project traffic volume, type of construction (new or rehabilitation), and industry input *(4)*. Several STAs have developed project selection guidelines, although the great majority are directed to pavement elements given that it carries a greater level of investment and risk. Some of the STAs with these guidelines are Wisconsin, California, Michigan, Colorado, Ohio, and Minnesota.
- **Selection of Performance Indicators** - These factors are indicators of distress, properties, and characteristics of the warranted component. These should be easily obtained, allow for repetitive measurements over time, and provide reliable information about the performance of the chosen element. STAs generally use historical information to identity typical criteria *(4)*. The Indiana Department of Transportation for instance uses rut depth, transverse cracking, longitudinal

cracking, international roughness index, and friction numbers as performance indicators for asphalt pavement *(4)*.

- **Setting Distress Threshold Values –** Threshold values are measurable tolerances of the performance indicators. Warranty provisions define maximum allowable tolerances for thresholds. When exceed, these thresholds trigger the warranty provision and require remedial action. The values are usually based on historical data and are dependent of the reliability of the initial data. STAs specify threshold values as a single value or as ranges with different remedial procedures to be followed according the different threshold levels *(4)*. In materials and workmanship warranty provision the STA must be careful to define these threshold values to account for materials and workmanship failure only, and not for design issues.
- **Warranty Period –** The warranty periods are usually defined based on cost/benefit analysis and type of project. Materials and workmanship warranty are shorter than other types of warranties and generally last up to three years *(4)*.
- **Bonding Requirements –** The costs of the warranty is generally included into the unit price of the warranted component; therefore, the contractor receives full payment of the item including warranty costs upon completion of construction. As a result, STAs require a bond to cover contractor warranty obligations during the warranty period. Bonds are secured through a surety, which becomes the responsible for the costs of remedial work in case the contractor fails to perform *(4)*. Different factors considering when calculating the bond values are:
    - Total dollar value of the warranted item,
    - Percentage of the total dollar value of the warranted item
    - Lower value between a percentage of the contract value and a set dollar amount, or
    - Estimated costs to perform a full repair or preservation technique.
- **Risk Allocation –** Materials and workmanship warranties usually require the contractor to conform to the standard specifications. The contractor can make some decisions over mix design or material selection, but it is generally restricted to the materials from a state approved list *(4)*. This should be taken into account when developing this type of warranty provisions as other types of warranty shift responsibility to the contractor and therefore provide more room for contractor decisions.

When to use it?

According to the Federal Highway Administration *(5)*, on National Highway System (NHS) projects, warranty provisions should be used for:

- A specific construction product or feature as it is unacceptable for the entire project.
- Warranties may not cover items of maintenance not eligible for Federal participation
- Contrators are not to be required to warrant items over which they have no control. There are no regulations about warranty durations
- Approval the FHWA Division Administrator of a warranty provision and its subsequent revisions are required.

- Use of warranty provisions for non-NHS is governed by the individual State written procedures

Good project element candidates are *(6)*:

- Asphalt pavement,
- Concrete pavement,
- Pavement marking,
- Bridge deck waterproofing membrane,
- Crack treatment,
- Microsurfacing,
- Bridge painting,
- Bridge deck joints,
- Chip sealing,
- Roofs,
- Intelligent transportation system components,
- Landscaping,
- Irrigation systems,
- Bridge components, and
- Reflective sheeting for signs

Limitations?

The following are some aspects to consider when considering and developing warranty provisions.

- The STA must ensure that warranty guidelines are reasonable and enforceable *(7)*
- Warranty may not be collectable if guidelines are too restrictive or place undue burden on contractor *(7)*
- Success of warranty depends on contractor and surety company involved. Sureties face higher risks under this type of provision *(2)*
- Warranties discourage participation of small contractors due to financial requirements *(2)*
- The use of warranty provisions may increase the bid cost by up to 15% *(8)*.
- Prescriptive warranty provisions are likely to be challenged and are un-enforceable *(9)*.

Who uses it?

Almost all STA use a form of the materials and workmanship warranty provision. In pavement warranties, one of the most frequently used type of warranty, Michigan, Florida, Ohio, Wisconsin, Illinois, California, Minnesota, Colorado, Mississippi and Indiana have the most experience *(4)*.

Example

The following are the Materials and Workmanship provisions for pavement used by the Michigan Department of Transportation (MDOT) *(10)*.

MICHIGAN
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR
MATERIALS AND WORKMANSHIP PAVEMENT WARRANTY

a. Description. The materials and workmanship pavement warranty consists of the warranty bond, the terms of this special provision, and the Special Provision for Warranty Work included in the contract. This special provision establishes the common terms and definitions applied to pavement projects requiring a warranty. The Materials and Workmanship Pavement Warranty warrants the Department against defects in materials and workmanship.

b. Definitions.

Materials and Workmanship Warranty. The Contractor is responsible for correcting defects in the pavement caused by elements within the Contractor's control (i.e., the materials supplied and the workmanship), during the warranty period. Since the Department is responsible for the pavement design, the Contractor assumes no responsibility for defects that are design related. If a defect is attributable to both, the materials and/or workmanship, and the design, responsibility for correcting the defect will be shared by the Department and the Contractor; the Contractor is responsible for the percentage of fault attributable to the workmanship and/or materials, and the Department is responsible for the percentage of fault attributable to the design.

Acceptance Date of Construction. The date when the warranted work is complete and confirmed in writing on the initial acceptance document, by the Department, to be in compliance with the contract specifications and is open to traffic. This is the date of initial acceptance and constitutes the start date for the warranty period. There may be more than one acceptance date of construction for a project.

Warranty Bond. A bond issued by a surety which guarantees that the warranty requirements will be met.

Conflict Resolution Team (CRT). The five-person team responsible for resolving disputes between the Department and the Contractor regarding any claim of non-compliance with the warranty requirements.

Driving Lane(s). The delineated pavement surface used by traffic and the portion of the pavement considered warranted work. Each of the following is considered a separate driving lane.

- Each individual main lane.
- The sum of all ramp lanes and the associated acceleration/deceleration lanes is considered a separate driving lane
- The sum of all auxiliary lanes, such as passing lanes and turn lanes, is considered a separate driving lane.

Approaches, driveways, shoulders, and adjoining transitions tapers between various types of pavement are not considered driving lanes for the purpose of this provision.

Warranty Work. Corrective action taken to bring the warranted work into contract compliance.

Longitudinal Crack Open/Joint. A crack or open joint, at least 5 feet in length that is oriented primarily in the longitudinal direction versus the transverse direction. That is, the angle between the overall crack line and the centerline is less than 45 degrees. It can exist anywhere in the warranty lane; i.e., at the pavement centerline joint, wheel path, center of lane, lane/shoulder joint, or lane/approach joint. This does not include reflective cracking from underlying pavement

De-bonding. A physical separation of two HMA layers. De-bonding will be visually identified as shoving, or the loss of the new surface course. Surface potholes, regardless of depth, will be classified as de-bonding.

Raveling. Surface disintegration, due to the loss of coarse or fine aggregate material, that occurs over an area or in a continuous longitudinal strip.

Flushing. The accumulation of excess asphalt binder on the pavement surface that creates a shiny, reflective condition and becomes tacky to the touch at high temperatures.

Rutting. A longitudinal surface depression in the wheel path. It may have associated transverse displacement or humping.

Transverse Crack. A crack, at least 5 feet in length, that is oriented primarily in the transverse direction versus the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees. It can be either straight or irregular in direction.

Alligator Cracking. Parallel longitudinal cracks with transverse tears between them exhibiting a pattern similar to an alligator hide. An alligator crack typically starts in a wheel path and may extend to other lane locations.

Block Cracking. Transverse and longitudinal cracking that has progressed to a pattern that the pavement is broken into blocks of size less than 12 foot by 12 foot. The shape of each block may be irregular.

c. Initial Acceptance. The Department and the Contractor must jointly review all completed warranted work, or a portion thereof, as determined by the Department. If the work does not meet contract requirements, the Contractor must make all necessary corrections, at their expense, prior to initial acceptance. Initial acceptance will occur as soon as the Department confirms in writing, on the initial acceptance form, that contract requirements have been met for the warranted work. The date on which initial acceptance occurs is termed the Acceptance Date of Construction.

Initial acceptance will be documented and executed jointly by the Department and the Contractor on a form furnished by the Department. A copy of the form will be sent to the Contractor’s warranty bond surety agent by the Department. Neither the initial acceptance nor any prior inspection, acceptance or approval by the Department diminishes the Contractor’s responsibility under this warranty.

The Department may accept the work and begin the warranty period, excluding any area needing corrective work, to accommodate seasonal limitations or staged construction.

Acceptance of material, in penalty, under the Department’s quality assurance program will not relieve the Contractor from meeting the material and workmanship warranty requirements for the accepted material.

d. Warranty Bond. The Contractor must furnish a single term warranty bond, in an amount stipulated in the Special Provision for Warranted Work Requirements, prior to contract award. The effective starting date of the warranty bond will be the Acceptance Date of Construction. The warranty bond will be released at the end of the warranty period or after all warranty work has been satisfactorily completed, whichever is latest.

e. Rights and Responsibilities of the Department. The Department:

1. Reserves the right to approve the schedule proposed by the Contractor to perform warranty work.

2. Reserves the right to approve all materials and specifications used in warranty work.

3. Reserves the right to determine if warranty work performed by the Contractor meets the contract specifications.

4. Reserves the right to perform, or have performed, routine maintenance during the warranty period, which routine maintenance will not diminish the Contractor's responsibility under the warranty.

5. Reserves the right, if the Contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the Contractor that action is required to address an unsafe condition. However, should the Contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the Contractor from meeting the warranty requirements of this special provision. Any costs associated with the emergency repairs will be paid by the Contractor if it is determined the cause was from defective materials and/or workmanship.

6. Is responsible for monitoring the pavement throughout the warranty period and will provide the Contractor all written reports of the surface treatment's condition related to the warranty requirements. The Contractor will not be relieved of any responsibility based upon a claim that the Department failed to adequately monitor the pavement or to report its findings to the Contractor.

7. Is responsible for notifying the Contractor, in writing, of any corrective action required to meet the warranty requirements.

f. Rights and Responsibilities of the Contractor. The contractor

1. Must warrant to the Department that the warranted work will be free of defects in materials and workmanship. The warranty bond must be described on a form furnished by the Department. The completed form must be submitted to the Department prior to award of contract.

2. Is responsible for performing all warranty work including, but not limited to, maintaining traffic and restoring all associated pavement features, at the Contractor's expense.

3. Is responsible for performing all temporary or emergency repairs, resulting from being in non-compliance with the warranty requirements, using Department approved materials and methods.

4. Must notify the Department and submit a written course of action for performing the needed warranty work a minimum of 10 calendar days prior to commencement of warranty work, except in the case of emergency repairs as detailed in this special provision. The submittal must propose a schedule for performing the warranty work and the materials and methods to be used.

5. Must follow a Department approved maintaining traffic plan when performing warranty work. All warranty work must be performed under permit issued by the Region Utilities and Permits Engineer. The permit fee and an individual permit performance bond will not be required. The permit insurance requirements, however, will apply.

6. May be responsible for reimbursing the Department a portion of any incentive payments paid to the Contractor for early completion of the original work. Reimbursements will be required if the proposed maintaining traffic plan for corrective action requires lane closures during peak hour traffic. Peak hours will be determined by the Region Traffic and Safety Engineer. The daily reimbursement amount must not exceed 25 percent of the original daily earned incentive payment. The Department will determine the actual percentage on a project by project basis.

7. Must furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any warranty work being performed. These supplemental bonds must be furnished prior to beginning any warranty work, using Department approved forms. These supplemental bonds must be in the amount required by the Department to cover the costs of warranty work.

8. Must complete all warranty work prior to conclusion of the warranty period, or as otherwise agreed to by the Department.

9. Will be liable during the warranty period in the same manner as Contractors currently are liable for their construction related activities with the Department pursuant to the standard specifications, including, but not limited to subsections 104.07.C, 107.10 and 107.11. This liability will arise and continue only during the period when the Contractor is performing warranty work. This liability is in addition to the Contractor performing and/or paying for any required warranty work, and will include liability for injuries and/or damages and any expenses resulting therefrom which are not attributable to normal wear and tear of traffic and weather, but are due to non-compliant materials, faulty workmanship, and to the operations of the Contractor as set forth more fully in subsections 104.07.C, 107.10 and 107.11 of the Standard

Specification for Construction.

g. Evaluation Method. The Department will conduct pavement evaluations by dividing the project into segments. Each individual driving lane will be divided into segments of 528 feet (1/10 mile) in length for measuring and quantifying the condition parameters. Evaluation will include use of both the Department's Pavement Management System and/or field pavement condition reviews. This evaluation may be waived in emergency situations.

The beginning point for laying out segments will be the Point of Beginning (POB) of the project. Segments will be laid out consecutively to the Point of Ending (POE) of the project. The original segmentation of the project will be used for all successive reviews throughout the warranty period.

h. Condition Parameters. Condition parameters are used to measure the performance of the warranted pavement during the warranty term. Each condition parameter has a threshold level applied to each segment and a maximum number of defective segments allowed before corrective action (warranty work) is required.

i. Warranty Requirements. Warranty work will be required when the following two criteria are met as a result of a defect in materials and/or workmanship.

Criterion 1 - The threshold limit for a condition parameter is exceeded, and
Criterion 2 - The maximum allowable number of defective segments is exceeded for one or more condition parameters for a driving lane.
Specific threshold limits and segment limits are covered in the Special Provision for Warranted Work.

To determine whether the failure to meet the warranty criteria is a result of defects in materials and/or workmanship, a joint field investigation by the Department and the Contractor will be conducted. The Department and Contractor may elect to have a forensic investigation conducted. The decision to undertake a forensic investigation, the scope of it, and the selection of the party to conduct it will be agreed to by the Department and the Contractor. The forensic investigation will be conducted following the "Material and Workmanship Forensic Investigation Procedure". If agreement cannot be reached a Conflict Resolution Team (CRT) may be convened in accordance with this special provision. The CRT will then decide the need for a forensic investigation, its scope and the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Contractor and the Department based on the determined cause of the condition.

During the warranty period, the Contractor will not be held responsible for pavement distresses that are caused by factors unrelated to materials and workmanship. These include, but are not limited to: chemical and fuel spills, vehicle fires, snow plowing, and quality assurance testing such as coring. Other factors considered to be beyond the control of the Contractor which may contribute to pavement distress will be considered by the Engineer on a case by case basis upon receipt of a written request from the Contractor.

j. Conflict Resolution Team. The sole responsibility of the Conflict Resolution Team (CRT) is to provide a decision on disputes between the Department and the Contractor regarding application or fulfillment of the warranty requirements. The CRT will consist of five members:

- Two members selected, and compensated by the Department.
- Two members selected and compensated by the Contractor.
- One member mutually selected by the Department and the Contractor. Compensation for the third party member will be equally shared by the Department and the Contractor.

If a dispute arises on the application or fulfillment of the terms of this warranty, either party may serve written notice that appointment of a CRT is required.

At least three members of the CRT must vote in favor of a motion to make a decision. The CRT may decide to conduct a forensic investigation, will determine the scope of work and select the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Contractor and the Department based on the determined cause of the condition.

k. Emergency Repairs. If the Department determines that emergency repairs are necessary for public safety, the Department or it's agent may take repair action. Emergency repairs must be authorized by the Region Engineer. Prior to emergency repairs, the Department will document the basis for the emergency action. In addition, the Department will preserve evidence of the defective condition.

l. Non-extension of Contract. This special provision must not be construed as extending or otherwise affecting the claim process and statute of limitation applicable to this Contract.

m. Measurement and Payment. All costs, including engineering and maintaining traffic costs, associated with meeting the requirements of this special provision are considered to be included in the Contract unit prices for the warranted work items regardless of when such costs are incurred throughout the warranty period. These costs include but are not limited to, all materials, labor and equipment necessary to complete required warranty work.

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C.13 Performance Warranty

What is it?

Performance warranty provisions require the contractor to guarantee some parts of a project for overall performance. This includes the design, construction, and some part of the maintenance. In comparison to a materials and workmanship warranty, performance warranty assign more responsibility to the contractors and are usually longer *(1)*.

Why use it?

Warranty provisions carry the following potential benefits to highway projects *(1)*:

- Enhanced performance through improved materials and workmanship,
- Redistribution of responsibility for product performance to the contractor, who has more control of it,
- Reduction of agency personnel time required for testing and inspection,
- Encouragement of contractor innovation,
- Reduced maintenance exposure when desired performance is not achieved,
- Fewer cycles of rehabilitation by practicing preventive maintenance and delaying the need for rehabilitation.

What does it do?

Performance warranties shift responsibility to the contractor for design, construction oversight, and quality management. These warranties are usually divided in two forms: short-term performance warranties and long-term performance warranties. Short-term performance warranties include the performance criteria to be achieved and the minimum materials and construction requirement acceptable to the State Transportation Agency (STA). In pavement warranties for example, the STA is responsible for the structural design of the pavement while the contractor is responsible for the mix design and the overall performance of such mix for the duration of the warranty *(2)*. Long-term performance warranties, increase the contractor's responsibility for performance but provide more room for contractor made decisions.

How to use it?

The following are some of the main elements to consider when using a performance warranty.

- **Project selection –** Some of the criteria to consider on this category are project size, existing conditions within the project limits, project traffic volume, type of construction (new or rehabilitation), and industry input *(11)*. Several STAs have developed project selection guidelines, although the great majority are directed to pavement elements given that it carries a greater level of investment and risk. Some of the STAs with these guidelines are Wisconsin, California, Michigan, Colorado, Ohio, and Minnesota.

- **Selection of Performance Indicators** - These factors are indicators of distress, properties, and characteristics of the warranted component. These should be easily obtained, allow for repetitive measurements over time, and provide reliable information about the performance of the chosen element. STAs generally use historical information to identity typical criteria *(11)*. The Indiana Department of Transportation for instance uses rut depth, transverse cracking, longitudinal cracking, international roughness index, and friction numbers as performance indicators for asphalt pavement *(11)*.
- **Setting Distress Threshold Values –** Threshold values are measurable tolerances of the performance indicators. Warranty provisions define maximum allowable tolerances for thresholds. When exceed, these thresholds trigger the warranty provision and require remedial action. The values are usually based on historical data and are dependent of the reliability of the initial data. STAs specify threshold values as a single value or as ranges with different remedial procedures to be followed according the different threshold levels *(11)*. In performance warranties the STA has more room to define more restrictive threshold values than those used in a materials and workmanship warranty; however, the STA must be careful that the threshold values are still enforceable and achievable.
- **Warranty Period –** The warranty periods are usually defined based on cost/benefit analysis and type of project. Short term performance warranties usually range from five to ten years *(2)* while long-term performance warranties range from 10 to 20 years *(2)*. However, warranty durations are susceptible to the warranted element and its life cycle.
- **Bonding Requirements –** The costs of the warranty is generally included into the unit price of the warranted component; therefore, the contractor receives full payment of the item including warranty costs upon completion of construction. As a result, STAs require a bond to cover contractor warranty obligations during the warranty period. Bonds are secured through a surety, which becomes the responsible for the costs of remedial work in case the contractor fails to perform *(11)*. Different factors considering when calculating the bond values are:
    - Total dollar value of the warranted item,
    - Percentage of the total dollar value of the warranted item
    - Lower value between a percentage of the contract value and a set dollar amount, or
    - Estimated costs to perform a full repair or preservation technique.
- **Risk Allocation –** Short term performance warranties usually require the contractor to conform to the standard specifications. The contractor can make some decisions over mix design or material selection, but it is generally restricted to the materials from a state approved list *(11)*. In long-term performance warranties some responsibility shifts to the contractor and therefore provides more room for contractor decisions.

When to use it?

According to the Federal Highway Administration *(7)*, on National Highway System (NHS) projects, warranty provisions should be used for:

- A specific construction product or feature as it is unacceptable for the entire project.
- Warranties may not cover items of maintenance not eligible for Federal participation
- Contractors are not to be required to warrant items over which they have no control. There are no regulations about warranty durations
- Approval the FHWA Division Administrator of a warranty provision and its subsequent revisions are required.
- Use of warranty provisions for non-NHS is governed by the individual State written procedures

The Ohio Department of Transportation (ODOT) *Innovative Contracting Manual (8)* presents the following project criteria selection for warranty contracting:

- Warranted work element is entirely within the Contractor's control and is measurable
- Material and workmanship attributes can be explicitly defined and measured in the field
- Aspects not under contractor's control will have minimal impacts on the warranted work during the warranty period or can be distinguished from the warranted work.
- Project provides opportunities to develop and incorporate innovative technologies
- Existing project conditions are well defined

Good project element candidates are *(8)*:

- Asphalt pavement,
- Concrete pavement,
- Pavement marking,
- Bridge deck waterproofing membrane,
- Crack treatment,
- Microsurfacing,
- Bridge painting,
- Bridge deck joints,
- Chip sealing,
- Roofs,
- Intelligent transportation system components,
- Landscaping,

- Irrigation systems,
- Bridge components, and
- Reflective sheeting for signs

Limitations?

The following are some aspects to consider when considering and developing warranty provisions.

- The STA must ensure that warranty guidelines are reasonable and enforceable *(3)*
- Warranty may not be collectable if guidelines are too restrictive or place undue burden on contractor *(3)*
- Success of warranty depends on contractor and surety company involved. Sureties face higher risks under this type of provision *(4)*
- Warranties discourage participation of small contractors due to financial requirements *(4)*
- The use of warranty provisions may increase the bid cost by up to 15% *(5)*.

Who uses it?

13 STAs have experience with warranty contracting: Michigan, Ohio, Florida, South Carolina, California, Wisconsin, Minnesota, West Virginia, Colorado, Mississippi, Indiana, Oregon, and Pennsylvania *(5)*.

Example

The Michigan Department of Transportation (MIDOT) used asphalt warranty provisions on the M-115 rehabilitation project in 2008. The project was a part of the Highways for Life program from the Federal Highway Administration and its main innovation was the use of performance contracting for construction. The project took place in the M-115 from the Osceola-Clare County line to Lake Station Avenue in Clare County. This portion of the highway was a rural two-lane roadway of 5.56 mi with two small bridges. The project consisted on the rehabilitation of the pavement and both bridges which were in poor condition at the beginning of the project and included profile cold-milling, substructure repair, HMA resurfacing, joint repair, intersection improvements, bridge approach work, bridge superstructure replacement, drainage installation, and upgrading of all guardrails. The pavement warranty provision was used as a component of the several performance contracting strategies used by MDOT.

The pavement performance warranty consisted of a warranty bond and required the contractor to warrant the HMA pavement for performance deficiencies for the duration of the warranty period. The minimum warranty period was 5 years, which were to begin on the construction acceptance date. The contractor’s maximum liability for warranty work was 80% of the project pavement costs, and it would be reduced over the warranty period if no previous performance deficiencies had occurred for which the contractor was responsible. The length of the warranty period would be used as a criterion to determine the best-value bid for the project.

To assess the pavement, MDOT divided the project into 0.1 mi lane segments used for measuring and quantifying the condition parameters. Warranty work was required when the threshold limits for a condition parameter was exceeded and the maximum allowable number of defective was exceeded for one or more condition parameters of a driving lane. The criteria and the recommended warranty corrective actions are shown in tables 1 and 2 below. Following construction of the entire length of the project, ride quality measurements would be calculated and reported as ride quality index (RQI) in accordance with the Michigan Test Method 726. The warranty provisions required the ride quality values shown in table 3.

Table 1. Warranty thresholds and requirements *(9)*

Condition Parameter	Threshold Limits Per Segment (Length = 528 feet)	Max. Defective Segment Per Driving Lane – Mile
Longitudinal Crack	30% of segment length	1
Longitudinal Joint Crack	10% of segment length	1
De-bonding	5% of segment length	1
Raveling	8% of segment length	1
Flushing	4% of segment length	1
Rutting	Average rut depth = 0.25 inch	1
Condition Parameter	**Threshold Limits Per Segment (Length = 1 mile)**	**Max. Defective Segment Per Driving Lane-Mile**
Transverse Crack	15 Cracks	1

Table 2. Recommended corrective actions *(9)*

Condition Parameter	Recommended Action
Longitudinal Crack	Cut and Seal
Longitudinal Joint Crack	Cut and Seal
De-bonding	Mill and Resurface
Raveling	Mill and Resurface
Flushing	Mill and Resurface
Rutting	Mill and Resurface
Transverse Crack	Mill and Resurface

Table 3: Ride Quality Requirements *(9)*

	For Total of Lane		For Each Half-Mile Segment		Surface Irregularities Subject to Correction
	Acceptable Range (RQI)	**Correction Limit (RQI)**	**Acceptable Range (RQI)**	**Correction Limit (RQI)**	
HMA-Surface	0-30	>30	0-30	>30	0.3 inch to 25 feet

The CalTrans *Alternative Procurement Guide (1)* provides the following example of performance warranty provisions:

Caltrans Asphalt Concrete Warranty Payment Provision

> "Warranty will be paid for on a lump sum basis. The contract lump sum price paid for warranty shall include full compensation for providing a warranty for asphalt concrete and for furnishing labor, materials, tools, equipment, and incidentals, and doing the work involved in repairing defective areas in the asphalt concrete, including job site inspection, placement and removal of temporary patches, cold planning, repair of defective areas, sealing cracks and replacement of traffic stripes, pavement markings and pavement markers obliterated by patches and repairs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Payment for the warranty item will be made in 10 equal payments. The first payment will be made on the third progress payment date after the warranty period begins, and subsequent payments will be made monthly thereafter."

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C.14 Lane Rental

What is it?

Lane Rental is a payment provision that reduces the impacts of a project to the traveling public by charging a rental fee to the contractor for the time period a lane is closed to traffic for contract work *(1)*. Lane rental fees are assigned in daily, hourly, or fraction of hour terms and depending on the type of lane closed and the time of the day *(2)*.

Why use it?

According to the Michigan Department of Transportation (MDOT) *Innovative Construction Contracting Guidelines (3)*, Lane Rental provisions encourage contractors to have work schedules that keep lane closures to a minimum. The Federal Highway Administration (FHWA) report *Work Zone Road User Costs – Concepts and Applications (1)* recognizes that Lane Rental can:

- Reduce work zone Road User Costs (RUC);
- Have positive effects on work zone safety;
- Encourage contract efficiency and productivity; and
- Better accommodate local traffic flow

What does it do?

Lane Rental provisions assess a lane rental fee to the contractor who has to pay to use a lane for construction activities. As stated before, the lane rental fees are calculated in different time units, and with variable values depending on the type of lane and hour of the day that the lane will be closed. As a result, the contractor is forced to provide aggressive schedules that minimize lane closures or where construction activity is performed during times that lane rental fees are low (e.g. night time, low traffic hours) *(4)*. Consequently, with such reduced lane closure periods, RUCs and safety concerns related with lane closures are also reduced *(4)*.

How to use it?

The director of transportation operations at Texas DOT (TxDOT) developed a guideline flow chart (figure 1) for the preparation of Lane Rental specifications where the most important step is to correctly determine the RUCs for the lane rental fees *(6)*. TxDOT also developed a flow chart, figure 2, that helps in the calculation of such RUCs.

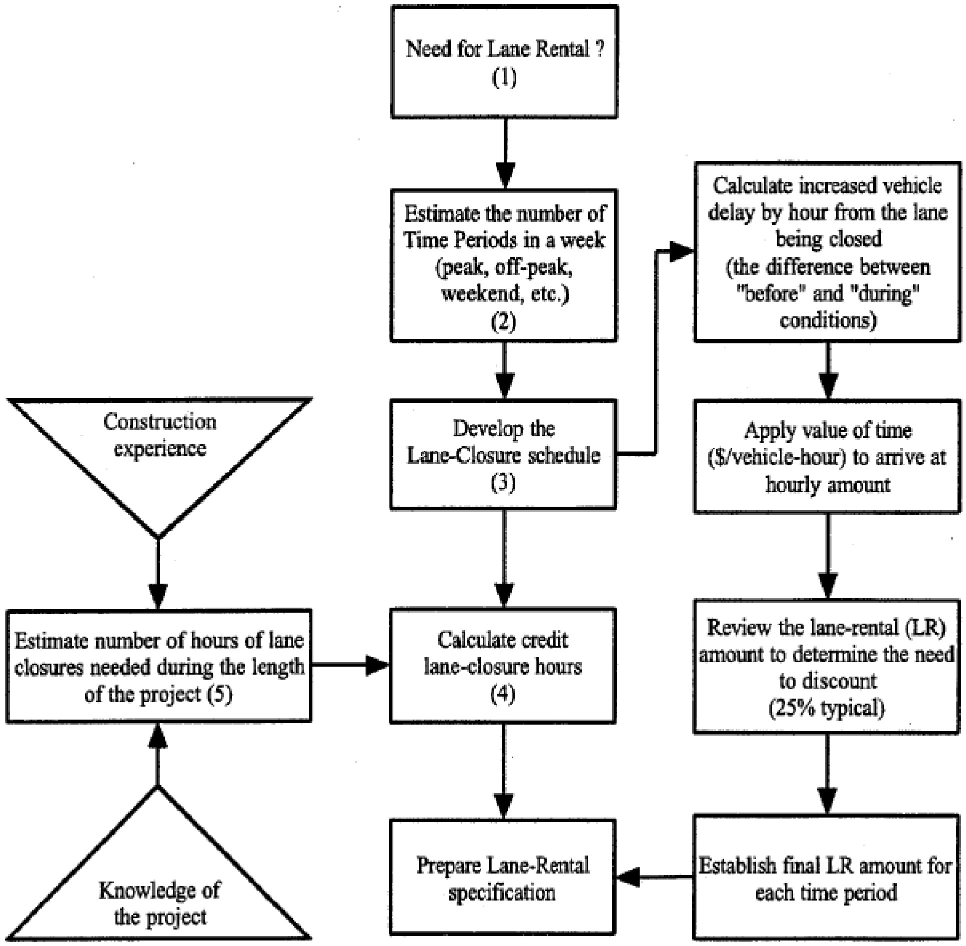

Figure 1 Lane rental specification preparation flow chart

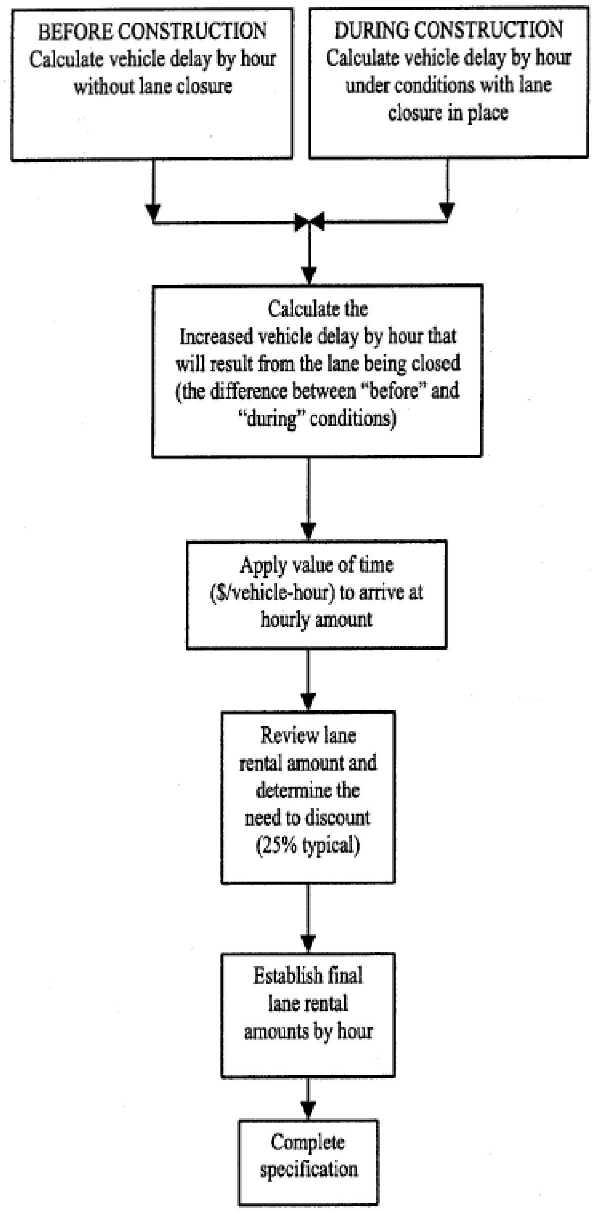

Figure 2 TxDOT Road User Cost calculation for lane rental

In addition to these guidelines, agencies should consider the following:

- **Safety**: Plans and specifications should identify when lane closures will be required to reduce the chance that contractors will take safety risks to reduce lane-rental charges *(8)*.
- **Compatibility**: When combining Lane Rental provision with other Incentive / Disincentive provisions (I/D), the agency should be careful not to use the same RUC as this can be different for each provision *(5)*.

When to use it?

Lane Rental provisions are adequate in projects where detours are long, unavailable, or impractical, and when peak hour traffic is impacted adversely. Agencies should use this type of provisions in projects with multiple roads and high traffic volumes where there is some flexibility for intermittent or temporary lane closures *(1)*.

According to the Minnesota Department of Transportation *Innovative Contracting Guidelines (3)* and the National Cooperative Highway Research Program report 652 *(4)*, good candidates for the use of these provisions are:

- Bituminous mill and overlay projects
- Grading projects
- Full depth patching
- Diamond grinding
- Full depth reclamation
- Cold recycle
- Guardrail projects
- Signing projects
- Stripping applications
- Crack sealing
- Signal systems
- Traffic management projects

Additionally the MDOT *(7)* identifies projects with critical completion dates, significant RUC, and with high community and local business impacts as suitable for Lane Rental provisions.

Limitations?

The FHWA report *Work Zone Road User Costs – Concepts and Applications (1)* identifies the following disadvantages of Lane Rental provisions:

- Contractors are likely to plan work at night which may reduce worker safety
- Not necessarily reduces project completion time
- Requires additional agency resources
- Makes contract change negotiations difficult
- Requires additional documentation and coordination

Additionally, the MDOT *(7)* report *Innovative Construction Contracting* shows that Lane Rental provisions:

- Have a potential for increased bid costs, and
- Require more construction oversight in order to track lane rental charges

Who uses it?

Lane Rental provisions in highway construction contracting were first introduced in the United Kingdom in 1984, and adopted by the United States in 1990. In 1995, Lane Rental provisions were declared operational under the FHWA Special Experimental Projects 14 (SEP-14) program and at least nine state transportation agencies (STAs) including New York, Arizona, North Carolina, Colorado, Indiana, Maine, Oklahoma, and Washington have experimented or implemented the use of lane rental provisions *(2)*.

Example

The Colorado Department of Transportation (CDOT) is using Lane Rental provisions on the I-25/Santa Fe Drive interchange improvement project in 2013. The project has an estimated cost of $32.1 million and consists of the replacement of two existing I-25 bridges over Santa Fe drive, construction of a new flyover ramp from northbound Santa Fe Drive to northbound I-25, and reconstruction and realignment of I-25. Construction of this project began on July, 2011. The following are the actual Lane Rental provisions that CDOT is using on the project *(8)*.

REVISION OF SECTION 104

LANE RENTAL FEE

Section 104 of the Standard Specifications is hereby revised for this project as follows:

Subsection 104.04 shall include the following:

(e) *Lane Rental Fee*. The Contractor shall pay lane rental fees for lane closures on I-25 that run over the allowed closure times listed in the Traffic Control Plan – General Project Special Provision.

- This fee will be assessed for each hour, or portion thereof, that lane closures are in place on I-25 outside of closure times allowed in the Traffic Control Plan.
- The Engineer will not charge fees for delays due to conditions beyond the control and fault of the
  Contractor, or when the Engineer suspends the work for periods of unsuitable weather or extenuating circumstances in accordance with Subsection 105.01.

The lane rental fee will be deducted from any monies due the Contractor for work performed. The deduction will be based on the applicable rate for any and all closures, whether work is performed or not. This deduction will be reflected in each progress payment. This deduction is not a penalty, but is a rental fee based upon road user costs to occupy lanes on I-25.

The lane rental fee for closures on I-25 shall be $5,000 per hour per lane.

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C.15 Active Management Payment Mechanism

What is it?

Active management payment mechanisms (AMPM) are payment provisions designed to minimize travel time through a work zone by providing a contractual incentive to contractors. The incentives are based on the measured travel speed and measured volumes in comparison to theoretical percentages of roadway capacity *(1)*.

Why use it?

The main advantages of AMPM are:

- It encourages contractors to schedule work at times that are least disruptive to road users *(1)*;
- It allows the contractor to use real-time data to adjust work operations in order to reduce congestion *(1)*; and
- It aligns the needs of the traveling public with the goals of the contractor by correlating incentives to throughput *(1)*

What does it do?

The AMPM is an evolved form of the shadow toll system and is comprised of three parts according a report on contract administration in Europe published by the Federal Highway Administration *(2)*: congestion management, safety management, and service management. The congestion management part is the most important. It encourages the contractor to actively manage the road work to reduce congestion and increase the reliability of road user travel times. This is done by reducing payments when congestion occurs on the project road. By accepting to manage congestion the contractor accepts the risk related to predictable congestion such as roadwork, special, events, slow moving vehicles, etc., as well as the risk of unpredictable congestion such as that due to accidents and poor weather *(2)*. Some examples of congestion management are: planning of road works to be performed during off-peak times; planning for impact of known events with local authorities, police, and other third parties; and providing additional signing and break down vehicles during special events *(3)*.

How to use it?

In its most basic form the congestion management part of AMPM provisions consists on measuring travel speeds through the work zone and providing incentives or disincentives based on these measurements compared to target travel speeds. In large and complex projects, the work zone is divided into sections and hours of the day, and the incentives are assessed based on these factors. The travel speeds allocated to each section and hour of the day are based on the expected level of traffic flow which generally comes from an average of previous measurements for each section of road and corresponding hour of the day for a contractually defined base period (e.g. previous four weeks). In some cases, full payments for each section and each hour are made if the road section satisfies minimum road condition criteria, and the target average speed for the road section is achieved. If the minimum performance criteria for a section is not met then the State Transportation Agency (STA) makes no payment to the contractor for that section and hour of the day. In case the average speed falls below the target average speed the payments are reduced according to a contractually defined scale *(2)*.

In addition to these congestion related incentives, the final payment can also be adjusted for how well the contractor manages safety and service on the project. For example, safety management adjustments can be made based on the number of personal injury accidents that occur on the project road when compared with a benchmark determined from the accident records of a comparable set of roads *(4)*.

When to use it?

AMPM provisions should be considered for Design-Build-Finance-Operate projects where the STA desired to minimize travel time through the work zone, and where project settings are appropriate for consistent traffic flow measures.

Limitations?

Some probable issues with this provision are *(1)*:

- Negative public reaction to the monitoring system;
- Time consuming review of monitoring data by the STA to determine incentives and penalties; and
- Incentives and penalties depend on the reliability of the monitoring equipment chosen

Who uses it?

AMPM provisions were developed by the British Highways Agency (BHA), which has been evaluating the provisions in some projects. In the United States the Arizona Department of Transportation (ADOT) has implemented a variation of the AMPM provisions on the State Route 68 design-build project *(5)*. The Massachusetts Highway Department applied another variation of AMPM provisions on the Coolidge Bridge Project *(1)*.

Examples

Example 1) British Highway Agency

The BHA used AMPM provisions on the A1 Darrington to Dishforth project, which comprised of improvements to and operation and maintenance of 33 miles of highway in Yorkshire, a major link of the national network connecting Scotland and the north east and south of England. The following shows an example of the different payment adjustments made *(4)*:

- Full payment was made if speeds were above target speed. If speeds fell below the target speed, payment was reduced
- Full payment was made if traffic exceeded the deemed capacity of the road section, even if the speed fell below the target speed.
- There was a graduation of the level of deduction for speeds between 60 and 90 kph and 80 and 100% capacity
- A bonus was paid if flow exceeded 110% and speeds exceeded 60 kph.
- Maximum bonus that could be earned was 20% of the payment for the hour and road section, if flow exceeded 120% of capacity and speed was higher than 90 kph

<u>Example 2) Arizona Department of Transportation</u>

Another example is ADOT which used AMPM provisions on the SR-68 reconstruction affecting 13 miles of high volume roadway. ADOT required the design-build contractor to measure speed consistency and performance through the work zone. The contract provided $400,000 travel time budget item that would be reduced if the target travel time average was exceeded. Contractual incentives and disincentives were implemented for performance above or below the contractual standard. The contractor used an electronic license plate reader system to track speeds by correlating license plates numbers of cars that entered and exited the limits of the construction project *(5, 6)*.

<u>Example 3) Michigan Department of Transportation</u>

The Michigan Department of Transportation used a form of the AMPM provisions on the M-115 rehabilitation project in 2008. The project was a part of the Highways for Life program from the Federal Highway Administration and its main innovation was the use of performance contracting for construction. The project took place in the M-115 from the Osceola-Clare County line to Lake Station Avenue in Clare County. This portion of the highway was a rural two-lane roadway of 5.56 mi with two small bridges in within. The project consisted on the rehabilitation of the pavement and both bridges which were in poor condition at the beginning of the project. The AMPM provisions were used as a component of the several performance contracting strategies which were combined with different incentives/disincentives.

The goal of the construction congestion management program was that no vehicle should be delayed by contractor operations more than 10 minutes beyond its normal travel time, which was estimated at 12 minutes. In order to measure the travel times, measurements were taken four times per week, twice during weekdays and twice on the weekends. The measurement were taken for both directions of travel and the measurement for the direction with the highest delay was recorded as the delay time. Incentives and disincentives were awarded based on this travel time.

The contractor implemented different innovations in order to attain the maximum incentives which included precast bridge construction, self-adjusting temporary signals to control single-lane traffic during precast bridge construction, 24-hour roadside patrol within the construction zone to minimize delays caused by breakdowns, and 11-ft-wide temporary traffic lanes during major construction stages to provide two-way traffic. The average delay based on 54 measurements was 2 minutes and 16 seconds. The following is the actual contract language used for this project *(7)*:

Motorist Delay

Stage operations to minimize motorist delay. No vehicle shall be delayed due to Contractor's operations more than 10 minutes beyond its normal travel time. Change work operations as needed, to maintain delays below this maximum.

Method of Measurement: On-site total travel time measurements from Dover Road to 13 Mile Road. The random on-site delay measurements will be taken four times per week, twice during the weekdays (Monday – Thursday) and twice on the weekend (Friday - Sunday). Each measurement will include both directions of travel. The measurement for the direction with the highest delay will be used for determining incentive / disincentive. The random on–site measurement will occur between 10:00 am - 1:00 pm and 3:00 pm – 6:00 pm, with a +/- 30 minute variance.

Normal travel time @ 55 MPH for 11 miles = 12 minutes

Example: A random measurement was taken on Tuesday at 3:30 pm. Travel time was measured for each direction of travel. Total time from Dover Road to 13 Mile Road was 20 minutes (8 minute delay). Total time from 13 Mile Road to Dover Road was 23 minutes (11 minutes delay). The higher delay of 11 minutes is used to determine incentive/disincentive, and there would be a $200 disincentive for this occurrence. This would also count as one of the three allowable occurrences of delay over 10 minutes and less than or equal to 15 minutes, as it applies to the Bonus Overall Incentive.

Incentive / Disincentive per Measurement:

Measured Delay	Incentive/Disincentive (dollars)
0-5 min	+1000
6 min	+ 800
7 min	+ 600
8 min	+ 400
9 min	+ 200
10 min	0
11 min	– 200
12 min	– 400
13 min	– 600
14 min	– 800
15 - 20 min	– 1000
+ 20 min	– 5000 and Contractor's operations may be shut down

Maximum Incentive = $50,000

Bonus Overall Incentive: If there are no more than 3 measured occurrences exceeding 10 minutes and less than or equal to 15 minutes delay for the duration of the project, the Contractor will be eligible for the Bonus Overall Incentive. Any one measurement exceeding 15 minutes will cause the Bonus Overall Incentive to not apply.

Bonus Overall Incentive = $50,000

Any time the random on-site delay measurements are greater than 20 minutes due to the Contractor's operation, the Contractor's operations may be shut down until all issues are resolved and may receive a $5000 penalty.

Outside of the random measurement, any delay that exceeds 20 minutes due to the Contractor's operation is cause for the Contractor's operations to be shut down until all issues are resolved.

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APPENDIX D. PROJECT DELIVERY SELECTION MATRIX (PDSM)

Project Delivery Selection Workshop Summary

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

Workshop Participants	
Name	**Email**

Project Delivery Selection Matrix

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 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 tool are:

- Present a structured approach to assist Agencies in making project delivery decisions;
- Assist Agencies 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 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 (D-B-B), Design-Build (D-B), 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 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 D-B-B, 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.

Design-Build 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 D-B-B 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 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 D-B-B, 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 agency to develop the technical requirements that would be necessary for D-B 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 STA 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 amount 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.

Project Delivery Selection 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. List known project attributes
  2. Set project goals
  3. Identify project dependent constraints

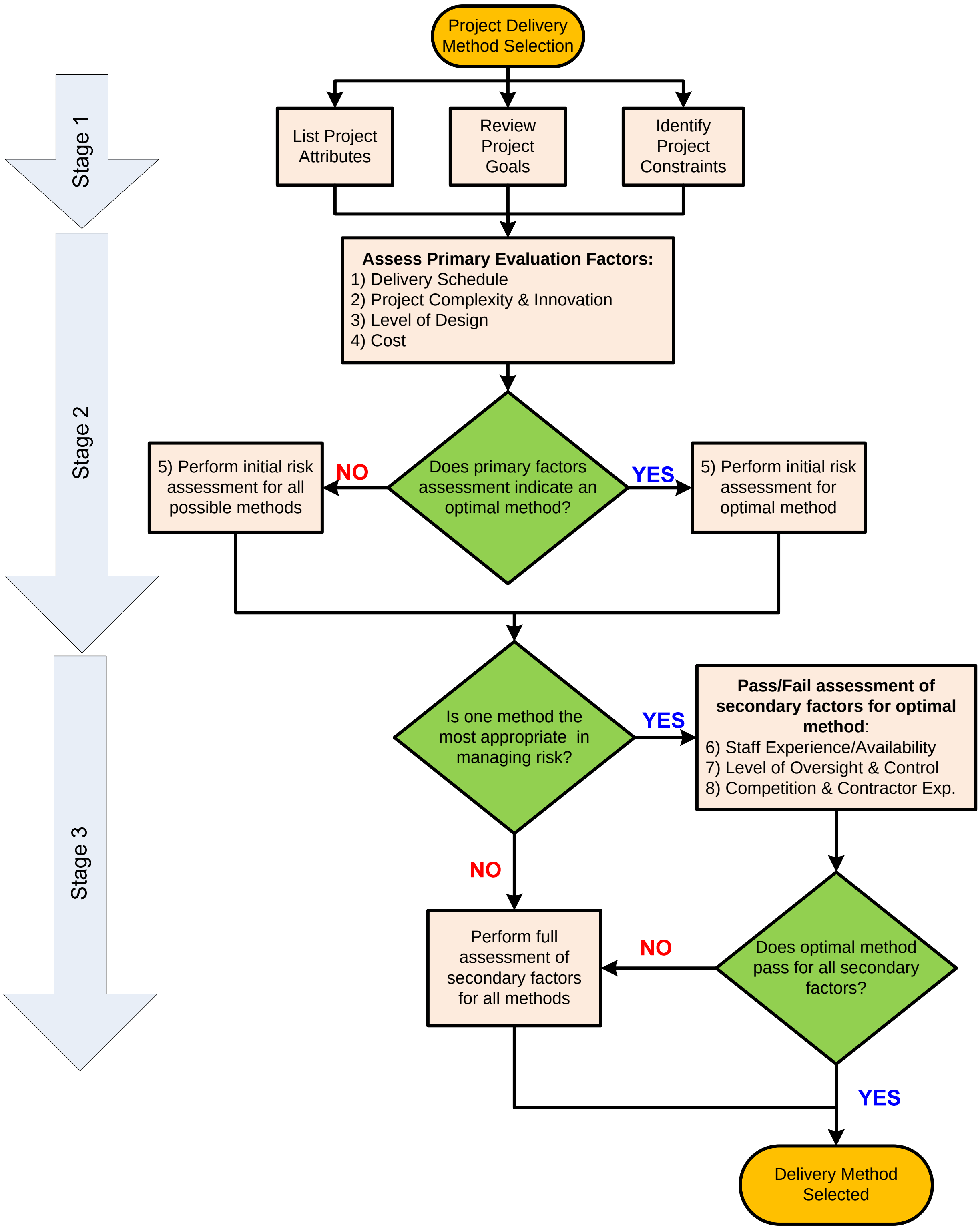
STAGE II – Evaluate primary selection factors

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

STAGE III – Evaluate secondary selection factors

- A. Perform a pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
  6. Staff Experience/Availability (Agency)
  7. Level of Oversight and Control
  8. Competition and Contractor Experience
- B. If the pass/fail analysis does not result in clear determination of the method of delivery, then perform a more rigorous evaluation of all eight factors against the potential delivery methods

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



Flowchart of the Project Delivery Selection Process

Project Delivery Selection Matrix 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 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.**

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 Obstacles (as applicable)
With Right of Way, Utilities, and/or Environmental Approvals:
During Construction Phase:
Main Identified Sources of Risk:
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 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 Agency
- 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 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			
	D-B-B	CM/GC	D-B
Primary Selection Factors			
1. Delivery Schedule			
2. Project Complexity & Innovation			
3. Level of Design			
4. Cost			
5. Perform Initial Risk Assessment			
Secondary Selection Factors			
6. Staff Experience/Availability (Agency)			
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

Project Delivery Selection Summary Conclusions and Comments

Project Delivery Selection Matrix Primary Factors

1) 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**

CM/GC - Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. 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	**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**

2) 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 Agency to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by Agency/Consultant expertise and through traditional agency directed processes such as VE studies and contractor bid alternatives.		
Opportunities	**Obstacles**	**Rating**

CM/GC - Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of Agency, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on GMP.		
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**

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 Agency or contracted design team, with Agency having complete control over the design.

Opportunities	Obstacles	Rating

CM/GC - Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of Agency, designer, and CM/GC 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 Agency to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).

Opportunities	Obstacles	Rating

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 - 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

CM/GC - Agency/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	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) Initial Risk Assessment

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**
CM/GC - Provides opportunity for Agency, 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**

Project Delivery Selection Matrix Secondary Factors

6) Staff Experience and Availability

Agency 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**
CM/GC - Strong, committed Agency project management resources are important for success of the CM/GC process. Resource needs are similar to D-B-B except Agency must coordinate CM's input with the project designer and be prepared for GMP negotiations.		
Opportunities	**Obstacles**	**Rating**
DESIGN-BUILD - 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	**Obstacles**	**Rating**

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 - Full control over a linear design and construction process.

Opportunities	Obstacles	Rating

CM/GC - Most control by Agency over both the design, and construction, and control over a collaborative agency/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**

CM/GC - Allows for the selection of the single most qualified contractor, but GMP 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) Delivery Schedule Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Schedule is more predictable and more manageable ☐ Milestones can be easier to define ☐ Projects can more easily be "shelved" ☐ Shortest procurement period ☐ Elements of design can be advanced prior to permitting, construction, etc. ☐ Time to communicate/discuss design with stakeholders	☐ Requires time to perform a linear design-bid-construction process ☐ Design and construction schedules can be unrealistic due to lack industry input ☐ Errors in design lead to change orders and schedule delays ☐ Low bid selection may lead to potential delays and other adverse outcomes.
CM/GC	
Opportunities	**Obstacles**
☐ 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 D-B ☐ Team involvement for schedule optimization ☐ Continuous constructability review and VE ☐ Maintenance of Traffic improves with contractor inputs ☐ Contractor input for phasing, constructability and traffic control may reduce overall schedule	☐ Potential for not reaching GMP and substantially delaying schedule ☐ GMP negotiation can delay the schedule ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to control schedule
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Potential to accelerate schedule through parallel design-build process ☐ Shifting schedule risk to D-B team ☐ Encumbers construction funds more quickly ☐ Industry input into design and schedule ☐ Fewer chances for disputes between agency and design-builders ☐ More efficient procurement of long-lead items ☐ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☐ Allows innovation in resource loading and scheduling by D-B team	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Time required to gain acceptance of quality program ☐ Requires agency and stakeholder commitments to an expeditious review of design

2) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Agencies can have more control of design of complex projects ☐ Agency 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
CM/GC	
Opportunities	**Obstacles**
☐ Highly innovative process through 3 party collaboration ☐ Allows for agency 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	☐ Process depends on designer/CM relationship ☐ No contractual relationship between designer/CM ☐ Innovations can add cost or time ☐ Scope additions can be difficult to manage ☐ Preconstruction services fees for contractor involvement ☐ Cost competitiveness – single source negotiated GMP
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Designer and contractor collaborate to optimize means and methods and enhance innovation ☐ Opportunity for innovation through draft RFP, best value and ATC processes ☐ Can use best-value procurement to select design-builder with best qualifications ☐ Constructability and VE inherent in process ☐ Early team integration ☐ Sole point of responsibility	☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☐ Qualitative designs are difficult to define (example. aesthetics) ☐ Risk of time or cost constraints on designer inhibiting innovation ☐ Some design solutions might be too innovative or unacceptable ☐ Quality assurance for innovative processes are difficult to define in RFP

3) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 100% design by agency ☐ Agency 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	☐ Agency 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
CM/GC	
Opportunities	**Obstacles**
☐ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor ☐ Contractor involvement in early design improves constructability ☐ Agency controls design ☐ Design can be used for D-B-B 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 ☐ If design is too far advanced it will limit the advantages of CM/GC or could require design backtracking
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Design advanced by the agency 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	☐ Must have very clear definitions and 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 ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Less agency control over the design ☐ Can create project less standardized designs across agency as a whole

4) Cost Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Competitive bidding provides a low cost construction to a fully defined scope of work ☐ Increase 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 Agency design responsibility
CM/GC	
Opportunities	**Obstacles**
☐ Agency/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 D-B-B ☐ Integrated design/construction process can provide a cost efficient strategies to project goals ☐ Can provide a cost efficient response to the project goals	☐ Non-competitive negotiated GMP introduces price risk ☐ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process ☐ Paying for contractors involvement in the design phase may increase total cost
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ 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

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.

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.

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 Agency should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the Agency 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.

2) Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to the Agency, 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 Agency:

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 Agency, designer, and contractor in the further development of the design.

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 Agency. 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 Agency, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

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 Agency 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 Agency, 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.

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.

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 Agency, the designer, and the contractor prior to GMP

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 the Agency, designer, and contractor.

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

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

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

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 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 agency and mostly addressed prior to procurement to minimize potential for claim ☐ Project can be shelved while resolving risks	☐ Agency 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 ☐ Contractor may avoid risks

DESIGN-BUILD	
Opportunities	**Obstacles**
☐ 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-bid 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

CM/GC	
Opportunities	**Obstacles**
☐ 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 CM/GC involvement ☐ Contractor will help identify and manage risk ☐ Agency still has considerable involvement with third parties to deal with risks ☐ Avoids low-bid risk in procurement ☐ More flexibility and innovation available to deal with unknowns early in design process	☐ Lack of motivation to manage small quantity costs ☐ Increase costs for non-proposal items ☐ Disagreement among Designer-Contractor-Agency can put the process at risk ☐ If GMP cannot be reached, additional low-bid risks appear ☐ Limited to risk capabilities of CM/GC ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to negotiate/optimize risks ☐ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction

6) Staff Experience and Availability Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Agency, 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 agency 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
CM/GC	
Opportunities	**Obstacles**
☐ Agency 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 agency project management is important to success ☐ Limitation of availability of staff with skills, knowledge and personality to manage CM/GC projects ☐ Existing staff may need additional training to address their changing roles ☐ Agency must learn how to negotiate GMP projects
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Less agency staff required due to the sole source nature of D-B ☐ Opportunity to grow agency staff by learning a new process	☐ Limitation of availability of staff with skills, knowledge and personality to manage D-B projects ☐ Existing staff may need additional training to address their changing roles ☐ Need to "mass" agency 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	
Opportunities	**Obstacles**
☐ Full agency 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 agency design responsibility ☐ Limited control over an integrated design/construction process
CM/GC	
Opportunities	**Obstacles**
☐ Preconstruction services are provided by the construction manager ☐ Getting input from construction to enhance constructability and innovation ☐ Provides agency control over an integrated design/construction process	☐ Agency must have experienced staff to oversee the CM/GC ☐ Higher level of cost oversight required
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ A single entity responsibility during project design and construction ☐ Continuous execution of design and build ☐ Getting input from construction to enhance constructability and innovation ☐ Overall project planning and scheduling is established by one entity	☐ Can require high level of design oversight ☐ Can require high level of quality assurance oversight ☐ Limitation on staff with D-B oversight experience ☐ Less agency 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	
Opportunities	**Obstacles**
☐ 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 D-B-B 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
CM/GC	
Opportunities	**Obstacles**
☐ Allows for qualifications based contractor procurement ☐ Agency 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 CM/GC, which will reduce the competition and availability ☐ Working with only one contractor to develop GMP can limit price competition ☐ Requires a strong project manager from the agency ☐ Teamwork and communication among the project team
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ 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 D-B qualifications can limit competition ☐ Lack of competition with past experience with the project delivery method ☐ Reliant on D-B team selected for the project ☐ The gap between agency experience and contractor experience with delivery method can create conflict

APPENDIX E. EXAMPLE PROJECT USING THE PDSM TOOL

Project Delivery Selection Workshop Summary

Workshop Summary	
Project Name:	TH52/CSAH9 Interchange and safety improvements project
Workshop Date:	July 25, 2013
Workshop Location:	MnDOT Regional Office 6B – Owatonna, MN
Facilitator:	Keith Molenaar
Delivery Method Selected:	Design-Build

Workshop Participants	
Name	**Email**
Heather Lukes	
Matt Rottermond	
Kevin Kosobud	
Mike Kempinger	

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: Trunk Highway (TH)52/County State-Aid Highway (CSAH)9 Interchange and Safety Improvements
Location: Goodhue County (rural interchange)
Estimated Budget: $8,900,000 (includes cost for construction, utility relocations, ROW acquisition, and extra budget for potential D-B delivery)
Estimated Project Delivery Period: Design and construction complete by November 2014
Required Delivery Date (if applicable): November 2014 open to traffic
Source(s) of Project Funding: Local and state public funds
Project Corridor: 3.25 miles of TH 52 from approximately 0.10 miles north of CSAH1 north to 1.1 miles south of CSAH 9 in Goodhue County
Major Features of Work – pavement, bridge, sound barriers, etc.: Grading, surfacing, bridge, drainage/storm water management, lighting and signing
Major Schedule Milestones: Environmental documentation completed. RFQ released on July 9th to perform pre-qualifications of potential bidders
Major Project Stakeholders: MnDOT, Goodhue County
Major Obstacles (as applicable) Utility relocation and completing ROW acquisition
With Right of Way, Utilities, and/or Environmental Approvals: No issues noted at this time
During Construction Phase: Detouring CSAH 9 traffic and local agricultural traffic during summer months
Main Identified Sources of Risk: Right of way acquisition, utility relocation
Safety Issues: Intersection in its current form identified as one of the most dangerous rural intersection in Minnesota
Sustainable Design and Construction Requirements: Completed within proposed RWO footprint; Maintain CSAH 9 design speed of 60 mph; No impacts to waterways north and south of preliminary interchange footprint; Open to traffic by November 2014.

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: Provide a safe geometric design
Goal #2: Obtain substantial completion prior to November 2014
Goal #3: Complete project within budget
Goal #4: Minimize impacts to the traveling public on TH 52
Goal #5: Provide a safe work environment for workers and traveling public

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: State and local funds only (no federal funds)
Schedule constraints: Start construction by May 1, 2014 and complete construction by November 2014
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc:
Project Delivery Specific Constraints
Project delivery constraint #1: RFQ process began on July 9th, 2013. RFP to be released by October 2013
Project delivery constraint #2:
Project delivery constraint #3:
Project delivery constraint #4:
Project delivery constraint #5:

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			
	D-B-B	CM/GC	D-B
Primary Selection Factors			
1. Delivery Schedule	-	-	++
2. Project Complexity & Innovation	+	+	+
3. Level of Design	++	++	+
4. Cost	+	+	++
5. Perform Initial Risk Assessment	+	-	++
Secondary Selection Factors			
6. Staff Experience/Availability (Agency)	NA	NA	PASS
7.Level of Oversight and Control	NA	NA	PASS
8. Competition and Contractor Experience	NA	NA	PASS

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

Project Delivery Selection Summary Conclusions and Comments

- The project delivery method selection found that Design-build is the most appropriate delivery method for the 52/9 Interchange Project.
- The project delivery method selection was performed to validate the decision to proceed with a Design-build delivery.
- Design-build is more appropriate for this project than CM/GC and D-B-B in the areas of Delivery Schedule, Cost, and Risk Assessment.
- When considering Project Complexity and Innovation, D-B is rated (+), the same as D-B-B and CM/GC.
- Design-build was rated (+) in Level of Design while D-B-B and CM/GC were both rated (++). The reason for this was MnDOT would not have full control over the design and the goal of providing a safe, geometric design would limit the innovation typically given to the Design-builder in a D-B scenario.
- After evaluating the project against the primary evaluation factors, Design-build was the most appropriate delivery method. Design-build was then evaluated against each of the secondary factors and rated as PASS for each.

Project Delivery Selection Matrix Primary Factors

1) 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**
Lack of federal funds reduces the review time	Bridge team does not have the staff for design	–
	Road design staff shortage	
	Overall high risk schedule to meet deadline	

CM/GC - Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. 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	**Obstacles**	**Rating**
Lack of federal funds reduces review time	Creates a higher schedule risk due to uncertainty of consultant selection	–
Meet schedule with design consultant using smaller construction packages and phasing	Creates a higher schedule risk due to negotiation of Guaranteed Maximum Price	
	Creates a higher schedule risk due to lack of staff experience	

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**
Can meet the Nov. 2014 completion date	Accelerated schedule may be burdened by RFP development and receiving responsive bids	++
Past project RFPs to help develop this project's RFP		
GEC already on board		
Lack of federal funds reduces the review time		

2) 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 Agency to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by Agency/Consultant expertise and through traditional agency directed processes such as VE studies and contractor bid alternatives.

Opportunities	Obstacles	Rating
Complexity is low – lends itself well to D-B-B	Proposals for bridge design	+
	Footprint is tight – could be a challenging bridge design	
	No contractor input to optimize costs	

CM/GC - Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of Agency, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on GMP.

Opportunities	Obstacles	Rating
Opportunity to generate innovative bridge design through contractor input	Proposals for bridge design	+
	Getting only one contractor's opinion/input on design	

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
Competition for innovative bridge designs	Industry thinks 'cookie cutter' projects should be D-B-B	+
Opportunity for innovation through draft RFP, best value and ATC processes	Proposals for bridge design	

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 Agency or contracted design team, with Agency having complete control over the design.		
Opportunities	**Obstacles**	**Rating**
MnDOT has complete ownership of the design – especially considering the geometric design	Not internal staff available to advance design	++

CM/GC - Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of Agency, designer, and CM/GC in the further development of the design. Iterative nature of design process risks extending the project schedule.		
Opportunities	**Obstacles**	**Rating**
Appropriate level of design to hire CM/GC		++
Opportunity to design early safety measures with contractor input		
MnDOT has complete ownership of the design – especially considering the geometric design		

DESIGN-BUILD - Design advanced by Agency to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).		
Opportunities	**Obstacles**	**Rating**
	MnDOT does not have 100% control over design – particularly geometric design	+
	Geometric performance specifications will limit design-builder on innovation	

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 - 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**
Increased certainty about cost estimates	More potential of cost change orders due to MnDOT design responsibility	+
Construction costs are contractually set before construction begins		

CM/GC - Agency/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	**Obstacles**	**Rating**
MnDOT/designer/contractor collaboration to reduce project risk can result in lowest project costs	Non-competitive negotiated GMP introduces price risk	+

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**
Design-builder collaboration and ATCs can provide a cost-efficient response to project goals		++
Potential lower average cost growth		
Contractor input during design can moderate cost to increase likelihood of meeting budget goals		

5) Initial Risk Assessment

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
MnDOT is most familiar with managing risks in D-B-B projects.	MnDOT takes ownership of more risks	+

CM/GC - Provides opportunity for Agency, 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
Risk management plan and allocation begin earlier with MnDOT/designer/contractor collaboration.	MnDOT has less experience with risk management in a CM/GC setting.	–
	If GMP cannot be reached, additional low bid risks may appear and jeopardize the goal to keep project under budget.	

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
More risks transferred from MnDOT to design-builder	Risks must be well defined	++
Designers and contractors can work together to mitigate risks		
Project appears to present few risks to transfer to design-builder which will likely result in lower D-B costs.		

Project Delivery Selection Matrix Secondary Factors

6) Staff Experience and Availability

Agency 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**
		NA

CM/GC - Strong, committed Agency project management resources are important for success of the CM/GC process. Resource needs are similar to D-B-B except Agency must coordinate CM's input with the project designer and be prepared for GMP negotiations.		
Opportunities	**Obstacles**	**Rating**
		NA

DESIGN-BUILD - 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	**Obstacles**	**Rating**
Size and complexity of the project provides an opportunity for staff to gain valuable D-B experience		**PASS**
Less staff required by MnDOT during design and construction		

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 - Full control over a linear design and construction process.		
Opportunities	**Obstacles**	**Rating**
		NA

CM/GC - Most control by Agency over both the design, and construction, and control over a collaborative agency/designer/contractor project team		
Opportunities	**Obstacles**	**Rating**
		NA

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**
Project elements important to MnDOT can be requested in the RFP	Less MnDOT control over design	**PASS**
A single entity is responsible for project design and construction		

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**
		NA

CM/GC - Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**
		NA

DESIGN-BUILD - Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**
Substantial number of D-B contractors available that possess similar project experience		**PASS**
Allows for a balance of qualifications and cost in design-builder procurement		

Project Delivery Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Project Delivery Selection Checklist

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

CM/GC	
Opportunities	**Obstacles**
☒ 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 D-B ☐ Team involvement for schedule optimization ☐ Continuous constructability review and VE ☒ Maintenance of Traffic improves with contractor inputs ☒ Contractor input for phasing, constructability and traffic control may reduce overall schedule	☒ Potential for not reaching GMP and substantially delaying schedule ☒ GMP negotiation can delay the schedule ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to control schedule

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

2) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☒ Agencies can have more control of design of complex projects ☐ Agency 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

CM/GC	
Opportunities	**Obstacles**
☒ Highly innovative process through 3 party collaboration ☒ Allows for agency 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	☒ Process depends on designer/CM relationship ☒ No contractual relationship between designer/CM ☐ Innovations can add cost or time ☐ Scope additions can be difficult to manage ☒ Preconstruction services fees for contractor involvement ☐ Cost competitiveness – single source negotiated GMP

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

3) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 100% design by agency ☒ Agency 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	☐ Agency 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
CM/GC	
Opportunities	**Obstacles**
☒ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor ☒ Contractor involvement in early design improves constructability ☒ Agency controls design ☐ Design can be used for D-B-B 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 ☐ If design is too far advanced it will limit the advantages of CM/GC or could require design backtracking
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Design advanced by the agency 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	☒ Must have very clear definitions and 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 ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☒ Less agency control over the design ☐ Can create project less standardized designs across agency as a whole

4) Cost Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☒ Competitive bidding provides a low cost construction to a fully defined scope of work ☒ Increase 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 Agency design responsibility
CM/GC	
Opportunities	**Obstacles**
☒ Agency/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 D-B-B ☒ Integrated design/construction process can provide a cost efficient strategies to project goals ☐ Can provide a cost efficient response to the project goals	☒ Non-competitive negotiated GMP introduces price risk ☒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process ☒ Paying for contractors involvement in the design phase may increase total cost
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ 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

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.

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.

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 Agency should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the Agency should perform the following investigations:

4) Basic design surveys
5) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
6) 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.

2) Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to the Agency, 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 Agency:

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 Agency, designer, and contractor in the further development of the design.

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 Agency. 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 Agency, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

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:

4) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?
5) Is there an existing cross-drainage undersized by design Criteria?
6) 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 Agency 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 Agency, 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.

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.

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 Agency, the designer, and the contractor prior to GMP

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 the Agency, designer, and contractor.

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 deliver project on an accelerated schedule ☐ Constructability of design issues ☐ Project complexity - scope, schedule, objectives, cost, and deliverables - are not clearly understood
Organizational Risks	**Construction Risks**
☒ Inexperienced staff assigned ☐ Losing critical staff at crucial point of the project ☐ Functional units not available or overloaded ☒ No control over staff priorities ☐ Lack of coordination/ communication ☐ Local agency issues ☐ Internal red tape causes delay getting approvals, decisions ☐ Too many projects/ new priority project inserted into program	☒ Pressure to deliver 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	
Opportunities	**Obstacles**
☐ 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 agency and mostly addressed prior to procurement to minimize potential for claim ☐ Project can be shelved while resolving risks	☒ Agency 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 ☐ Contractor may avoid risks
CM/GC	
Opportunities	**Obstacles**
☒ 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 CM/GC involvement ☒ Contractor will help identify and manage risk ☒ Agency still has considerable involvement with third parties to deal with risks ☐ Avoids low-bid risk in procurement ☐ More flexibility and innovation available to deal with unknowns early in design process	☐ Lack of motivation to manage small quantity costs ☐ Increase costs for non-proposal items ☐ Disagreement among Designer-Contractor-Agency can put the process at risk ☒ If GMP cannot be reached, additional low-bid risks appear ☐ Limited to risk capabilities of CM/GC ☒ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to negotiate/optimize risks ☐ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ 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-bid 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	
Opportunities	**Obstacles**
☐ Agency, 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 agency 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
CM/GC	
Opportunities	**Obstacles**
☐ Agency 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 agency project management is important to success ☐ Limitation of availability of staff with skills, knowledge and personality to manage CM/GC projects ☐ Existing staff may need additional training to address their changing roles ☐ Agency must learn how to negotiate GMP projects
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Less agency staff required due to the sole source nature of D-B ☒ Opportunity to grow agency staff by learning a new process	☒ Limitation of availability of staff with skills, knowledge and personality to manage D-B projects ☐ Existing staff may need additional training to address their changing roles ☐ Need to "mass" agency 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	
Opportunities	**Obstacles**
☐ Full agency 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 agency design responsibility ☐ Limited control over an integrated design/construction process
CM/GC	
Opportunities	**Obstacles**
☐ Preconstruction services are provided by the construction manager ☐ Getting input from construction to enhance constructability and innovation ☐ Provides agency control over an integrated design/construction process	☐ Agency must have experienced staff to oversee the CM/GC ☐ Higher level of cost oversight required
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ A single entity responsibility during project design and construction ☒ Continuous execution of design and build ☒ Getting input from construction to enhance constructability and innovation ☐ Overall project planning and scheduling is established by one entity	☐ Can require high level of design oversight ☐ Can require high level of quality assurance oversight ☒ Limitation on staff with D-B oversight experience ☒ Less agency 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	
Opportunities	**Obstacles**
☐ 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 D-B-B process	☐Risks associated with selecting the low bid (the best contractor is not necessary selected) ☐No contractor input into the design process ☐Limited ability to select contractor based on qualifications
CM/GC	
Opportunities	**Obstacles**
☐ Allows for qualifications based contractor procurement ☐ Agency 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 CM/GC, which will reduce the competition and availability ☐ Working with only one contractor to develop GMP can limit price competition ☐ Requires a strong project manager from the agency ☐ Teamwork and communication among the project team
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ 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 D-B qualifications can limit competition ☐ Lack of competition with past experience with the project delivery method ☒ Reliant on D-B team selected for the project ☐ The gap between agency experience and contractor experience with delivery method can create conflict

APPENDIX F. PROCUREMENT PROCEDURE SELECTION MATRIX (PPSM)

Procurement Procedure Selection Workshop Summary

Workshop Summary	
Project Name:	
Workshop Date:	
Workshop Location:	
Facilitator:	
Procurement Procedure Selected:	

Workshop Participants	
Name	**Email**

Procurement Procedure Selection Matrix

Overview

This document provides a project procurement procedure selection approach for highway projects. The information below lists the procurement procedures followed by an outline of the process, instructions, and general forms for use by transportation agency (Agency) staff and project team members. By using these forms, a brief Procurement Selection Report can be generated for each individual project. The primary objectives of this tool are:

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

Background

The procurement procedure is the process of selecting firms to purchase goods and services necessary to complete the various stages of design and construction of a project. The difference in the procurement procedures depends on whether quantitative factors, qualitative factors or a combination of the two are used to select a firm. Currently, there are many types and variations of procurement procedures available for publicly funded transportation projects. The most common systems are Low bid, Best Value, and QBS. No single procurement procedure method is appropriate for every project. Each project must be examined individually to determine how it aligns with the attributes of each available procurement procedure. The definitions below contain the three primary procurement procedures and a list of supplementary procurement procedures that are used in conjunction with one of the three primary procedures.

Primary Procurement Procedures

Low Bid is the most traditional selection methodology for construction services where contractors submit bids on a project and the lowest "responsible and responsive" bidder is then awarded the contract.

Best Value is a selection strategy used to choose contractors where price and other factors are used to determine which proposal or bid would bring the highest or best value to the Agency. Relative weights for the different factors vary from project to project as does the relationship between price and the other factors.

Qualifications-Based selection is a process whereby an Agency selects a design professional based on experience, expertise and overall credentials to procure the most qualified firm or individuals for a given project. There is no cost proposal associated with choosing a firm. Costs are negotiated with the selected firm after procurement is complete, but before the contract is signed.

Facilitation of the tool

When embarking on using the procurement procedure 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 procurement procedure. 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 procurement procedure 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 different individuals to participate in the selection. The selection team needs to include the project manager, the project engineer, a representative of the procurement/contracting office, and any other STA 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 amount 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 procurement procedure to choose. However, there might be participants that have a preconceived notion about the procurement procedure 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 *Procurement Procedure Description*, the *Procurement Procedure Goals*, and the *Procurement Procedure 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.

Procurement Procedure Selection Process

The process is shown as an outline below and as a flowchart on the following page for reference. 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. Procurement procedures to consider
    1. Low Bid
    2. Best Value
    3. Qualifications-Based
B. Project Description/Goals/Constraints
    1. Describe the project
    2. State the project delivery method selected
    3. Set the project goals
    4. Determine and review project dependent constraints

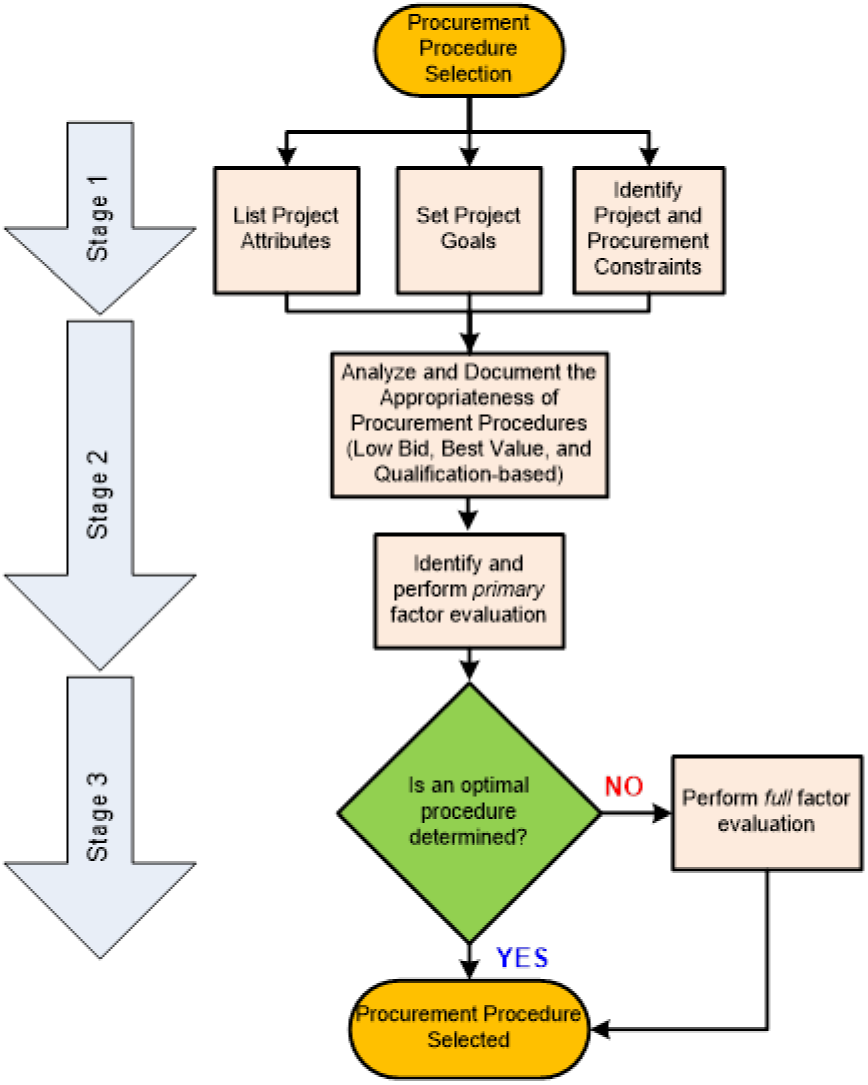
STAGE II – Determine Procurement Procedures and Selection Factors to Evaluate

A. Review each potential procurement procedure against the selected delivery method
    1. Eliminate procurement procedures that are inappropriate for the selected delivery method
B. Determine which of the eight factors need to be evaluated
    1. Delivery Schedule
    2. Complexity & Innovation
    3. Level of Design
    4. Cost
    5. Assessment of Risk
    6. Staff Experience and Availability
    7. Level of Oversight and Control
    8. Competition and Contractor Experience

STAGE III – Evaluate Factors

A. Assess each potential procurement procedure in regards to the factors determined to need evaluation
B. Review checklists for each factor being evaluated
C. If the above steps do not reveal an optimal procedure, proceed with evaluating remaining factors against all potential procurement procedures

NOTE: Typically, the entire selection process can be completed by the project team in a 2 hour workshop session, as long as each team member has individually reviewed and performed the assessment prior to the workshop.



Flowchart of the Procurement Procedure Selection Process

Procurement Procedure Selection Matrix Worksheets and Forms

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

Project procurement 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 procurement 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 procurement procedure for the project.

Project procurement constraints worksheet – including example project constraints

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

Procurement procedure selection summary form

The procurement procedure selection summary form outlines the assessment of the eight selection factors for the three procurement procedures. 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 procurement procedures selection summary should provide an executive summary of the key reasons for the selection of the chosen procedure.

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
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.

Procurement procedure 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 procurement procedure 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 **Procurement Procedure Selection Summary.**

Procurement procedure opportunities / obstacles checklists

These forms provide the project team with direction concerning typical procurement procedure 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.

Project Procurement 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 procurement procedure decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name:
Location:
Estimated Budget:
Delivery Method Selected:
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 Obstacles with Right of Way, Utilities, and/or Environmental Approvals:
Major Obstacles During Construction Phase:
Main Identified Sources of Risk:
Safety Issues:
Sustainable Design and Construction Requirements:

Project Procurement Goals

An understanding of project goals is essential to selecting an appropriate procurement procedure. Typically, the project goals can be defined in three to five items. 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 Procurement Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible procurement procedures. 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 procurement selection.

General Constraints
Source of Funding:
Schedule constraints:
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc:
Procurement Specific Constraints
Procurement constraint #1:
Procurement constraint #2:
Procurement constraint #3:
Procurement constraint #4:
Procurement 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 Agency
- 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

Procurement Procedure Selection Summary

Determine the factors that need to be evaluated in the procurement procedure selection, taking into account the project delivery method that will be used. Then, discuss the opportunities and obstacles related to each selection factor, and document the discussion on the following pages. At the conclusion of the evaluation, complete the summary table below.

PROCUREMENT PROCEDURES OPPORTUNITY/OBSTACLE SUMMARY					
	Evaluate Factor? (Circle One)		Low Bid	Best Value	Qualifications-Based
Selection Factors					
1. Delivery Schedule	Yes	No			
2. Project Complexity & Innovation	Yes	No			
3. Level of Design	Yes	No			
4. Cost	Yes	No			
5. Assessment of Risk	Yes	No			
6. Staff Experience and Availability	Yes	No			
7. Level of Oversight and Control	Yes	No			
8. Competition and Contractor Experience	Yes	No			

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
NA	Factor not applicable or not relevant to the selection

Procurement Procedure Selection Summary Conclusions and Comments

Procurement Procedure Selection Matrix Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. For procurement, consider the length of time needed to develop the RFP, proposal development, and evaluation. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

LOW BID – The shortest duration of competitive procurement methods. One factor to consider, cost, and this is the most traditional method that many understand.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – Procurement period is the longest for this method. Additional time needed for bids to be prepared as well as evaluating and Rating proposals.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – Requires time to evaluate qualitative factors. Clarifications for some of the bids may be needed, which can extend the letting period.		
Opportunities	**Obstacles**	**Rating**

2) Project Complexity and Innovation

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

LOW BID – The traditional letting approach. Does not allow for additional factors to be considered such as innovative designs and alternative technical concepts. Useful for low complexity projects that do not need additional innovations to complete.		
Opportunities	**Obstacles**	**Rating**
BEST VALUE – A quantitative and qualitative procurement method that allows for additional factors such as innovative designs and techniques to be provided in the proposals.		
Opportunities	**Obstacles**	**Rating**
QUALIFICATIONS-BASED – Useful for projects that do not have a complete bid package or where a complete bid package cannot be feasibly developed due to complexities and necessary innovations.		
Opportunities	**Obstacles**	**Rating**

3) Level of Design

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

LOW BID – Design needs to be complete, or near complete, and accurate so that firms can responsibly prepare cost bids.		
Opportunities	**Obstacles**	**Rating**
BEST VALUE – Very little design needs to be complete before advertising the RFP. Plans do not need to be fully detailed as the RFP requirements can include design alternatives.		
Opportunities	**Obstacles**	**Rating**
QUALIFICATIONS-BASED – Very little or no design needs to be complete as firms are selected based on other factors besides cost and schedule.		
Opportunities	**Obstacles**	**Rating**

4) Cost

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

LOW BID – Competitive bidding on costs can provide for low construction costs based on a fully defined design and scope.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – Development of the RFP needs to be complete and accurate so that cost changes are minimized.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – Procurement only evaluates factors such as past experience, reputation, financial stability, and does not include cost.		
Opportunities	**Obstacles**	**Rating**

5) Initial Risk Assessment

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 assessment of project risks is important to ensure the selection of a procurement procedure that can properly address them.

LOW BID – Evaluation of proposals only considers cost and does not include any information on how a bidding firm will address any risks. Agencies can allocate more risks to the contract, but that will be reflected in the bids.		
Opportunities	**Obstacles**	**Rating**
BEST VALUE – The RFP can request risk management plan, which provides the agency with an understanding of how the project team will allocate and manage risks.		
Opportunities	**Obstacles**	**Rating**
QUALIFICATIONS-BASED – Selection can consider past performances with project risks and can request information on how the qualifying firm plans to manage risks on the project.		
Opportunities	**Obstacles**	**Rating**

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the procurement procedure in question.

LOW BID – This is the traditional method that most Agencies have a plethora of experience and knowledge.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – This is a more extensive process that Agencies may not have the experience or knowledge to use. Additional resources will be needed to develop the RFP and evaluate received proposals.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – This can be an unknown procedure in how to evaluate subjective factors. Experience by Agencies in this procedure is low.		
Opportunities	**Obstacles**	**Rating**

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to develop the procurement documents, and the amount of agency staff required to evaluate received proposals/bids.

LOW BID – Minimal amount of staff and time required to develop procurement documents and evaluation typically only requires reviewing the cost amount submitted by bidding firms.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – Additional staff and time is required to develop the criteria for the RFP. Evaluation of proposals is extensive and requires additional resources that when evaluating cost alone. Agency does have more control over what to require of proposing firms.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – Minimal amount of staff and time required to create the RFQ. Additional staff and time is needed to evaluate the qualifications. Agency has control over what to require of qualifying firms.		
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 and associated procurement procedure.

LOW BID – Firms are most familiar with this procedure and it promotes a high level of competition.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – Provides a balance of qualifications and costs. Promotes fair competition among firms. However, many firms may not be familiar with this procedure and are unable to responsibly provide a proposal.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – Provides for qualifying firms in selection. This can lead to limited competition and unfamiliarity by firms.		
Opportunities	**Obstacles**	**Rating**

Procurement Procedure Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that requires the shortest procurement time ☐ Allows for projects to be more easily “shelved” ☐ Reduced time required to deliver project to advertisement ☐	☐ May lead to potential delays and other adverse outcomes ☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Rebidding a project increases the procurement time and overall schedule may be delayed ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Well developed and planned schedules are available if schedule is one of the parameters requested in the RFP ☐ Overall project schedule can be compressed ☐ Positive impact on cost, quality, schedule, and flexibility ☐ Shifts risks to awarded firm ☐ Helps to promote innovation, especially in project schedule	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Requires agency and stakeholder commitments to an extensive review of proposals in a timely manner ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Bidding firms may utilize more resources to develop a complete project schedule, which could increase bid costs
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Overall project schedule can be compressed ☐ Less time required for procurement if firms are pre-qualified ☐ ☐ ☐	☐ Award process can be lengthy if negotiating with multiple firms ☐ Iterative process until an agreement is reached ☐ ☐ ☐

2) Project Complexity and Innovation Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Useful for projects that require little or no innovation ☐ Complex design can be resolved and competitively bid on cost ☐ Innovations can add cost or time ☐ ☐	☐ Diminishes innovation in design and construction ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Greater opportunity for innovation and improvements in quality ☐ Can request solutions to project complexities in RFP ☐ Innovative opportunities to allocate risks to different parties in RFP requirements (e.g., schedule, means and methods, phasing) ☐	☐ Qualitative factors can be difficult to define and evaluate ☐ Some potential design solutions might be too innovative or difficult to evaluate properly ☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☐ Innovations can add cost or time ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Works well will projects where complexity, technical risks and/or evolving scope make it difficult to prepare a clear and accurate bid package to procure using competitive pricing ☐ Risk of innovation can be better defined, minimized, and allocated during negotiations ☐ ☐	☐ ☐ ☐ ☐ ☐

3) Level of Design Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method requiring the design to be complete or near complete by the agency for accurate bidding ☐ Scope of the project is well defined with complete plans and specifications ☐ ☐	☐ Design must be complete and accurate as design errors or omissions may lead to change orders and schedule delays ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Very little design needs to be complete ☐ Plans do not have to be as detailed because the RFP can request further design alternatives ☐ ☐ ☐	☐ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Can create less standardized project designs across agency as a whole due to different design requirements ☐ The majority of the design to be completed by design-builder
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Can utilize a lower level of design prior to selecting a firm then collaboratively advance design with the agency and project team ☐ ☐ ☐ ☐	☐ Trust that the contractor will provide useful input during design ☐ ☐ ☐ ☐

4) Cost Project Procurement Procedure Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Competitive bidding provides low cost construction to a fully defined scope of work ☐ Low bid amount received is used as contract amount ☐ Can reduce overall engineering costs ☐ ☐	☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Accuracy of bids is limited unless design is complete and accurate ☐ Increased risk to Agency that all received bids will exceed budget ☐ ☐

Best Value	
Opportunities	**Obstacles/Risks**
☐ Complete and accurate requirements in the RFP can help to reduce change orders in number and magnitude during construction ☐ Agency runs the risk of higher initial costs, but risk of poor quality is reduced ☐ Cost is not the only primary factor to consider in evaluating received proposals ☐ Can reduce engineering costs ☐	☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Increased cost to prepare proposal can limit responsive firms ☐ Cost to prepare proposal can be substantial, resulting in increased bid amounts ☐

Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency does not have to award to lowest, responsive bidder ☐ Only evaluating qualitative factors, no cost to consider ☐ ☐ ☐	☐ Procurement does not include cost portion in proposals ☐Subjective selection based on qualitative factors only ☐ ☐ ☐

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

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

5b) Assessment of Risk Procurement Procedure Selection Opportunities/Obstacles Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Risk allocation is most widely used and understood ☐ When design is complete, opportunity to avoid or mitigate risks ☐ ☐	☐ Low bid related risks ☐ Agency needs to resolve risks related to environmental, railroads and third party involvement before procurement begins ☐ Agency responsible for addressing ROW and utilities risks before beginning procurement ☐ Contractor has the ability to avoid risks
Best Value	
Opportunities	**Obstacles/Risks**
☐ Innovative opportunities to allocate risks to bidding firms ☐ Eliminates low bid risks ☐ Can define risk/reward structure in RFQ/RFP ☐ Contractor can identify risks related to environmental, railroads, ROW, and utilities ☐Contractors can propose innovative solutions to eliminate or mitigate risks	☐ Need a detailed project scope, description and any other necessary information for the RFP so that accurate, complete, and comprehensive responses are received ☐ Introduces risks associated with the agreement when design is not complete or alternate solutions are to be used ☐ ☐ ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Eliminates low bid risks ☐ Bidders can help to identify project risks ☐ ☐ ☐	☐ High cost risks, as no quantitative factors to base a selection on ☐ If an agreement cannot be negotiated, then low bid risks appear ☐ ☐ ☐

6) Staff Experience and Availability Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that Agency staff knows and understands ☐ Less Agency resources needed for developing request for proposal and evaluating received bids ☐ Reduces Agency construction administrative staffing ☐	☐ Additional Agency administrative efforts needed to ensure compliance with documentation requirements ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Provides Agency staff with experience in developing Best Value proposals and evaluating received proposals ☐ Opportunity to grow agency staff by learning a new process ☐ Ability to tailor the evaluation plan to the specific needs of a project ☐ ☐	☐ Agency staff may need training on how to evaluate proposals ☐ High amount of agency management and technical resources needed for RFP development ☐ Inexperienced agency staff can increase the organizational risk ☐ Legislation may need to be enacted to use best value legally
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Similar procurement procedure in selecting design professionals ☐ Works well for projects where Agency cannot develop full bid packages ☐ Provides for more interaction with bidding firms ☐ ☐	☐ Agency staff may be unfamiliar with this procedure for selecting contractors ☐ Additional Agency management is needed for negotiations and qualification factor development ☐ Additional Agency management is required ☐ ☐

7) Level of Oversight and Control Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Oversight roles well understood ☐ Few resources needed to evaluate and award project ☐ ☐ ☐	☐ Agency must select the lowest, responsive bid, regardless of other factors ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Bidders provide input to enhance constructability and innovation ☐ Cost, schedule, and other factors determined by bidding firms ☐ Agency has full control over awarding project ☐ ☐	☐ Requires more Agency resources to develop RFP ☐ Requires more Agency resources to evaluate proposals ☐ Less Agency control over final design ☐ Control of design relies on the proper development of RFQ and RFP ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency controls procurement process by evaluating qualitative factors ☐ Agency has full control over awarding project ☐ ☐ ☐	☐ Agency must have experienced staff to oversee the procurement process ☐ Agency cannot control negotiations with potential firms ☐ ☐ ☐

8) Competition and Contractor Experience Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☐ Contractors are familiar with Low Bid process ☐ Definable and defensible (objective) award	☐ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☐ Limited ability to select a contractor on qualifications ☐ Increased likelihood of disputes and claims by contractors
Best Value	
Opportunities	**Obstacles/Risks**
☐ Allows a balance of qualifications and cost ☐ Fair competition and performance-based accountability ☐ Helps to assure the Agency is selecting a capable and qualified firm ☐	☐ Less contractors are familiar with the qualitative aspects of proposals ☐ Increased cost to prepare proposal can limit responsive firms ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Smaller firms can be limited in participation ☐ Highly subjective evaluation of qualitative factors ☐ Qualitative factors leave room for human error or biases ☐ Lowest cost bidder may not receive award, resulting in opposition
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Allows for Qualitative procurement of contractors ☐ Focuses on contractor abilities ☐ Bid transparency ☐ Only have to negotiate with one firm on contract ☐	☐ Limited ability to select a contractor based on cost ☐ Qualifying firms can limit competition ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Potential for upset, non-awarded firms due to subjectivity evaluation of qualitative factors ☐ Smaller firms can be limited in participation

APPENDIX G. EXAMPLE PROJECT USING THE PPSM TOOL

Procurement Procedure Selection Workshop Summary

Workshop Summary	
Project Name:	1-25 managed lanes project from 120th Ave to SH7
Workshop Date:	July 9, 2013
Workshop Location:	CDOT District 4 HQ – Greeley, CO
Facilitator:	Keith Molenaar
Procurement Procedure Selected:	Best value

Workshop Participants	
Name	**Email**
Dan Marcucci	
Ina Zisman	
Wes Goff	
Carol Parr	
Bob Grube	
Keith Schaeffer	

Project Procurement 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 procurement procedure decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name: I-25 Managed Lanes – 120^{th} Ave to SH7
Location: Along Interstate 25 in north Denver from 120^{th} Ave (SH 128) to SH7
Estimated Budget: $54,500,000
Delivery Method Selected: Design-Build. This project will consider Low Bid or Best Value for procuring a firm. Qualifications-based will not be evaluated.
Estimated Project Delivery Period: CDOT 30% design 10/2013 to 11/2014. Procurement 11/2014 to 5/2014. Construction 5/2015 to 6/2016.
Required Delivery Date (if applicable): Before January 1, 2017
Source(s) of Project Funding: RAMP
Project Corridor: I-25 NB and SB lanes in north Denver metro area
Major Features of Work – pavement, bridge, sound barriers, etc.: Bridge widening E-17-FH and E-17-FG, roadway widening, noise walls, asphalt paving, managed lanes implementation, ITS. The project will follow existing grade and alignment
Major Schedule Milestones: Opening of managed lanes from SH128 to SH7 – Summer 2016 Risk assessment – already started Design consultant selection – already started 30% plans – 11/2014 Project Delivery Selection – Design-Build July 2013 Construction RFP including shortlist and selection – 5/2014 FOR Begin construction – Summer 2015 Complete construction – Summer 2016
Major Project Stakeholders: CDOT, RTD, CDOT transit division, Broomfield County, Adams County
Major Obstacles With Right of Way, Utilities, and/or Environmental Approvals: Utilities, environmental approval, ROD2
Major Obstacles During Construction Phase: Traffic management, implementation of managed lanes, ITS
Main Identified Sources of Risk: ROD2 and funding
Safety Issues: Standard traffic issues
Sustainable Design and Construction Requirements: Provide for a more uniform traffic flow thereby saving on pollution and energy. Using existing roadway template with overlay

Project Procurement Goals

An understanding of project goals is essential to selecting an appropriate procurement procedure. Typically, the project goals can be defined in three to five items. 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: Primary goal Schedule – Very aggressive with total completion by end of 2016. Need to minimize project delivery time, complete project on schedule, accelerate start of project revenue
Goal #2: Primary goal Cost – Funding through RAMP should be available. Need to make sure RAMP funded section is on or below budget as additional funds will not be available. Need to maximize project budget, complete the project on or below budget, and maximize the project scope and improvements within the project budget
Goal #3: Secondary goal Quality – Meet or exceed project requirements, select the best team, provide high quality design and construction constraints, provide aesthetically pleasing project, project is providing interim improvements with final improvements many years away
Goal #4: Secondary goal Functional – Maximize the life-cycle performance of the project, maximize the capacity and mobility improvements, minimize inconvenience to the traveling public during construction, maximize safety of workers and traveling public during construction, provide revenues for a future P3 project to the north along I-25
Goal #5:

Project Procurement Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible procurement procedures. 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 procurement selection.

General Constraints
Source of Funding: RAMP funds – Potential that these funds are not made available. State makes decision on funding at end of August 2013 (Assume for this selection tool that RAMP funds will be made available)
Schedule constraints: Complete project by 12/31/2016 based on current corridor schedule
Federal, state, and local laws: NA
Third party agreements with railroads, ROW, etc: Utility clearance for the project itself (scheduling), timely ROW plans by end of 2014 could be aggressive

Procurement Specific Constraints
Procurement constraint #1: ROD 2 – Record of decision to be complete by May 2014. Can be a risk if public involvement takes longer than planned. ROW plans depend on the ROD. Reduced risk for completing ROD 2 for 120th to SH7 section only
Procurement constraint #2: MS 4 (water quality) for the width that is added (the additional pavement). Impact should be minimal
Procurement constraint #3: Topography survey has not been completed and design cannot begin in earnest until this is complete
Procurement constraint #4:
Procurement constraint #5:

Procurement Procedure Selection Summary

Determine the factors that need to be evaluated in the procurement procedure selection, taking into account the project delivery method that will be used. Then, discuss the opportunities and obstacles related to each selection factor, and document the discussion on the following pages. At the conclusion of the evaluation, complete the summary table below.

PROCUREMENT PROCEDURES OPPORTUNITY/OBSTACLE SUMMARY					
	Evaluate this Factor? (Circle One)		Low Bid	Best Value	Qualifications-Based
Evaluation Factors					
Delivery Schedule	Yes	No	**NA**	**NA**	**NA**
Project Complexity and Innovation	Yes	No	**+**	**++**	**NA**
Level of Design	Yes	No	**-**	**++**	**NA**
Cost	Yes	No	**+**	**++**	**NA**
Assessment of Risk	Yes	No	**-**	**++**	**NA**
Staff Experience and Availability	Yes	No	**NA**	**NA**	**NA**
Level of Oversight and Control	Yes	No	**NA**	**NA**	**NA**
Competition and Contractor Experience	Yes	No	**-**	**++**	**NA**

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
NA	Factor not applicable or not relevant to the selection

Procurement Procedure Selection Summary Conclusions and Comments

The procurement procedures selection workshop resulted in selecting Best Value for the Design-Build I-25 managed lanes project, from 120th Ave to SH7

In the workshop, the factors of project complexity, level of design, cost, risk and competition and contractor experience were evaluated for low bid and best value procurement.

It was determined before evaluating the factors to eliminate delivery schedule as the time needed to perform the procurement is not a constraint and there is time available to perform any procurement method

It was also determined to eliminate staff experience and availability and level of oversight and control factors as CDOT is in the process of hiring a consultant that will be available to assist CDOT with both of these situations, regardless of the procurement method selected

In evaluating complexity and innovation, it was determined that although this project is not very complex, it would be beneficial with the selected design-build delivery method to receive the best value available for this project and to allow for bidders to propose possible innovations to save cost and time

In evaluating level of design, it was determined that besides the ITS needing to be completely designed by CDOT, the rest of the project only needs to be developed to the 30% design complete range. This works well with best value. In low bid for design-build, the design would need to be advanced further than 30% to get more accurate bids

In evaluating cost, it was determined that the size of this project in terms of budget would make it one of the largest low bid design-build projects that CDOT has ever done. Also, the workshop participants were all in agreement that a technical portion in the RFP would provide a better value to CDOT, meaning best value is optimal for this factor.

In evaluating risk, the largest concern was the ITS design, which has to be completed by CDOT. Then, the discussion focused on the fact that in either procurement method, CDOT will pay for risks that are allocated to the bidding firm. Since that will occur, it makes more sense to use best value, which can then provide justification for how a risk will be handled by the awarded firm. This is not possible with low bid.

In evaluating competition and contractor experience, the location of the project will allow for high competition from responsive bidders who are familiar with design-build and preparing a best value proposal. Qualifications of the bidding firm can be a part of the technical portion of the RFP for best value, while low bid would still then need to conduct pre-qualifications before letting the project for bid.

Procurement Procedure Selection Matrix Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. For procurement, consider the length of time needed to develop the RFP, proposal development, and evaluation. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

LOW BID – The shortest duration of competitive procurement methods. One factor to consider, cost, and this is the most traditional method that many understand.		
Opportunities	**Obstacles**	**Rating**
Current corridor schedule provides enough time to use this procedure		**NA**
Schedule was not evaluated for Low Bid		

BEST VALUE – Procurement period is the longest for this method. Additional time needed for bids to be prepared as well as evaluating and Rating proposals.		
Opportunities	**Obstacles**	**Rating**
Current corridor schedule provides enough time to use this procedure		**NA**
Schedule was not evaluated for Best Value		

QUALIFICATIONS-BASED – Requires time to evaluate qualitative factors. Clarifications for some of the bids may be needed, which can extend the letting period.		
Opportunities	**Obstacles**	**Rating**
Not included in the evaluation		**NA**

2) Project Complexity and Innovation

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

LOW BID – The traditional letting approach. Does not allow for additional factors to be considered such as innovative designs and alternative technical concepts. Useful for low complexity projects that do not need additional innovations to complete.

Opportunities	Obstacles	Rating
Project is not very complex and may not need innovative ideas and techniques to complete the project		+

BEST VALUE – A quantitative and qualitative procurement method that allows for additional factors such as innovative designs and techniques to be provided in the proposals.

Opportunities	Obstacles	Rating
Allow CDOT to introduce innovation request and requirements in technical portion of RFP	Innovations could add costs or time	++
No constraint on procurement schedule and the added technical portion of RFP will allow for more innovative ideas		

QUALIFICATIONS-BASED – Useful for projects that do not have a complete bid package or where a complete bid package cannot be feasibly developed due to complexities and necessary innovations.

Opportunities	Obstacles	Rating
Not evaluated		NA

3) Level of Design

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

LOW BID – Design needs to be complete, or near complete, and accurate so that firms can responsibly prepare cost bids.		
Opportunities	**Obstacles**	**Rating**
More of the design is controlled and completed by CDOT	Design will need to be developed by CDOT further for low bid over best value before releasing the RFP	**–**
ITS is completed by CDOT	With more complete design, difficult to make changes	

BEST VALUE – Very little design needs to be complete before advertising the RFP. Plans do not need to be fully detailed as the RFP requirements can include design alternatives.		
Opportunities	**Obstacles**	**Rating**
Design does not need to be advanced beyond 30% before advertising the RFP	ITS needs to be completed by CDOT	**++**
Design does not have to be detailed as the RFP can request further design and technical alternates		

QUALIFICATIONS-BASED – Very little or no design needs to be complete as firms are selected based on other factors besides cost and schedule.		
Opportunities	**Obstacles**	**Rating**
Not evaluated		**NA**

4) Cost

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

LOW BID – Competitive bidding on costs can provide for low construction costs based on a fully defined design and scope.		
Opportunities	**Obstacles**	**Rating**
Low bid amount in proposal us used as contract amount	The project would be the largest budget-wise to use Low Bid with Design-Build at CDOT	+

BEST VALUE – Development of the RFP needs to be complete and accurate so that cost changes are minimized.		
Opportunities	**Obstacles**	**Rating**
The budget of the project fits better with best value		++
Allows for innovative ideas that may reduce costs		
Cost is not the only factor to consider in evaluating received proposals		

QUALIFICATIONS-BASED – Procurement only evaluates factors such as past experience, reputation, financial stability, and does not include cost.		
Opportunities	**Obstacles**	**Rating**
Not evaluated		**NA**

5) Initial Risk Assessment

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 assessment of project risks is important to ensure the selection of a procurement procedure that can properly address them.

LOW BID – Evaluation of proposals only considers cost and does not include any information on how a bidding firm will address any risks. Agencies can allocate more risks to the contract, but that will be reflected in the bids.

Opportunities	Obstacles	Rating
More design complete and low bid is the contract amount	CDOT pays for risks in any procurement, but difficult to understand how bidder addresses risks with no technical portion in the RFP or received proposals	–

BEST VALUE – The RFP can request risk management plan, which provides the agency with an understanding of how the project team will allocate and manage risks.

Opportunities	Obstacles	Rating
Allows for more uncertainties to be addressed in technical portion	ITS needs to be completed by CDOT	++
CDOT pays for risk in any procurement, best value allows CDOT to see how a bidder will address a risk with the technical portion of the RFP		
Technical portion eliminates the risks associated with choosing the lowest bidder		
Allows for traffic management plan to be a part of RFP		

QUALIFICATIONS-BASED – Selection can consider past performances with project risks and can request information on how the qualifying firm plans to manage risks on the project.

Opportunities	Obstacles	Rating
Not evaluated		NA

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the procurement procedure in question.

Opportunities	Obstacles	Rating
LOW BID – This is the traditional method that most Agencies have a plethora of experience and knowledge.		
Opportunities	**Obstacles**	**Rating**
Not evaluated as third party consultant will assist CDOT		**NA**
BEST VALUE – This is a more extensive process that Agencies may not have the experience or knowledge to use. Additional resources will be needed to develop the RFP and evaluate received proposals.		
Opportunities	**Obstacles**	**Rating**
Not evaluated as third party consultant will assist CDOT		**NA**
QUALIFICATIONS-BASED – This can be an unknown procedure in how to evaluate subjective factors. Experience by Agencies in this procedure is low.		
Opportunities	**Obstacles**	**Rating**
Not evaluated		**NA**

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to develop the procurement documents, and the amount of agency staff required to evaluate received proposals/bids.

LOW BID – Minimal amount of staff and time required to develop procurement documents and evaluation typically only requires reviewing the cost amount submitted by bidding firms.		
Opportunities	**Obstacles**	**Rating**
Not evaluated as third party consultant will assist CDOT		**NA**

BEST VALUE – Additional staff and time is required to develop the criteria for the RFP. Evaluation of proposals is extensive and requires additional resources that when evaluating cost alone. Agency does have more control over what to require of proposing firms.		
Opportunities	**Obstacles**	**Rating**
Not evaluated as third party consultant will assist CDOT		**NA**

QUALIFICATIONS-BASED – Minimal amount of staff and time required to create the RFQ. Additional staff and time is needed to evaluate the qualifications. Agency has control over what to require of qualifying firms.		
Opportunities	**Obstacles**	**Rating**
Not evaluated		**NA**

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 and associated procurement procedure.

LOW BID – Firms are most familiar with this procedure and it promotes a high level of competition.		
Opportunities	**Obstacles**	**Rating**
Location and size of project allows for many received proposals from responsive bidders	Need to pre-qualify bidders to avoid selecting the lowest bidder that is not qualified	–

BEST VALUE – Provides a balance of qualifications and costs. Promotes fair competition among firms. However, many firms may not be familiar with this procedure and are unable to responsibly provide a proposal.		
Opportunities	**Obstacles**	**Rating**
Location and size of project allows for many potential proposals from responsive bidders		++

QUALIFICATIONS-BASED – Provides for qualifying firms in selection. This can lead to limited competition and unfamiliarity by firms.		
Opportunities	**Obstacles**	**Rating**
Not evaluated		**NA**

Procurement Procedure Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that requires the shortest procurement time ☐ Allows for projects to be more easily "shelved" ☐ Reduced time required to deliver project to advertisement ☐	☐ May lead to potential delays and other adverse outcomes ☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Rebidding a project increases the procurement time and overall schedule may be delayed ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Well developed and planned schedules are available if schedule is one of the parameters requested in the RFP ☐ Overall project schedule can be compressed ☐ Positive impact on cost, quality, schedule, and flexibility ☐ Shifts risks to awarded firm ☐ Helps to promote innovation, especially in project schedule	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Requires agency and stakeholder commitments to an extensive review of proposals in a timely manner ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Bidding firms may utilize more resources to develop a complete project schedule, which could increase bid costs
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Overall project schedule can be compressed ☐ Less time required for procurement if firms are pre-qualified ☐ ☐ ☐	☐ Award process can be lengthy if negotiating with multiple firms ☐ Iterative process until an agreement is reached ☐ ☐ ☐

2) Project Complexity and Innovation Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Useful for projects that require little or no innovation ☐ Complex design can be resolved and competitively bid on cost ☒ Innovations can add cost or time ☐ ☐	☒ Diminishes innovation in design and construction ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Greater opportunity for innovation and improvements in quality ☒ Can request solutions to project complexities in RFP ☒ Innovative opportunities to allocate risks to different parties in RFP requirements (e.g., schedule, means and methods, phasing) ☐	☒ Qualitative factors can be difficult to define and evaluate ☐ Some potential design solutions might be too innovative or difficult to evaluate properly ☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☒ Innovations can add cost or time ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Works well will projects where complexity, technical risks and/or evolving scope make it difficult to prepare a clear and accurate bid package to procure using competitive pricing ☐ Risk of innovation can be better defined, minimized, and allocated during negotiations ☐ ☐	☐ ☐ ☐ ☐ ☐

3) Level of Design Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Traditional method requiring the design to be complete or near complete by the agency for accurate bidding ☒ Scope of the project is well defined with complete plans and specifications ☐ ☐	☒ Design must be complete and accurate as design errors or omissions may lead to change orders and schedule delays ☐ ☐ ☐ ☐

Best Value	
Opportunities	**Obstacles/Risks**
☒ Very little design needs to be complete ☒ Plans do not have to be as detailed because the RFP can request further design alternatives ☐ ☐ ☐	☒ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Can create less standardized project designs across agency as a whole due to different design requirements ☐ The majority of the design to be completed by design-builder

Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Can utilize a lower level of design prior to selecting a firm then collaboratively advance design with the agency and project team ☐ ☐ ☐ ☐	☐ Trust that the contractor will provide useful input during design ☐ ☐ ☐ ☐

4) Cost Project Procurement Procedure Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Competitive bidding provides low cost construction to a fully defined scope of work ☒ Low bid amount received is used as contract amount ☐ Can reduce overall engineering costs ☐ ☐	☒ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Accuracy of bids is limited unless design is complete and accurate ☒ Increased risk to Agency that all received bids will exceed budget ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Complete and accurate requirements in the RFP can help to reduce change orders in number and magnitude during construction ☐ Agency runs the risk of higher initial costs, but risk of poor quality is reduced ☒ Cost is not the only primary factor to consider in evaluating received proposals ☐ Can reduce engineering costs ☐	☐ Undefined events or conditions found after procurement can impact schedule and cost ☒ Increased cost to prepare proposal can limit responsive firms ☒ Cost to prepare proposal can be substantial, resulting in increased bid amounts ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency does not have to award to lowest, responsive bidder ☐ Only evaluating qualitative factors, no cost to consider ☐ ☐ ☐	☐ Procurement does not include cost portion in proposals ☐Subjective selection based on qualitative factors only ☐ ☐ ☐

5) 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 agency issues ☐ Internal red tape causes delay getting approvals, decisions ☐ Too many projects/ new priority project inserted into program	☐ Pressure to delivery project on an accelerated schedule ☐ Inaccurate contract time estimates ☐ Construction QC/QA issues ☐ Unclear contract documents ☐ Problem with construction sequencing/ staging/ phasing ☒ Maintenance of Traffic/ Work Zone Traffic Control

5) Assessment of Risk Procurement Procedure Selection Opportunities/Obstacles Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Risk allocation is most widely used and understood ☐ When design is complete, opportunity to avoid or mitigate risks ☐ ☐	☒ Low bid related risks ☐ Agency needs to resolve risks related to environmental, railroads and third party involvement before procurement begins ☒ Agency responsible for addressing ROW and utilities risks before beginning procurement ☐ Contractor has the ability to avoid risks

Best Value	
Opportunities	**Obstacles/Risks**
☒ Innovative opportunities to allocate risks to bidding firms ☒ Eliminates low bid risks ☒ Can define risk/reward structure in RFQ/RFP ☒ Contractor can identify risks related to environmental, railroads, ROW, and utilities ☒Contractors can propose innovative solutions to eliminate or mitigate risks	☒ Need a detailed project scope, description and any other necessary information for the RFP so that accurate, complete, and comprehensive responses are received ☐ Introduces risks associated with the agreement when design is not complete or alternate solutions are to be used ☐ ☐ ☐

Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Eliminates low bid risks ☐ Bidders can help to identify project risks ☐ ☐ ☐	☐ High cost risks, as no quantitative factors to base a selection on ☐ If an agreement cannot be negotiated, then low bid risks appear ☐ ☐ ☐

6) Staff Experience and Availability Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Traditional method that Agency staff knows and understands ☐ Less Agency resources needed for developing request for proposal and evaluating received bids ☐ Reduces Agency construction administrative staffing ☐	☐ Additional Agency administrative efforts needed to ensure compliance with documentation requirements ☐ ☐ ☐ ☐

Best Value	
Opportunities	**Obstacles/Risks**
☒ Provides Agency staff with experience in developing Best Value proposals and evaluating received proposals ☐ Opportunity to grow agency staff by learning a new process ☐ Ability to tailor the evaluation plan to the specific needs of a project ☐ ☐	☐ Agency staff may need training on how to evaluate proposals ☒ High amount of agency management and technical resources needed for RFP development ☐ Inexperienced agency staff can increase the organizational risk ☐ Legislation may need to be enacted to use best value legally

Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Similar procurement procedure in selecting design professionals ☐ Works well for projects where Agency cannot develop full bid packages ☐ Provides for more interaction with bidding firms ☐ ☐	☐ Agency staff may be unfamiliar with this procedure for selecting contractors ☐ Additional Agency management is needed for negotiations and qualification factor development ☐ Additional Agency management is required ☐ ☐

7) Level of Oversight and Control Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Oversight roles well understood ☐ Few resources needed to evaluate and award project ☐ ☐ ☐	☐ Agency must select the lowest, responsive bid, regardless of other factors ☐ ☐ ☐ ☐

Best Value	
Opportunities	**Obstacles/Risks**
☐ Bidders provide input to enhance constructability and innovation ☐ Cost, schedule, and other factors determined by bidding firms ☐ Agency has full control over awarding project ☐ ☐	☐ Requires more Agency resources to develop RFP ☐ Requires more Agency resources to evaluate proposals ☐ Less Agency control over final design ☐ Control of design relies on the proper development of RFQ and RFP ☐

Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency controls procurement process by evaluating qualitative factors ☐ Agency has full control over awarding project ☐ ☐ ☐	☐ Agency must have experienced staff to oversee the procurement process ☐ Agency cannot control negotiations with potential firms ☐ ☐ ☐

8) Competition and Contractor Experience Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☒ Contractors are familiar with Low Bid process ☒ Definable and defensible (objective) award	☐ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☒ Limited ability to select a contractor on qualifications ☒ Increased likelihood of disputes and claims by contractors
Best Value	
Opportunities	**Obstacles/Risks**
☒ Allows a balance of qualifications and cost ☐ Fair competition and performance-based accountability ☐ Helps to assure the Agency is selecting a capable and qualified firm ☐	☐ Less contractors are familiar with the qualitative aspects of proposals ☐ Increased cost to prepare proposal can limit responsive firms ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Smaller firms can be limited in participation ☐ Highly subjective evaluation of qualitative factors ☐ Qualitative factors leave room for human error or biases ☐ Lowest cost bidder may not receive award, resulting in opposition
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Allows for Qualitative procurement of contractors ☐ Focuses on contractor abilities ☐ Bid transparency ☐ Only have to negotiate with one firm on contract ☐	☐ Limited ability to select a contractor based on cost ☐ Qualifying firms can limit competition ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Potential for upset, non-awarded firms due to subjectivity evaluation of qualitative factors ☐ Smaller firms can be limited in participation