

# Innovative Construction Contracting

December 1, 2010

## TABLE OF CONTENTS

1.	<a href="#">Introduction and Definitions</a> .....	2
2.	<a href="#">Innovative Construction Contracting Methods Selection Matrix</a> .....	7
3.	<a href="#">Acceleration Techniques</a> .....	11
	A. Accelerated Contract Provisions	
	1. <a href="#">Accelerated Schedules</a> .....	12
	2. <a href="#">Standard Incentive/Disincentive</a> .....	13
	3. <a href="#">A+B Incentive/Disincentive</a> .....	14
	4. <a href="#">No Excuse Incentive/Disincentive</a> .....	16
	5. <a href="#">Accepted for Traffic Incentive/Disincentive</a> .....	17
	6. <a href="#">Lane Rental</a> .....	18
	7. <a href="#">Interim Completion Date Incentives</a> .....	20
	B. Alternate Construction Methods	
	1. <a href="#">Precast Bridge Segments</a> .....	21
	2. <a href="#">Early Purchasing of Materials</a> .....	22
	3. <a href="#">Self Propelled Modular Transporters</a> .....	23
4.	<a href="#">Procurement and Payment Techniques</a> .....	25
	A. Procurement/Selection	
	1. <a href="#">Best Value</a> .....	27
	2. <a href="#">Project Specific Qualification</a> .....	29
	3. <a href="#">Alternate Bids</a> .....	31
	4. <a href="#">Fixed Cost Variable Scope/Build to Budget</a> .....	33
	5. <a href="#">Best and Final Offer</a> .....	35
	B. Payment	
	1. <a href="#">Performance-Based Incentives</a> .....	36
	2. <a href="#">Lump Sum</a> .....	38
	3. <a href="#">Indefinite Delivery/Indefinite Quantity</a> .....	40
5.	Delivery Methods	
	A. <a href="#">Design-Build</a> .....	43
	B. <a href="#">Design-Build-Finance</a> .....	46
	C. <a href="#">Design-Build-Finance-Operate (or Maintain)</a> .....	48
	D. <a href="#">Construction Management @ Risk</a> .....	50
6.	Resources	
	Appendix A – <a href="#">References</a> .....	53
	Appendix B – <a href="#">Sample Special Provisions</a> .....	55
	1. <a href="#">CPM Schedules</a> .....	56
	2. <a href="#">Accepted for Traffic (including sample Progress Clause)</a> .....	62

3.	<a href="#">Lane Rental</a> .....	67
4.	<a href="#">Extension of Time and Extra Cost</a> .....	70
Appendix C –	<a href="#">Special Experimental Project No. 14 (SEP-14) Process</a> .....	72
Appendix D –	<a href="#">White Papers on MDOT Material Performance Incentives</a> .....	74
1.	<a href="#">Hot Mix Asphalt</a> .....	75
2.	<a href="#">Permanent Pavement Markings</a> .....	77
3.	<a href="#">Portland Cement Concrete</a> .....	80

## Introduction



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# Introduction



This document contains fundamental information on various innovative construction contracting methods that may be used to enhance the implementation and delivery of MDOT construction projects. Innovative construction contracting methods are typically utilized to address specific project objectives that conventional contracting methods cannot, such as minimizing motorist delay or time to project completion. These methods are broken out into the following sections which are categorized by the three most common objectives:

## **Acceleration Techniques**

This section contains innovative construction contracting methods that may help expedite construction progress and minimize user delays. These methods range from Standard Incentive/Disincentive to Accelerated Construction Techniques, such as Precast Bridge Segments or Early Purchasing of Materials.

## **Procurement/Payment**

This section contains innovative construction contracting methods that describe ways to select a contractor and/or make payments on a contract. The selection options utilize additional factors (other than cost alone) to evaluate and award construction contracts. The factors are typically focused on improving the overall performance and value of construction projects. The methods in this section range from Best Value to Fixed Cost Variable Scope. For payments, the department typically reimburses contractors based on unit prices related to work completed, whereas innovative payment options can be based on performance and/or other factors that provide a more flexible contract administration.

## **Delivery Methods**

This section contains innovative construction contracting methods that are primarily focused on accelerating the time to both develop and deliver a construction project. This section includes overviews of the multiple variations of Design-Build and Construction Management @ Risk.

The region systems manager or program manager should be contacted to obtain their input, particularly to verify sufficient funding is available, when evaluating the use of any innovative construction contracting method.

The appendixes are comprised of additional resources that provide more detailed information on the innovative construction contracting methods.

In addition to the sections listed above, an “Innovative Construction Contracting Methods Selection Matrix” has been provided (see Table 2.1 on page 7) as a tool to help identify which innovative methods may be appropriate to achieve specific project objectives or criteria.

## Definitions

### ACCELERATION TECHNIQUES

#### **Standard Incentive/ Disincentive (I/D)**

Incentive/Disincentive is a method used to motivate the contractor to complete work or open-to-traffic a portion of the work on or ahead of schedule by providing a bonus for early completion or open-to-traffic. It is also used as a penalty for late project completion or for lanes not open-to-traffic. The bonus or penalty is based on road user delay costs, but the bonus is limited to a maximum of 5% of the project costs. Progress clauses list any additional liquidated damages in conjunction with Section 108 of the 2003 Standard Specifications for Construction.

#### **A+B Incentive/ Disincentive**

A+B Bidding is a cost-plus-time bidding procedure that selects the low bidder based on a monetary combination of the contract bid items ("A" portion) and the time ("B" portion) needed to complete the project or a critical portion of the project. The rate of incentive/disincentive for the "B" portion is typically based on estimated road user delay costs.

#### **No Excuse Incentive**

A No Excuse Incentive can reduce contract time by tying an incentive to the completion of specific construction activities by a set date, which may or may not be the contract completion date. The completion date(s) cannot be changed for any reason and a penalty is not applied if the contractor fails to meet the completion date(s). The amount of incentive is based on estimated road user delay costs.

#### **Accepted for Traffic Incentive/ Disincentive (AFT)**

The department will pay the contractor a lump sum incentive if the work in the contract is Accepted for Traffic on or before the AFT incentive date(s). The contractor would be assessed a penalty if they failed to meet the AFT date(s). The rate of incentive/disincentive is based on estimated road user delay costs.

#### **Lane Rental**

The contractor is charged a fee for occupying lanes or shoulders to complete contract work and can earn an incentive or disincentive based on the number of days they occupy the lane or shoulder versus the original Lane Rental lump sum bid. The hourly assessment is charged by the hour and is based on estimated road user delay cost.

#### **Interim Completion Date Incentive/Disincentive**

Similar to the Standard Incentive/Disincentive, the contractor is paid an incentive for completing a specified amount of work on or before the interim completion date(s). A penalty is applied if the work is not completed by the interim completion date(s). The incentive/disincentive is typically based on the rate of liquidated damages specified in the MDOT Standard Specifications for Construction.

#### **Precast Bridge Segments**

To help accelerate construction, prefabricated bridges or their elements and systems may be manufactured on-site or off-site, under controlled conditions, and brought to the final bridge location ready to install.

#### **Early Purchasing of Materials**

To help expedite construction of a project (especially bridge work), a separate contract is let to procure materials (i.e., structural steel) in advance of the main contract in order to avoid delays associated with material fabrication and delivery.

## PROCUREMENT/PAYMENT

### **Best Value**

A selection method in which both price and qualitative components are provided by the contractor and the award is based upon an evaluation of a combination of price and qualitative considerations.

### **Project Specific Qualification**

A selection method in which contractors are required to meet Project Specific Qualifications in order to be eligible to bid on a project.

### **Lump Sum**

A payment method where the contractor agrees to provide specified construction for one specific price. The department agrees to pay the price upon completion or acceptance of the work or according to a negotiated payment schedule.

### **Performance-Based Incentive/Disincentive**

A payment method where payment is based on a Performance-Based Incentive/Disincentive. These payment factors are defined by specific objectives or measurements that the contractor must satisfy to achieve additional compensation or avoid monetary penalties. A Performance-Based Incentive/Disincentive usually provides the contractor flexibility to select the means and methods to achieve the performance objectives. The amount of incentive/disincentive is typically determined through the application of MDOT quality assurance test results and a statistical evaluation, such as the "Percent Within Limits" method for HMA and concrete initiatives.

### **Alternate Bids**

A selection method where the contractor can bid on equivalent designs of competing alternates (i.e., HMA and concrete pavements).

### **Fixed Cost Variable Scope/Build to Budget**

A selection method where the contractor proposes to complete items of work within an established budget. Each item of work is assigned a value for evaluation purposes. The contractor with the best value for the established budget is awarded the contract at the budget price.

### **Best and Final Offer (BAFO) (Design-Build contracts only)**

A Design-Build selection method where proposals are first submitted by the design-builders. Following review with proposers, Best and Final Offers (BAFOs) would be called for by the department. The design-builder would submit their best prices and/or technical responses in reply to the department's request. In effect, this step levels the playing field by allowing finalists an opportunity to provide their BAFO after interviews have been conducted.

## DELIVERY METHODS

### **Design-Build (DB)**

Design-Build is a delivery method where both the design and construction of a project are contracted with a single entity known as the design-builder. The design and construction phases usually overlap on a DB contract which can significantly reduce the overall project delivery time.

### **Design/Build/Finance (DBF)**

A Design-Build contract where the design-builder is responsible for obtaining financing for the Design-Build costs. The design-builder is reimbursed based on a defined schedule of payments established by the department.

### **Design/Build/Operate (or Maintain) (DBFOM)**

A Design-Build contract where the contract transfers specific financial, operational, and maintenance responsibilities to the design-builder for a specific period of time.

**Construction Management @ Risk (CM@Risk)**

In a CM@Risk project, MDOT has a direct contract with an architectural/engineering (A/E) firm for construction management and a separate contract with a contractor for construction. CM@Risk is a delivery method which entails a commitment by the construction manager to deliver the project within a Guaranteed Maximum Price (GMP), in most cases. The construction manager acts as consultant to MDOT in the development and design phases but as the equivalent of a general contractor during the construction phase. When a construction manager is bound to a GMP, the most fundamental character of the relationship is changed. In addition to acting in MDOT's interest, the construction manager must manage and control construction costs to not exceed the GMP.

## Innovative Construction Contracting Methods Selection Matrix



**Table 2.1 – Innovative Contracting Recommendations**

• = May apply	Acceleration Techniques								Procurement/Payment							Delivery Method			
	Lane Rental	A+B I/D	Accepted for Traffic I/D	No Excuse I/D	Standard I/D	Accelerated Schedules	Interim Completion Date Incent.	Alternate Const Methods	Best Value	Project Specific Qualification	Lump Sum	Performance-Based Incentives	Alternate Bids	Fixed Cost Variable Scope	Indefinite Delivery/Ind. Quantity	Design-Build	Design-Build-Finance	DBF-Operate Maintain	CM @ Risk
<b>Project Objective</b>																			
Expedite construction	•	•	•	•	•	•	•	•							•	•	•	•	
Minimize road user delay costs	•	•	•	•	•	•	•	•	•			•			•	•	•	•	
Promote innovation <sup>(7)</sup>								•	•			•	•		•	•	•	•	
Expedite contract award <sup>(4)</sup>															•	•	•	•	
Minimize risk of claims/disputes				•											•	•	•	•	
Maximize work within set budget <sup>(1)</sup>												•	•				•	•	
Enhance quality <sup>(6)</sup>								•	•		•				•	•	•	•	
Define construction budget early <sup>(2)</sup>																		•	
Reduce design & construction time <sup>(5)</sup>									•						•	•	•	•	
Leverage external funding sources <sup>(3)</sup>																•	•		
<b>Project Criteria</b>																			
Specialized expertise <sup>(9)</sup>										•		•							
Emergency project	•	•	•	•	•	•	•	•	•					•	•				
Complex staging									•			•			•	•	•	•	
Unique scope of work <sup>(8)</sup>										•									
Critical project completion dates	•	•	•	•	•	•	•	•	•						•	•	•		
Consistent work at variable locations <sup>(10)</sup>											•			•					
Need for innovative traffic management								•	•						•	•	•	•	
Work zone/construction safety issues									•			•			•	•	•	•	

**Table 2.1 – Innovative Contracting Recommendations (continued)**

•= May apply	Acceleration Techniques								Procurement/Payment							Delivery Method			
	Lane Rental	A+B I/D	Accepted for Traffic I/D	No Excuse I/D	Standard I/D	Accelerated Schedules	Interim Completion Date Inc.	Alternate Const Methods	Best Value	Project Specific Qualification	Lump Sum	Performance-Based Incentives	Alternate Bids	Fixed Cost Variable Scope	Indefinite Delivery/Quantity	Design-Build	Design-Build-Finance	DBF-Operate Maintain	CM @ Risk
<b>Project Type</b>																			
Roadway Rehabilitation <sup>(a)</sup>	•	•	•	•	•	•	•			•	•	•	•		•				
Roadway Reconstruction	•	•	•	•	•	•	•		•	•		•	•	•	•		•	•	
New Roadway/Bridge Construction		•	•	•	•	•	•	•	•	•		•	•	•	•		•	•	
Road Capital Preventive Maintenance (CPM) <sup>(b)</sup>	•	•	•	•	•	•	•		•		•	•	•	•	•				
Bridge Rehabilitation <sup>(c)</sup>	•	•	•	•	•	•	•		•	•	•	•			•				
Bridge Reconstruction	•	•	•	•	•	•	•	•	•		•	•	•		•				
Bridge Painting	•	•	•	•	•	•	•			•	•		•	•					
Bridge Capital Scheduled Maintenance (CSM) <sup>(d)</sup>	•	•	•	•	•	•	•			•	•	•	•		•				
Traffic Signs					•	•	•			•				•	•				
Traffic Signals					•	•	•		•	•				•	•				
Barrier and Guardrail <sup>(e)</sup>	•	•	•	•	•	•	•			•				•	•				
Pavement Markings and Rumble Strips					•	•	•			•	•			•	•				
Landscaping and Enhancement <sup>(f)</sup>					•	•	•			•	•	•	•	•	•				
Miscellaneous <sup>(g)</sup>					•	•	•	•											

## NOTES

### Project Objectives and Project Criteria

- (1) Goal is to use all budgeted funds and maximize the construction work that can be completed.
- (2) Projects where the budget must be defined early with no options to increase later.
- (3) Projects where funding is flexible but limited.
- (4) The department needs to get the award of the project as soon as possible; usually related to earliest obligation of federal funds.
- (5) Projects where the goal is to get the construction completion date as early as possible.
- (6) Goal is to improve the quality of the construction; usually providing a type of performance specification.
- (7) Projects with complex issues that appeal to contractor innovations.
- (8) Work not usually contracted by MDOT but done often elsewhere (usually no prequalification classification established).
- (9) Work that requires either design or construction expertise that is specialized to the construction being done.
- (10) Projects where the work is standard but usually locations have not been established (i.e., traffic signal installation, signing, pavement marking, etc.)

### Project Type

**For most project types, the applicability of innovative construction contracting methods will depend on the amount and complexity of work.**

- (a) Roadway rehabilitation includes HMA/concrete overlay, rubbilize and resurface, cold mill and resurface, etc.
- (b) Road CPM projects include chip seal, microsurface, crack seal, ultra thin overlay, surface seal, etc.
- (c) Bridge rehabilitation projects include concrete overlay, bridge barrier replacement, expansion joint replacement, etc.
- (d) Bridge CSM projects include epoxy overlay, penetrating healer sealer, concrete surface coating, concrete patches, etc.
- (e) Barrier and guardrail projects include median cable barrier, concrete barrier, and guardrail projects.
- (f) Landscaping and enhancement projects include sidewalks, bike paths, landscape, and other enhancements.
- (g) Miscellaneous projects include rest areas, pump houses, lighting, and ITS.

## Acceleration Techniques

- A. Accelerated Contract Provisions
- B. Alternate Construction Methods



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# Acceleration Techniques



## Introduction

MDOT has considerable experience with the application of innovative construction contracting methods that are targeted at accelerating construction progress. General guidance is provided for the following accelerated contract provisions that have been used by MDOT:

1. Accelerated Schedules
2. Standard Incentive/Disincentive
3. A+B (or cost plus time bidding) Incentive/Disincentive
4. No Excuse Incentive/Disincentive
5. Accepted for Traffic Incentive/Disincentive
6. Lane Rental
7. Interim Completion Date Incentives

MDOT has used some alternate construction methods including early ordering of critical materials, such as pumps for pump houses and cable for lighting projects; and using precast bridge components, such as deck panels, abutments, piers, and footings. MDOT has not used Self Propelled Modular Transports (SPMT) but other agencies have used them recently. See page 23 for more information on SPMT use.

On most accelerated projects, particularly those with complex staging, the frequently used special provision for Critical Path Method Network Schedules (CPM Schedules) is included in the contract. The decision to use this special provision is usually made by the TSC delivery engineer. This special provision requires the contractor to provide a CPM schedule in addition to the initial progress schedule. The CPM schedule requires a detailed breakdown of each schedule activity. See the frequently used special provision for CPM schedules in Appendix B for the specific requirements.

The region systems manager or program manager should be contacted to obtain their input, particularly to verify sufficient funding is available, when evaluating the use of these innovative construction contracting methods.

## Background

Initial guidelines for Incentives/Disincentives named “Guidelines for the Use of Incentive/Disincentive and Special Liquidated Damage Clauses” were approved by the Engineering Operations Committee on August 14, 1990. These were based on the Federal Highway Administration’s (FHWA) Technical Advisory T 5080.10 dated February 8, 1989. In 1990, FHWA Special Experimental Project No. 14 (SEP-14) Innovative Contracting allowed agencies to use cost plus time bidding (A + B), Lane Rental, Design-Build contracting, and warranty clauses. In 2002, SEP-14 was revised from Innovative Contracting to Alternate Contracting. No Excuse Incentives were allowed in 1996. The MDOT Work Zone Safety and Mobility Policy also addresses the use of incentives. The Bureau of Highways Instructional Memorandum 2002-14 Final Project Reviews, Monitoring Construction Engineering and Incentive/Disincentive Projects, addresses revision to projects with incentives/disincentives. Traffic and Safety Note 907B (7/2008) also provides guidance for determining if an incentive/disincentive clause is warranted.

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## A. Accelerated Contract Provisions

### 1. Accelerated Schedules

#### Description

Accelerated Schedules is a method used to motivate the contractor to speed up the completion of work through the use of an expedited schedule. In accordance with the MDOT Standard Specifications for Construction, on expedited projects the contract completion date is based on a five workday week, whereas a standard project uses a four workday week. The MDOT construction manual contains additional guidance and examples of progress clauses for expedited projects which are typically generated by the TSC delivery engineer or designated representative. The contractor would be subject to liquidated damages per the MDOT Standard Specifications for Construction for failure to meet the contract completion date.

#### Advantages

- Earlier project completion time
- Earlier open-to-traffic date
- Benefits to motorists/local access
- Reduces road user delay costs
- Better scheduling by contractors for construction activities
- Extension of time option

#### Disadvantages

- Likelihood of increased bid costs for construction
- Likelihood of increased costs for construction oversight
- Unless additional contract requirements are provided, there are no additional disincentives for failing to meet the contract completion date besides standard liquidated damages

#### Recommendations for Use

##### Preferred Candidates:

- Projects with critical completion dates where incentives are not practical
- Projects with significant road user delay costs

##### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns such as utility relocations

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## A. Accelerated Contract Provisions

### 2. Standard Incentive/Disincentive

#### Description

Standard Incentive/Disincentive is a method used to motivate the contractor to complete work on or before a contract completion or open-to-traffic date. If the contractor meets the completion or open-to-traffic date specified in the progress clause, an incentive is paid. Conversely, a disincentive rate is applied if the contractor fails to meet the specified date. The dollar amount of incentive (both per day and total amount available) is specified in the progress clause and the schedule of items. The amount of incentive per day should be based on road user delay costs with the total incentive available limited to a maximum of 5% of the estimated construction costs. The disincentive rate should match the incentive rate which also needs to be based on road user delay costs and needs to be specified in the progress clause. The total incentive amount needs to be included within both the project estimate and programming. Liquidated damages may also apply as well with the disincentive.

#### Advantages

- Earlier project completion or open-to-traffic date
- Minimizes impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities
- Disincentives for failing to meet contract completion or open-to-traffic date

#### Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- Due to cap on maximum amount, the incentive may be less than road user delay costs
- Incentive amount or disincentive rate may not be enough to motivate the contractor to accelerate construction

#### Recommendations for Use

##### Preferred Candidates:

- Projects with critical completion dates
- Projects with significant road user delay costs and/or community or local business impacts

##### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns, such as utility relocations

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## A. Accelerated Contract Provisions

### 3. A+B Incentive/Disincentive

#### Description

A+B, otherwise known as cost plus time bidding, is a method used to motivate the contractor through incentives to minimize the duration of a construction project. A+B uses the combination of bid prices and time to determine the successful bidder. Under the A+B method, each bid submitted consists of two components:

- 1) The "A" component is the traditional bid for the contract items and is the dollar amount for all work to be performed under the contract.
- 2) The "B" component is a "bid" of the total number of calendar days required to complete the project, as estimated by the bidder. (Calendar days are used to avoid any potential for controversy which may arise if work days were used.)

The bid for award consideration is based on a combination of the bid for the contract items and the associated cost of the time according to the following formula:

$$(A) + (B \times \text{Road User Cost} / \text{Day}) = \text{Total Bid}$$

This formula is only used to determine the lowest responsible bidder for award and is not used to determine payment to the contractor.

A disincentive provision, that assesses road user costs, is incorporated into the contract to discourage the contractor from overrunning the time "bid" for the project. Liquidated damages may also apply as well with the disincentive. In addition, an incentive provision should be included to reward the contractor if the work is completed earlier than the time bid. Like the Standard Incentive/Disincentive, the amount of incentive is limited to a maximum of 5% of the estimated construction costs. The total incentive amount needs to be included within both the project estimate and programming.

For critical projects that have high road user delay impacts, the A+B method can be an effective technique to significantly reduce these impacts.

#### Advantages

- Earlier contract completion or open-to-traffic date
- Minimizes impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities
- Disincentives for failing to meet contract completion or open-to-traffic date

#### Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- No extension of time for the incentive
- No allowance for weather
- Due to cap on the maximum amount, the incentive may be less than road user delay costs

## Recommendations for Use

### Preferred Candidates:

- Projects with critical completion dates
- Projects with significant road user delay costs and/or community and local business impacts

### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns, such as utility relocations

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## A. Accelerated Contract Provisions

### 4. No Excuse Incentive/Disincentive

#### Description

No Excuse Incentive is a method used to motivate the contractor to complete work or open-to-traffic a portion of the work on or ahead of schedule by providing a bonus for early completion or open-to-traffic. MDOT will give the contractor a "drop-dead date" for completion of a phase or project. If the work is completed in advance of this date, the contractor will receive a bonus. There are no excuses for any reason, such as weather delays or not making the early completion or open-to-traffic date. On the other hand, there are no disincentives (other than normal liquidated damages) for not meeting the early completion or open-to-traffic date. This technique has applicability to projects that must be open to meet a critical date, such as a major sporting event. This has been used for the Major League Baseball All Star Game, Super Bowl, NCAA Final Four, and North American Auto Show. Like the other incentives/disincentives, the amount of incentive is limited to a maximum of 5% of the estimated construction costs.

For more detailed information on this acceleration technique, see the special provision No Excuse Incentive/Disincentive in Appendix B.

#### Advantages

- Earlier contract completion or open-to-traffic date
- Minimize impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities

#### Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- Due to cap on the maximum amount, the incentive may be less than road user delay costs
- No increased disincentives for failing to meet contract completion or open-to-traffic date

#### Recommendations for Use

##### Preferred Candidates:

- Projects with critical completion dates
- Projects with significant road user delay costs and/or community and local business impacts

##### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns, such as utility relocations

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## A. Accelerated Contract Provisions

### 5. Accepted for Traffic Incentive/Disincentive

#### Description

Accepted for Traffic is a method used to motivate the contractor to open-to-traffic a portion of the work on or ahead of schedule by providing an incentive for open-to-traffic. MDOT has used these incentives (which are similar to No Excuse Incentives) on projects that needed to be open to traffic for festivals and major sporting events. The special provision and progress clause for this innovative construction contracting method allows no extension of time for the critical milestone (Accepted for Traffic) dates. The critical milestones involve opening all lanes to traffic by a specified date or dates. The final critical milestone entails completing all contract work required to open all lanes to traffic by a specified date. A contract completion date must also be specified but is not eligible for an incentive payment. The special provision allows the contractor additional compensation to keep the project on schedule and meet the milestone dates for delays, extra work, and increased quantities if specific conditions are met. The progress clause provides a monetary incentive if the contractor meets the specified Accepted for Traffic dates. A disincentive is applied if the contractor fails to meet the Accepted for Traffic dates.

The incentive and disincentive for the Accepted for Traffic dates should be based on road user delay costs. The sum of the incentives is limited to a maximum of 5% of the estimated construction costs.

For more detailed information on this acceleration technique, see the special provision for Accepted for Traffic and sample progress clause in Appendix B. An MDOT SEP-14 report dated October 15, 2007, was prepared for this innovative construction contracting method and the link to its location is provided in Appendix A.

#### Advantages

- Earlier open-to-traffic dates and contract completion
- Minimizes impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities

#### Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- Due to cap on the maximum amount, the incentive may be less than road user delay costs

#### Recommendations for Use

##### Preferred Candidates:

- Projects with critical open-to-traffic dates
- Projects with significant road user delay costs and/or community and local business impacts

##### Undesirable Candidates:

- Projects with third party coordination concerns, such as utility relocations

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## A. Accelerated Contract Provisions

### 6. Lane Rental

#### Description

The goal of Lane Rental is to encourage a contractor to minimize the amount of time that through lanes are closed, and therefore limit the associated road user delay impacts. Under this concept, a provision for a rental fee assessment is included in the contract. The rental fee is based on estimated cost of delay or inconvenience to the road user during the rental period. The fee is assessed for the time that the contractor occupies or obstructs part of a lane on the mainline, ramp(s), or bridge(s) specified in the special provision for Lane Rental which is included in Appendix B. The tally of cumulative Lane Rental assessments are then deducted from the original Lane Rental lump sum bid on a bi-weekly basis until the contract work is completed.

The Lane Rental fee rates are stated in the above special provision in dollars per lane per hour or fractions of an hour. The contractor estimates the amount of time for which the rental assessment will apply and must bid a positive lump sum amount for the Lane Rental. Neither MDOT nor the contractor gives an indication as to the anticipated amount of time for which the assessment will apply and the apparent low bidder is determined solely on the lowest cumulative amount bid for the schedule of items in the contract.

The rental fee rates are dependent on the number and type of lanes closed and can vary for different hours of the day. For example, the rush hour periods from 6:30 to 9:00 a.m. and 3:00 to 6:00 p.m. could have a rental fee of \$2,000 per hour for closing one lane while at all other times a lane could be closed at a rental fee of \$500 per hour.

The incentive for Lane Rental is limited to a maximum of 5% of the estimated construction cost. The maximum incentive is determined and listed in the special provision for Lane Rental as "Lane Rental, Incentive". The incentive payment will be determined by taking the contract Lane Rental lump sum bid by the contractor and subtracting the total Lane Rental assessments which cannot exceed the maximum. For example, if a contractor bids \$1 million (lump sum) for Lane Rental and the total of the Lane Rental assessments is \$900,000 based on 900 hours at \$1,000 per hour, then the Lane Rental incentive equals \$100,000 provided it does not exceed the maximum incentive listed in the special provision.

The intent of Lane Rental is to encourage contractors to schedule their work to keep traffic restrictions to a minimum, both in terms of duration and number of lane closures. The Lane Rental concept has merit for use on projects that significantly impact the traveling public with the prime candidates being in major urban areas.

For more detailed information on this acceleration technique, see the special provision for Lane Rental in Appendix B.

#### Advantages

- Earlier contract completion or open-to-traffic date
- Minimizes impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities
- Disincentives for exceeding the estimated lane rental amounts

## Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- Tracking of lane rental charges

## Recommendations for Use

### Preferred Candidates:

- Projects with critical completion dates
- Projects with significant road user delay costs and/or community and local business impacts

### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns, such as utility relocations

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## A. Accelerated Contract Provisions

### 7. Interim Completion Date Incentives

#### Description

An Interim Completion Date Incentive is a method used to motivate the contractor to complete or open-to-traffic a portion of the work on or ahead of schedule by providing an incentive. In addition to the contract completion date, MDOT will give the contractor an interim completion or open-to-traffic date(s) for a phase, or phases, of a project. If the work is completed on or before the interim completion date(s), the contractor will receive an incentive. An Interim Completion Date Incentive can be treated as a Standard Incentive/Disincentive or a No Excuse Incentive. See the summaries for Standard Incentive/Disincentive and No Excuse Incentive in this section for information on these two acceleration techniques.

An Interim Completion Date Incentive can be effective on projects with multiple stages or open-to-traffic dates that must be completed in an accelerated manner to ensure the effective progression of work or to accommodate a special event.

#### Advantages

- Earlier completion or open-to-traffic date for critical phases of a project
- Minimizes impacts to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities

#### Disadvantages

- Increased project costs may require additional funding
- Potential for increased bid costs
- Potential for increased costs for construction oversight
- Due to cap on the maximum amount, the incentive may be less than road user delay costs

#### Recommendations for Use

##### Preferred Candidates:

- Projects with critical completion dates
- Projects with significant road user delay costs and/or community and local business impacts

##### Undesirable Candidates:

- Projects with open-to-traffic constraints, such as weekends to accommodate seasonal peak volumes or extended periods for special events, which significantly limit the amount of work hours or days per week
- Projects with third party coordination concerns, such as utility relocations

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## B. Alternate Construction Methods

### 1. Precast Bridge Segments

#### Description

Precast Bridge Segments are used to expedite bridge construction. In current construction practices, precast segments include footings, piers, pier caps, abutments, bridge decks, and railings. These segments are generally manufactured off-site and shipped to the project site ready to install.

#### Advantages

- Reduces project site construction time
- Innovative and improves constructability
- Earlier project completion time
- Reduction in open-to-traffic date
- Benefits to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities

#### Disadvantages

- Increased bid costs for construction
- Requires a different or greater degree of scheduling and planning
- Increased costs for fabrication inspection
- May require special means of fabrication, transportation, and assembly to handle precast segments
- Potential for increased camber growth in precast members which are not used within a certain time (this is more prevalent on long precast beams)
- Potential design issues with connection details (i.e., grouted splices, etc.)
- Lack of contractor experience

#### Recommendations for Use

##### Preferred Candidates:

- New bridge construction
- Bridge reconstruction

##### Undesirable Candidates:

- Bridge painting
- Bridge rehabilitation
- Bridge Capital Scheduled Maintenance (CSM)

---

## B. Alternate Construction Methods

### 2. Early Purchasing of Materials

#### Description

Early Purchasing of Materials is used in order to expedite the delivery of critical materials for a project. These contracts are let prior to larger contracts in order to ensure critical materials are on-site and ready for installation on or before a specified date so the larger contracts can remain on-schedule. This method has been used on pumps for pump houses, electrical cable for street lighting projects, and steel beams for bridge construction projects.

This method requires special provisions be included in both the early purchasing and larger contracts that clearly and logically specify the contractual requirements for each contractor and their obligations for the fabrication, delivery, storage, testing, and acceptance of the materials. Contact the Engineer of Design for assistance in the development of the special provisions for this method.

#### Advantages

- Reduces lead time for delivery of the material
- Lower risk for contractor
- Earlier project completion time
- Reduction in open-to-traffic date
- Benefits to motorists and/or community
- Reduces road user delay costs
- Better scheduling by contractors for construction activities

#### Disadvantages

- Contract is between MDOT and the fabricator
- Greater risk for MDOT
- Extension of time impacts the other contract
- Delivery delays of material impact the other contract
- No provision of expedited delivery

#### Recommendations for Use

##### Preferred Candidates:

- Projects with materials that historically have a large lead time which may jeopardize the contractor's ability to keep the project on-schedule or meet critical completion dates. Some of these project include, but are not limited to:
  - Bridge construction involving new steel beams
  - Miscellaneous projects including pump houses and street lighting

##### Undesirable Candidates:

- Any project with materials that are readily available or with sufficient lead time for materials that historically take a long time to receive

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## B. Alternate Construction Methods

### 3. Self Propelled Modular Transporters

#### Description

A Self Propelled Modular Transporter (SPMT) is a platform vehicle with a large array of wheels on the bottom. They are used for transporting massive objects, such as bridges, large bridge sections, and other objects that are too big or heavy for trucks. A typical SPMT can have a grid of several dozen computer-controlled wheels, all individually controllable and steerable, in order to evenly distribute weight and steer accurately. Each individual wheel can swivel independently from other wheels allowing the SPMT to turn, move sideways, or even spin in place. Some SPMTs allow each wheel to telescope independently of each other allowing the load to be kept flat and evenly distributed while moving over uneven terrain. As SPMTs often carry the world's heaviest loads on wheeled vehicles, they are very slow vehicles and often move at less than one mile per hour while fully loaded. Some SPMTs are controlled by a worker with a hand held control panel, while other SPMTs have a driver cabin. In addition, multiple SPMTs can be combined to transport massive building-sized objects. (Information taken from Wikipedia.)

SPMTs have been used to expedite bridge superstructure removal and construction. After the existing bridge is removed with the SPMT, the bridge superstructures are constructed near the existing bridge site, transported into position, and placed using the SPMT. The use of SPMTs has been limited to locations with high traffic volumes either on the bridge or on the roadway below the bridge.

#### Advantages

- Reduces delays, road user delay costs, and the open-to-traffic date for the crossing roadway
- Leads to innovation and improves constructability
- Earlier project completion time
- Benefits to motorists and/or community
- Better scheduling by contractors for construction activities

#### Disadvantages

- Increased costs for construction
- Requires different or greater degree of scheduling and planning
- Requires special means of transportation and assembly
- If structure is not on the same foot print, substructure must be designed and constructed
- Lack of contractor experience

#### Recommendations for Use

##### Preferred Candidates:

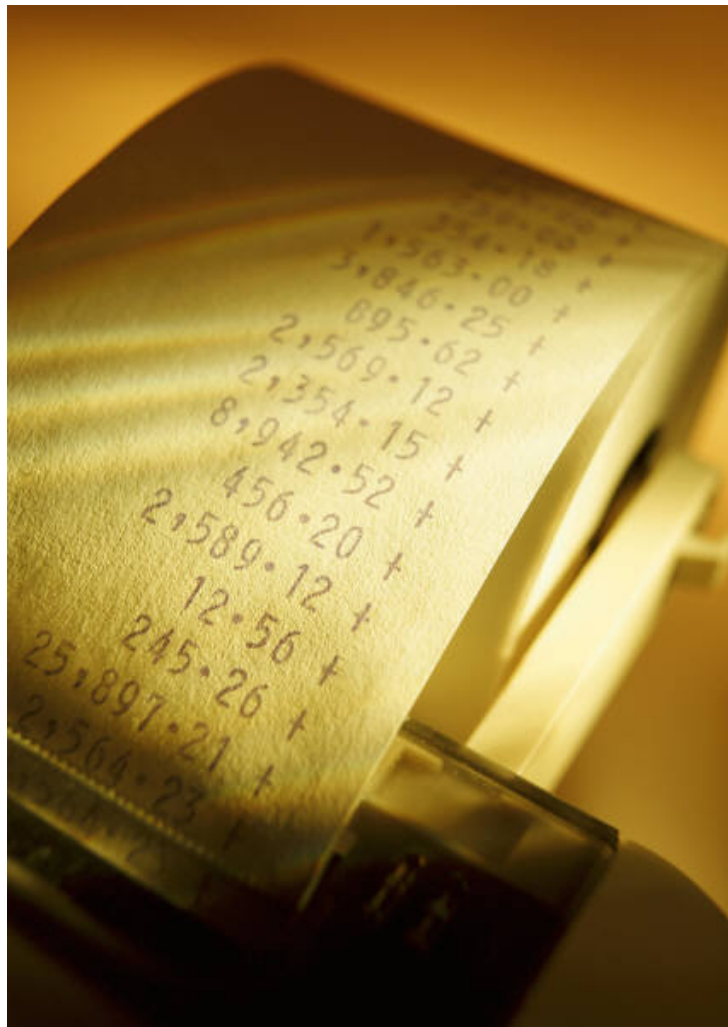
- Bridge reconstruction

##### Undesirable Candidates:

- New bridge construction
- Bridge rehabilitation
- Bridge Capital Scheduled Maintenance (CSM)

## Procurement and Payment Techniques

- A. Procurement/Selection
- B. Payment



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# Procurement and Payment Techniques



## Introduction

This chapter covers two areas of innovative contracting: Procurement/Selection and Payment. The first section covers various methods that can be used to select and award a construction contract. The second section covers innovative payment methods that may be used during the execution of a contract. These methods are commonly used together on the same contract (i.e., an innovative selection method like Best Value and innovative payment method like Lump Sum are part of the same contract). However, all methods can be used exclusive of others.

## One-Step versus Two-Step

A two-step process is where qualifications of contractors are solicited early in the contract development process. The qualifications are reviewed and a short list of qualified contractors are named or short-listed. These are the only contractors that can proceed to the second or final selection step. The final selection may be any selection method. A one-step process is where the selection will be at the final step (no short-listing). The final selection still may be any selection method. The following are examples of various ways that selections could be done:

One-Step: Low bid (current usual selection method)

Two-Step: Low bid (common when no prequalification available)

One-Step: Best Value (qualifications and price evaluated at final selection)

Two-Step: Best Value (one set of qualifications are used for short-listing, and different qualifications and the price are evaluated at final selection)

More details on how the selection methods can be used are provided in the following sections.

NOTE: The department currently prequalifies construction contractors for the majority of our construction contracting. This is a two-step process since most contracts have prequalification requirements (only contractors prequalified can bid on a project). Therefore, prequalification is the first step and the bid is the second step. However, for the purpose of this chapter, if prequalification is required it will be assumed to be completed and not included in the process steps.

## A. Procurement/Selection

The department selects most construction contracts based on the lowest bid price. The methods covered in this section describe selecting a construction contractor based on factors that may or may not include lowest bid price with the primary objective being the best overall value for the project. Innovative approaches to procurement/selection in construction contracting that are covered in this section include:

1. Best Value
2. Project Specific Qualifications
3. Alternate Bids
4. Fixed Cost Variable Scope/Build to Budget
5. Best and Final Offer

## B. Payment

Alternative payment methods are options that may simplify administration of contracts or are focused on improved performance of the project. The innovative payment methods covered in this section include the following:

1. Performance Based Incentive

2. Lump Sum
3. Indefinite Delivery/Indefinite Quantity

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## A. Procurement/Selection

### 1. Best Value

#### Description

A Best Value procurement method involves selection of a contractor on the basis of price and other key factors to obtain the best overall value for the project. The goal is to balance cost with technical factors to achieve long-term performance and value of construction for the public.

In the department's Best Value method, the selection team develops scoring criteria for the technical part of the evaluation. The technical evaluation may be a single item, such as an aesthetic treatment of a bridge or the approach to maintaining traffic. It may also contain many items to be evaluated, such as qualification of the contractor's team, resumes, understanding of the project, innovations, and more. If time allows, the evaluation can include interviews with the prospective bidders. Interviews should be well-documented so that scoring associated with it can be justified. When developing the list of items to be evaluated and scored, the selection team should focus on project specific needs that can be objectively defined, evaluated, and scored. However, some subjectivity may be used as long as a consistent approach to scoring is documented by the selection team.

The technical scoring is then combined with the weighted scores for the bids. The bid scores are determined by assigning a score to the lowest bid and then each subsequent bid receives a score calculated on the percent that bid is compared to the low bid.

The selection team must decide how to weigh the bid price versus the qualification scoring. The actual number assigned to each is arbitrary - it is the ratio that is important. For example, if the maximum qualification score is 120 points and the team wants an equal (50/50) ratio with the bid score, then the maximum bid score (given to the low bidder) would be 120. But the two scores could easily be 200 points each or 50 points each and still provide the 50/50 ratio. The Central Selection Review Team (CSRT) must review and approve all scoring criteria. In the past, the CSRT has recommended that the bid score be at least 25 % (or a 25/75 ratio) of the overall score. When establishing the ratio, if the selection team is giving a heavier weight towards the bids due to budget issues (above 80% of the score), they should seriously consider using low bid or a two-step selection method with low bid.

Under Best Value, the department may use either a one-step or two-step procurement process. In a one-step Best Value procurement, all contractors submit technical qualifications and other required criteria prior to or concurrent with their price proposals (bids). If concurrent with each other, the price proposal is submitted in an envelope separate from the technical information. The department reviews and scores the technical qualifications and then opens the bids and scores the bids. At no time does the selection team see the bids prior to scoring the technical proposals.

The two-step Best Value selection process is similar to the one-step process except that there is an initial Request for Qualifications (RFQ) to short-list the contractors who can submit technical qualifications and price proposals. After the short-listing, all contractors are considered equal. When using a two-step selection, the same criteria used to short-list the contractors **can not** be used in the second step which involves the final technical evaluation and scoring.

#### Advantages

- Depending on what technical evaluation is used in combination with price, the department could see improvements in project quality and schedule savings
- More opportunity for innovations

- Allows for project schedule, quality, and/or other parameters to be competitively bid
- May achieve higher quality by open competition with contractors that may provide a higher price but more qualifications or technical expertise
- May result in lower life cycle costs

### Disadvantages

- Learning curve for the department and its industry partners
- Can be administratively burdensome for both MDOT and contractors
- Takes additional time to process
- Requires additional staff time and a different level of training to evaluate Best Value proposals
- Preparing a Best Value proposal will likely require a high level of effort which may discourage smaller or DBE contractors with limited resources from bidding
- Potential for a higher initial cost – especially for the designers with no stipend available
- Subjectivity of the evaluation process may result in protests

### Recommendations for Use

#### Preferred Candidates:

- Projects with opportunity for proposing different aesthetic designs
- Projects which are highly complex or unique that would receive measurable benefit from using an alternative form of procurement
- Projects with high public involvement
- Projects where MDOT is not familiar with construction techniques
- Projects that require specialized equipment, knowledge of construction, or exclusive technology
- Projects with several maintaining traffic options and complexities
- Projects where design innovations are optimum

#### Undesirable Candidates:

- Projects that do not have unique design issues or require specialized expertise
- Projects which are clearly defined with no allowance for design innovations

### Implementation Steps

For construction projects (except Design-Build) using federal funds, a SEP-14 is required to use a Best Value approach. See Appendix C for more detailed information on the SEP-14 process. The selection team should work with the CSRT to develop and get approval of the technical scoring to be used in the selection.

Currently, Best Value has been used by the department on five Design-Build projects. It has also been used on many solicitations for service contracts where allowed by federal regulation. MDOT's CSRT has developed guidance for a more consistent approach to Best Value scoring and has many examples that selection teams can use.

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## A. Procurement/Selection

### 2. Project Specific Qualification

#### Description

The department prequalifies contractors for work types that are associated with road and bridge construction. The Project Specific Qualification method is used when a contractor needs additional or unique expertise to build and consequently bid the project. This unique expertise may be related to unusual structures, work type, or proprietary elements. This guidance assumes that the evaluation will determine if a contractor has the Project Specific Qualifications to bid. The selection team must establish the minimum qualifications a contractor must have to be able to bid on the project. The contract selection then can follow one of the following procedures:

- 1) One-Step Selection - The contractors supply qualification information either just before or at the same time the bids are provided. The selection team reviews the qualification of all the contractors and determines (based on scoring) which firms are eligible to have their bids open. Eligible bids are open and any bids from companies not qualified are returned unopened or rejected. The lowest responsible bid is selected. At no time can the selection team see the bids prior to reviewing the qualifications of the contractors.
- 2) Two-Step Selection (short-listing) - Early in the process, an RFQ is posted. The contractors submit qualification information which is evaluated and scored by the selection team. The short-listed contractors are notified that they are eligible to provide a bid. Except for Design-Build which has specific federal requirements on the number of short-listed contractors, the department may choose to short-list any number of contractors. However, it should not be less than three. The final selection is based on the lowest responsible bid.

If a combination of qualifications and value (cost) is proposed (the low bid may not be selected), the selection is then considered Best Value (see Section 1 above).

#### Advantages

- Improved project quality for unique elements
- Better documentation of department needs in description and evaluation of qualifications
- Improved competition from contractors well-qualified to do the work
- Costs that better reflect the unique projects; contractors without the specific qualifications or experience may not understand or bid the project correctly

#### Disadvantages

- More department resources needed to establish qualifications
- More cost to contractors to submit additional information
- Additional monitoring of projects to assure that key contractor personnel are working on projects
- Longer period between design and award is needed to review and approve qualifications
- Longer time is needed to determine eligible bidders
- Need for experienced staff to set and evaluate specific qualifications

#### Recommendations for Use

##### Preferred Candidates:

- Projects that have no existing department prequalifications
- Projects with new or unique elements that have not been previously used by the department

- Projects with unusual requirements
- Projects with aesthetic treatments that need to be evaluated

Undesirable Candidates:

- Expedited award contracts
- Any contract where the contractor's expertise can be provided with standard prequalification

### Implementation Steps

The department has used Project Specific Qualification on work, such as Intelligent Transportation Systems (ITS) and new traffic barrier installations. If an office feels their project will require Project Specific Qualifications, they should contact the Engineer of Design so that it can be determined if any existing prequalification can be used.

NOTE: Scoring criteria and selection team scoring of qualification must be approved by the CSRT.

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## A. Procurement/Selection

### 3. Alternate Bids

#### Description

The solicitation of Alternate Bids allows competition on pavement types or other transportation features. Each alternate must provide approximately equal life cycle costs. By allowing the contractor to choose an alternate process, the bid should provide equal or improved performance at a lower life cycle cost.

The selection process for Alternate Bids can be two pay items in a low bid selection (concrete pavement vs. HMA pavement) or two approaches to meeting a goal (bridge replacement). It can also be incorporated into a Best Value selection that has other factors being included in the bid. In an Alternate Bid, the department should establish what the choices are for the bidder to provide a price and, for that item, the lowest bid is selected. It would be considered Best Value if the contractor also provides approaches to alternate items and a value is established in the scoring of the approaches.

#### Advantages

- Allows for innovation if the contractor can propose design options
- Allows MDOT to define two different alternatives
- Allows competition between products with different maintenance and service life expectations

#### Disadvantages

- May increase risks of protests if bid documents do not clearly state instructions regarding the alternates
- May reduce the number of capable bidders if the alternates are outside the average contractor's capabilities
- Life-cycle costing to determine low bid can be difficult to determine
- Requires development of full plans and specifications for each alternate, increasing MDOT's engineering costs
- Multiple designs increase the potential for conflicting details, specifications, and quantities which may cause confusion in bid preparation and disputes or claims afterward

#### Recommendations for Use

##### Preferred Candidates:

- Bridges (steel vs. concrete beams)
- Pavement replacement projects (hot mix asphalt vs. concrete)
- Work items or projects that have competing designs that do not require a significant design effort
- Projects that are small enough to attract a large pool of bidders, but large enough where the potential cost savings are significant enough to justify the additional costs to develop plans and specifications for multiple design alternates

##### Undesirable Candidates:

- Projects with no clear cut alternates

#### Implementation Steps

The department has piloted alternate pavement bidding in the past. This pilot program was approved through FHWA. At this time, any additional projects with alternate pavements must be approved through that study.

If federal funding is proposed to be used where Alternate Bids are proposed (other than pavement types), the department must follow the SEP-14 process to get FHWA approval. For state or local funded projects, contact the Engineer of Design.

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## A. Procurement/Payment

### 4. Fixed Cost Variable Scope/Build to Budget

#### Description

Fixed Cost Variable Scope or Build to Budget is a method where bidders propose to complete items of work within an established budget. Each item of work is assigned a value for evaluation purposes. The contractor bidding the most items of work for the established budget is awarded the contract. The contractors still provide a bid in case more than one contractor proposes to do the same amount of work. The contract amount will be the lowest bid and is usually less than at the budget price.

As an example – a project was designed with 25 miles of resurfacing but the current engineer's estimate provides that the current budget will cover approximately 20 miles of resurfacing. The project is let with the budget amount as a maximum and the contractors to bid on the number of miles of resurfacing they will provide. The contractor with the lowest price for the most number of miles of resurfacing which is closest to (but under) the budgeted amount is selected. If contractors provide the same amount of work, the contractor with the lowest bid for the amount of work will be selected.

This method can also be used on Design-Build selections where the teams provide bids on work items that include design of the work items.

The selection process for this method can be one-step where prequalified contractors provide the information at the bid letting or two-step where contractors are short-listed before allowed to bid. Additional elements adding a qualification evaluation scoring and bid scoring could be added but may make the selection process more confusing. It is important that the contractors are clear on how to bid the project.

#### Advantages

- Will not exceed budget
- Possible opportunity to get more work done than originally planned

#### Disadvantages

- Takes more time to evaluate proposal
- Takes time to determine how to split work for bidding purposes
- Possible challenge for contractor selection if selection criteria is not clearly defined and defensible
- Potential for unused design if design plans provided to the contractor cover more than what can be constructed for the budget

#### Recommendations for Use

##### Preferred Candidates:

- Projects that can be split into definable elements for bidding
- ITS devices (number of devices for a set cost)
- Capital Preventive Maintenance work
- Resurfacing projects
- Projects with the desired scope or limits of work with estimates that exceed the budget
- Design-Build projects with possible innovations to allow for "more" scope of work to be completed when bid upon

Undesirable Candidates:

- Projects where work cannot be split out
- Projects where the engineer's estimate significantly exceeds the budget

### Implementation Steps

This contracting method is currently being piloted on an International Bridge project. Results of the pilot will be provided in the innovation contracting information in Project Wise (Statewide Resources/Innovative Contracting).

For Design-Build, this method is already allowed by the Federal Regulations. If an office wants to use this selection process on another federal aid project, a SEP-14 would be required. If they want to use it on a project without federal aid, they should contact the Engineer of Design to start the process.

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## A. Procurement/Selection

### 5. Best and Final Offer

#### Description

A Best and Final Offer (BAFO) selection method can only be utilized in a Design-Build selection process. It is a method where prices and deliverables are negotiated based on submittals and interviews. It is usually only utilized on very large projects (exceeding \$100 million) and would involve high level management approval to document that negotiations were fair and well-supported. In the process, the design-builders submit their proposals or offers. The offers are reviewed by the department and then interviews are conducted with the design-builders. When the department is comfortable that further discussions are not required, a BAFO is requested from the design-builders. The design-builder then submits their best prices and/or technical responses in reply to the department's request. In effect, this step levels the playing field by allowing finalists an opportunity to provide their BAFO after interviews have been conducted. The decision to award is based on the score of the BAFOs.

A project chosen to go through this selection would be unique; therefore, the elements used in selection and negotiations would be established just for that contract. It may include items such as coordinating with the public, minimizing impact to road users, environmental issues, aesthetics, and more.

#### Advantages

- May drive down costs
- May increase understanding of work alternatives and allow for more innovations
- Allows design-builders to re-evaluate their proposals for a more competitive bid and technical approach

#### Disadvantages

- Difficult to determine how many discussions will be allowed before it is the final offer
- Need lengthy period (3 to 6 months) of negotiation for final offer which delays the award
- Negotiators must have authority for project and budget decisions; therefore, high level resources are needed

#### Recommendations for Use

##### Preferred Candidates:

- Projects with well-established budgets
- Projects with opportunities for innovation and varying approaches to complete work

##### Undesirable Candidates:

- Small projects
- Projects that need to be constructed quickly

#### Implementation Steps

This method has never been used by the department. It is only applicable for Design-Build projects. In other states, it is only used for large projects (over \$100 million). If the department decides to move forward with a BAFO, full involvement from upper management is expected in selection of the project and negotiations.

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## B. Payment

### 1. Performance-Based Incentives

#### Description

A Performance-Based Incentive contract emphasizes aspects of construction to be structured around the purpose of the work to be performed as opposed to the manner in which the work is to be performed. It is designed to ensure that contractors are given the freedom to determine how they will meet the performance objectives and achieve the appropriate performance quality levels. It is also designed to ensure the understanding with the contractor that payment will only be made for work that meets the objectives and levels. Some examples of Performance-Based Incentives include traffic control (amount of delay of motorist), pavement performance (ride and condition), and bridge performance (condition and maintenance). Performance-Based Incentives could also be incorporated into a Design-Build contract.

The department has used Performance Based Incentives for certain materials on construction projects. The three primary work items are hot mix asphalt, concrete, and pavement markings. For more information on these performance incentives, see Appendix D.

For this type of contracting, a straight low bid can be used but there is more benefit to add one of the innovative selection methods provided in this guidance document. For example, including Best Value will provide the department the opportunity to evaluate the contractor's team's approach to achieving the performance the contract requires before the bids are open. Project Specific Qualifications could ensure that only contractors well-qualified to perform the work will be allowed to bid.

#### Advantages

- Limits the state's financial liability for unworkable solutions
- Shifting risk of providing a quality product to contractors; contractor responsible for corrective action throughout the performance life of the contract
- Eliminate blame when there is a problem with the quality of a specific work item
- Potential reduction in costs
- Improved level of service
- Allows more innovation
- Promotes partnering among contracting team and stakeholders when contractors are included in defining performance goals and objectives

#### Disadvantages

- Currently there are limited contractors with Performance-Based contracting experience which may reduce competition
- Challenges in estimating construction bids
- Adjustments required to go from method to performance specifications
- May increase product monitoring and inspection costs (unless a warranty is required)
- May have higher bids
- Requires a longer procurement process
- Uncertainty associated with long-term contracting relationships - will the contractor still be in business for the entire performance period?
- Additional long-term contract oversight and associated costs if performance measures are provided over a long time period

- Longer project close-out; time is needed after project completion to ensure performance levels of service are met
- Contractor may be required to finance a portion of the work during the performance period

## Recommendations for Use

### Preferred Candidates:

- Projects with a known means to achieve a fixed level of service
- Projects where performance can be objectively evaluated based on well-defined qualitative standards or quantitative measures

### Undesirable Candidates:

- Projects where current procedures of specification are working well
- Projects where performance of construction can not be objectively measured
- Small projects (less than \$5 million)

## Implementation Steps

This procurement type, with a Best Value method added, was used on a "Highways for LIFE" SEP-14 project. If an office feels a project would benefit from this type of procurement method, the department must follow the SEP-14 process for FHWA approval. Additionally, the Engineer of Design should be contacted for assistance since development of the project will require close coordination with several areas within the department and involve input from the contracting industry.

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## B. Payment

### 2. Lump Sum

#### Description

Lump Sum is when the contractor agrees to provide specified construction for one specific price. The department agrees to pay the price upon completion of the work or according to a negotiated payment schedule. This innovative construction contracting method requires the contractor to submit a Lump Sum price to complete a project (or a portion of a project) as opposed to bidding on individual pay items with quantities provided.

A Lump Sum contract is the most basic form of agreement between a contractor and the department. In developing a Lump Sum bid, the department will estimate the cost usually by breaking down the work to be included into typical construction pay items and applying current average unit prices. The contractor will use a similar method when developing their bid but may increase the bid based on the contractor's assessment of risk. It may be determined that a portion of the work should remain as a unit price because the perceived risk to the contractor would push the bids higher. In Design-Build, this is called "shared risk" items.

If the actual costs are higher than the contractor's estimate, the contractor's profit will be reduced. If the actual costs are lower, the contractor gets more profit. Either way, the cost to the department is the same. In practice, however, costs that exceed the estimates may lead to disputes over the scope of work or attempts to substitute less expensive materials for those specified.

The primary purpose of Lump Sum projects is to reduce the costs of design and contract administration associated with quantity calculation, verification, and measurement. If the department is designing the project, 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 as "Lump Sum". In Design-Build, the Lump Sum includes the design and construction of the project.

#### Advantages

- May lower financial risk to the department
- Staffing needed for construction administrative may be reduced, thus reducing engineering costs\*
- Construction cost is defined at bid
- May alleviate some department oversight related to quality and schedule\*
- Contractor should/would assign best personnel due to maximum financial motivation to achieve early completion and superior performance
- Contractor selection is easier as compared to other innovative construction contracting methods
- May reduce time required to deliver program or project to advertisement

#### Disadvantages

- Changes can be difficult and costly
- Additional MDOT resources needed to establish pay schedule for contractor if partial payments are to be made on large Lump Sums
- Higher financial risk to contractor may result in higher bids
- Competition may be reduced if fewer contractors want to bid Lump Sum items
- Since contractor is free to choose lowest cost means, methods, and materials consistent with the specifications, only minimum specifications may be provided

- Needs conversion to dollars after letting and prior to award in order to facilitate payments through Field Manager

\*For federal aid projects, unless performance specifications and/or warranties are provided and approved by FHWA, certain work items will still need to be inspected and tracked in Field Manager. This is done to assure the work and materials meet specifications and to verify testing requirements are satisfied. Because standard work items are not available (they are replaced with a Lump Sum), an additional shadow contract must be developed in Field Manager which creates some additional work.

## Recommendations for Use

### Preferred Candidates:

- Projects where work is well-defined
- Stable project conditions - scope unlikely to change; delays unlikely
- Projects with very few bid items and short completion duration
- Projects using Design-Build delivery process
- Pavement marking
- Bridge painting
- Fencing
- Guardrail
- Intersection improvements (with known utilities)
- Landscaping
- Lighting
- Mill/Resurfacing (without complex overbuild requirements)
- Minor road widening
- Sidewalks
- Signing
- Signalization

### Undesirable Candidates:

- Urban construction/reconstruction projects
- Complex or unique projects
- Projects with potential utility delays
- Rehabilitation projects of movable bridges
- Projects with sub-soil earthwork or underground utility work
- Concrete pavement rehabilitation projects
- Major bridge rehabilitation/repair projects where there are many unknown quantities

## Implementation Steps

As stated above, Lump Sum contracts were used and will be used for all the Design-Build contracts. There are several standard Lump Sum pay items the department currently uses ranging from bridge rehabilitation to maintaining traffic items.

Lump Sum contracting can be used on projects with federal aid without additional approval from FHWA. Coordination with an FHWA area engineer is recommended even if the project does not require FHWA oversight.

If a Lump Sum item will have partial payments during construction, it should be converted to “dollars” after the letting and prior to award in order to facilitate payments through Field Manager.

If an office would like to expand the concept to include an entire project or significant amount of work as Lump Sum, they should contact the Engineer of Design for assistance and coordination.

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## B. Payment

### 3. Indefinite Delivery/Indefinite Quantity

#### Description

Indefinite Delivery/Indefinite Quantity (ID/IQ) contracting is a method used when the locations of the work items are unknown but an overall estimate of the contract value is known. Under this method, contractors competitively bid on work items based on unit prices for a specific contract term with the locations to be determined through future work orders. With ID/IQ contracting, there is uncertainty associated with scheduling of work and the total quantity of work associated with a contract. However, an estimate of the total work over the life of the contract is provided in the contract. Once the contract is awarded, the department (usually through the project manager) will issue work orders for specific locations as services are needed.

#### Advantages

- Saves department resources needed for separate bids and contracts
- Reduces overall procurement time
- Increases opportunity for smaller or disadvantaged businesses
- More flexibility for the department in assigning work
- Allows for quicker response when work is defined
- Potential project savings by combining similar work
- Expedited schedule for use in emergency contracts

#### Disadvantages

- Prices may vary per region and increase bids
- Difficult to provide accurate quantities - may increase costs
- Each task must be completely defined such that only unknowns are the exact time of need and number of times the task may be needed
- Difficult to determine bidders' capacities/outstanding work when bidding on other contracts
- Higher prices due to possible work flow conflicts or labor shortage when contract is put in place
- Completed contract may have unused pay items or overruns which requires contract modifications
- If contract is large, smaller contractors may not be able to bid
- If there is no guarantee or a minimum of work, potential contractors may not bid

#### Recommendations for Use

The department has used this type of contracting quite successfully for service contracts, such as traffic signal design, fabrication steel inspection, and asbestos inspections. It has also been used for traffic signal installation and pavement marking contracts.

ID/IQ contracting is suitable for projects that have clearly defined work items that are standardized or repetitive. The contracts need to have flexibility in both quantities and delivery scheduling.

#### Preferred Candidates:

- Pavement marking contracts
- Signing contracts
- Traffic signal contracts
- Maintenance repair contracts
  - Guardrail or attenuator repair and/or replacement

- Catch basin repair and/or replacement
  - Weed control/mowing
- Building demolition contracts

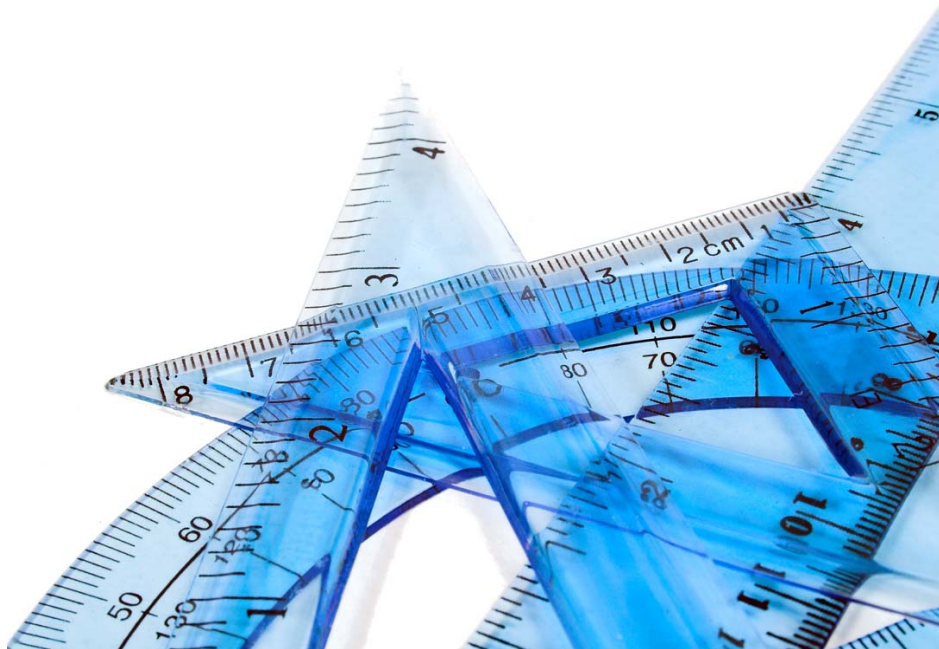
Undesirable Candidates:

- Projects with complicating issues, such as major utility conflicts, right-of-way acquisitions, wetland concerns, or other unresolved issues
- Major road or bridge rehabilitation or reconstruction projects
- Work involving items with escalating costs

### Implementation Steps

1. Initial project selection
2. Contact the Engineer of Design or Contract Services Division
3. Determine bid items and quantities
4. Advertisement and award
5. Determine work areas and perform design work
6. Issue work orders
7. Construction activities

## Delivery Methods



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## Delivery Methods

### A. Design-Build

#### Description

Design-Build (DB) is a project delivery method that combines two usually separate services into a single contract. With Design-Build procurements, MDOT executes a single contract for both architectural/engineering services and construction. The Design-Build entity may be a single firm, consortium, joint venture, or other organization assembled for a particular project.

Design-Build differs from traditional contracting methods by overlapping design and construction activities which allow construction to begin after only a portion of the design has been completed. Typically Design-Build contracts are awarded after MDOT has completed some preliminary design, the environmental process is complete (or nearly complete), and right-of-way is secured. The level of preliminary design is typically 10% - 30% and depends greatly on the risks associated with the project.

With Design-Build the design-builder assumes responsibility for the majority of the design work and all construction activities together with the risks associated with providing these services for a fixed fee. In current Design-Build contracts, MDOT has retained responsibility for financing, operating, and maintaining the project.

Design-Build projects are typically tailored to large construction projects (greater than \$10 million) but can be utilized on smaller projects. Design-Build projects can utilize different procurement and selection methods in order to best meet the needs of the project. This method involves either a one-step or two-step selection process. In a two-step process, an RFQ is developed and usually three to five teams are selected or "short-listed". In a one-step method, only a Request for Proposal (RFP) is developed. The RFQ and RFP provide detailed information on how the teams will be scored and selected. Common procurement/selection methods with Design-Build are:

- One-Step Best Value
- One-Step Low Bid
- Two-Step with Best Value (short-listing and then a Best Value )
- Two-Step with Low Bid (short-listing and then a Low Bid)
- Fixed Cost Variable Scope (FCVS) - the price paid to a DB team is fixed and the selected DB team is the one that proposed to perform the most work
- Best and Final Offer (BAFO) - procurements typically involve additional negotiations after DB teams submit price and technical proposals and are allowed to submit new proposals after the negotiations

See the Procurement and Payment Techniques section for more details on the use of Best Value, Fixed Cost Variable Scope, and Best and Final Offer as well as benefits they may provide.

Any two-step process allows the department to offer the unsuccessful proposers a stipend. The amount of the stipend represents a portion of the cost to prepare a proposal and requires the Director's approval. If the team accepts payment of the stipend, the department owns any and all information provided in their unsuccessful proposal and it may be used on the Design-Build project or other projects. Also, by paying a stipend, the teams may put additional time into their proposals and provide a better bid price than if the stipend were not available. The teams do not have to accept the stipend and then can keep an innovative idea or cost savings as confidential information the department may not use or share.

A Design-Build project often requires extensive work to develop an RFQ and RFP. The department has hired consultants to assist in this effort. For projects being considered for Design-Build, contact the Engineer of Design as soon as possible. The MDOT region/TSC and the Engineer of Design will need to coordinate efforts to define the scope of work and begin the Design-Build method. Part of the discussion must be the desired procurement/selection method. If a two-step selection allowing for the use of stipends is preferred, the Engineer of Design will request approval from the Director.

All federally funded Design-Build programs and projects shall meet The Federal Code of Regulations, Title 23, Part 636 – Design-Build Contracting requirements. Projects not conforming to the above requirements must receive federal approval before utilization of the Design-Build procurement method.

### Advantages

- Risk primarily owned by Design-Builder, except for designated “at risk” items
- May shortened completion time by overlapping design and construction
- Much earlier obligation of federal funds
- Stipend payment allows for the department to keep ideas from unsuccessful proposers
- Construction can begin before all design details are final
- Greater innovation in selecting design, materials, and construction methods
- Reduced claims due to design errors
- Accelerated response time and dispute resolution through a team effort
- Single point of contact for quality, cost, and schedule from design through construction
- Ability to use two-step and/or Best Value project award selection criteria which evaluates the qualifications of the Design-Build team
- Reduced or eliminated conflicts arising from a difference in design and actual conditions
- Can use various procurement options that are beneficial to the needs of the project (i.e., short-listing, Low Bid, Best Value Selections, A+B/Lane Rental Provisions, Fixed Cost Variable Scope, etc.)

### Disadvantages

- High learning curve because Design-Build changes stakeholders' roles
- Difficult to anticipate staffing needs due to the piece-meal design submittals
- Large time commitment is needed from MDOT PM and other key stakeholders
- Parties are more familiar with traditional methods
- Bidding process more expensive for Design-Build teams
- Coordination is more challenging due to faster pace
- Low Bid projects without a short-listing process tend to yield a project that utilizes minimum standards
- Small dollar Design-Build projects tend to have higher costs
- Heavy reliance on consultants

### Recommendations for use

#### Preferred Candidates:

- Projects that need to be “fast-tracked” or expedited
- Projects that allow for innovation in the design and construction efforts
- Projects with funding deadlines where traditional Design-Bid-Build delivery may not be able to achieve these dates
- Projects where traditional delivery processes cannot meet the project demands
- Emergency projects
- Projects with a clearly defined scope, design basis, and performance requirements
- Projects with low possibility for significant change during all phases of work
- Projects with low risk of unforeseen conditions

- ITS projects involving software development or integration and/or rapidly changing technologies
- Projects with a complete National Environmental Policy Act (NEPA) process
- Projects with limited utility relocation
- Projects that require minimal or no right-of-way acquisition; FHWA approval is needed if all anticipated right-of-way is not acquired at the time of fund obligation
- Projects greater than \$10 million
- Projects that can utilize Best Value procurement or other methods tailored to benefit the specific needs of a project
- New alignments, widenings, reconstruction, and rehabilitation projects with a clear scope of work

Undesirable Candidates:

- Projects with complicating issues, such as utility conflicts, right-of-way acquisition, hazardous materials, wetland and environmental concerns, or other unresolved issues
- Major bridge rehabilitation/repair projects with significant unknowns
- Urban construction/reconstruction with major utilities, major subsoil, right-of-way, or other major unknowns
- Rehabilitation projects of movable bridges
- Significant and/or undefined third party requirements
- Stand-alone sewer pump station projects
- Areas of work without established standards and specifications, or undefinable outcome-based performance standards

### Implementation Steps

1. Initial project selection
2. Contact the Engineer of Design
3. Initial scope verification and risk analysis
4. Determination of procurement methods
5. RFQ process (two-step only)
6. RFP development and preliminary engineering activities
7. Advertisement and award
8. Design and construction activities

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## Delivery Methods

### B. Design-Build-Finance

#### Description

Design-Build-Finance (DBF) augments a typical Design-Build project by transferring the financing of the project to the Design-Build private sector partners. In this approach, projects can be partly or wholly financed by the private sector partner and are compensated by MDOT at a future point as defined in the DBF contract.

Michigan's 2008 DBF projects required the DB team to provide the funding for the projects throughout construction. MDOT began making relatively small payments when the projects reached substantial completion with a balloon payment for the balance of the contract being made more than two years after the completion of the project.

DBF projects can be implemented on projects where DB procurements can be utilized. However, the financial component of a DBF project must be evaluated thoroughly prior to expending significant time and effort on the development of the project. The ability of DB teams to provide funds for the project will vary with the status of the financial market. Depending on the willingness of creditors, DB teams may not be able to secure financing for projects without hindering their ability to seek additional future construction contracts.

The size of a DBF project also affects the ability of a DB team to secure funding. In 2008, the financial community expressed that projects less than \$200 million would not draw the interest in large national and international financial institutions, and projects under \$200 million would need to be financed by local financial institutions or through a DB team self-financing a project. Local financial institutions may not be willing to loan money toward transportation projects and DB teams may not have the ability to self-finance a project.

If a DBF procurement is desired, MDOT should have extensive early coordination with the financial and contracting industries to verify if the project could be financially viable. Additionally, if federal funds are intended to be used, FHWA must be in agreement to the funding concepts.

#### Advantages

- See Design-Build section
- Potential cost savings by constructing the project early through the yearly inflation of construction costs
- Reduced maintenance costs and safety benefits due to the road, structure, or facility being constructed in an earlier fiscal year than originally planned
- Job creation and economic stimulus due to a project being constructed in an earlier fiscal year than originally planned
- Provides the ability to build a project needing improvements in an earlier year
- DBF does not impact MDOT's ability to bond
- Depending on the payment structure, a DB team has a vested interest in completing a project quickly if payments are tied to project completion

#### Disadvantages

- See Design-Build section
- DBF may limit the number of DB teams that can pursue a project

- The financial market is constantly changing; potential DBF projects may be viable today but not in the near future; this unknown factor makes a programmatic approach to utilizing DBF difficult
- Potential cost increases due to the DB team financing the contract for a period of time
- DBF projects may take projects from a future fiscal year into a current year - this can leave a gap in the future program causing an undesired economic impact to designers and contractors

## Recommendations for use

### Preferred Candidates:

- See Design-Build section
- Emergency projects
- Projects where infrastructure is needed in an expedited manner for a special event, such as the Super Bowl
- Projects that are in immediate need of repair without funding available in the current fiscal year

### Undesirable Candidates:

- See Design-Build section
- Projects that are unable to be financed due to size or specific project risks

## Implementation Steps

1. Initial project selection
2. Contact the Engineer of Design
3. Initial scope verification
4. Industry outreach to assure financial viability
5. Initial risk analysis
6. Determination of procurement methods
7. RFQ process (two-step process only)
8. RFP development and preliminary engineering activities
9. Advertisement and award
10. Design and construction activities

To learn more about DBF, contact the Engineer of Design.

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## Delivery Methods

### C. Design-Build-Finance-Operate (or Maintain) (DBFOM)

#### Description

Design-Build-Finance-Operate (or Maintain) (DBFOM) projects, commonly known as Public-Private-Partnerships (PPPs or P3s) and Public-Private Ventures (PPVs), transfer specific design, construction, financial, operational, and maintenance responsibilities to the private sector partner for a specific period of time. The P3 contractual agreement between MDOT and the private partner clearly defines the limits of the responsibilities between both parties.

Typically P3 projects have revenue generated by the project through road user costs (tolling); however, they do not need be toll facilities. MDOT may choose to fund projects through traditional funding methods or a combination of traditional funding and road user fees.

Based on current Michigan law, most P3 contracts are not allowed. However, Michigan has legislation proposed (Bill 4961) that would allow a broad range of P3 contracts. If legislation is passed, this section will be updated to include additional guidance on what is allowable by Michigan law.

Transportation related P3 projects are typically mega projects that can only be financed if MDOT enters into a long-term agreement with a private partner. P3s have been successfully implemented on both new and improved road and bridge systems.

P3s can be used to improve the transportation system by adding lanes, high-occupancy lanes, high-occupancy toll lanes, and new roadway systems; and to provide additional services on multimodal transportation entities, such as bussing and railroads. P3s have also been used to transfer the operation and maintenance of an existing facility for a period of time in exchange for a lump sum dollar amount. The funds then can be use to improve other areas of the transportation system (i.e., the Chicago Skyway).

#### Advantages

- Allows for the implementation of large projects that are otherwise cost prohibitive
- Risk allocation and mitigation to the party that can best manage the risk(s)
- Budgetary management
- Potential for accelerated construction
- Potential generation of revenue
- Unsolicited proposals may be submitted allowing the private market to select potentially viable projects

#### Disadvantages

- Politically sensitive procurement method (out-of-state/country investors, long duration of lease or contract, etc.)
- Potential revenue loss if road user fee revenues exceed expectations
- Appearance that MDOT does not have control of a transportation facility
- Imposing road user fees is typically opposed by the general public at the onset of the project

#### Recommendations for use

Preferred Candidates:

- Mega projects
- Projects that can or could generate revenue
- Projects with the potential for innovations
- Projects with significant congestion needs
- Multimodal facilities
- High Occupancy Toll (HOT) lane facilities
- International border crossings

Undesirable Candidates:

- Projects that could be stopped by politics
- Projects with uncompleted NEPA process or significant undefinable mitigation requirements from the NEPA process

### Implementation Steps

1. Approved legislation
2. Contact the Engineer of Design
3. Initial project selection
4. Initial project evaluation (traffic and revenue forecasts support the project's business case)
5. Selection of technical, financial, and legal expertise
6. RFQ process
7. RFP process
8. Administration and oversight of the final contract for the period of the concession

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## Delivery Methods

### D. Construction Management @ Risk

#### Description

The department in a Construction Management @ Risk (CM@Risk) project has a direct contract with an architectural/engineering (A/E) firm and a separate contract with a construction company. The construction company is the construction manager (CM) for the project. The A/E firm designs the project, and the A/E firm and the CM are contractually required to work together during the design phase in order to create a project that is potentially less expensive and is quicker and easier to construct.

The CM@Risk delivery method has some of the same benefits as the Design/Build method. The CM@Risk method is based on team building and cooperation between MDOT, the A/E firm, and the CM from the beginning of the project's conceptual design through the final construction and operation or occupancy of the facility. The team approach provides for input from all of the team members throughout the design and the construction phases. The ability of the CM to input constructability reviews, construction phasing, material availability, and cost estimating throughout the design process reduces the probable occurrences of change orders, project construction delays, and increased project costs due to contractor identification of these elements in the design phase instead of the construction phase.

The selection of the A/E firm is the initial step during the early stages of the project. The A/E firm is typically contracted through project completion which includes site investigations, alternative analyses, cost estimates, detailed design, construction bid documents, and department-related construction management services.

The selection of the CM is on a quality based selection similar to that under which design consultants are selected. The department advertises an RFP when the scope and schedule are known, typically prior to the design being 25% complete. The CM@Risk submits a response to the department's RFP. At a minimum, the response should highlight the CM's personnel to be assigned to the project, previous experience on similar projects, financial resources, a local office to service the project, and the CM's approach to managing and completing the project.

The CM is contracted for the design phase to conduct document review, constructability reviews, cost estimating, and scheduling. When the project plans and specifications are 50% - 100% complete and the desired construction schedule is known, the CM negotiates a Guaranteed Maximum Price (GMP) for the entire project. The GMP is composed of work, overhead, profit, and a contingency (usually 2% to 5%) needed to complete a project within the desired scope of the department. The department and the A/E firm are directly involved in the review and acceptance of the GMP. One draw back to a CM@Risk procurement is that the price is negotiated; therefore, it may be difficult to verify that the cost of some items of work is reasonable since the work is not procured through competitive bidding.

The interaction of the CM with the department and A/E firm during the design phase of the project enables the CM to input cost and construction details that should improve the GMP and attain the project goals. The CM is considered "at risk" for delivering the project within the scope, schedule, and established GMP.

CM@Risk procurement has been a common delivery method in the vertical construction industry (buildings) and is being considered as a method of constructing transportation facilities.

## Advantages

- Potential time savings by fast-tracking design and construction activities
- Allows for innovation and constructability recommendations in the design phase, yet the department still retains significant control over design
- Since the CM is “at risk” once a GMP is established, the CM puts more investment in cost engineering and constructability reviews
- Fixes project cost and completion responsibility
- A project may be phased over a period of time as additional funding becomes available

## Disadvantages

- Price is negotiated with a CM and not competitively bid
- Once construction begins, the CM assumes the role of a general contractor leading to possible tensions with the department over project quality, budget, and schedule
- The department retains design liability
- CM input may not be included by designer
- Incentive split of savings scheme may create perception of inflated GMP
- GMP approach may lead to a large contingency to cover uncertainties and incomplete design elements
- Use of a GMP may lead to disputes over the completeness of the design and what constitutes a change to the contract
- Limited use and experience nationally on transportation infrastructure projects

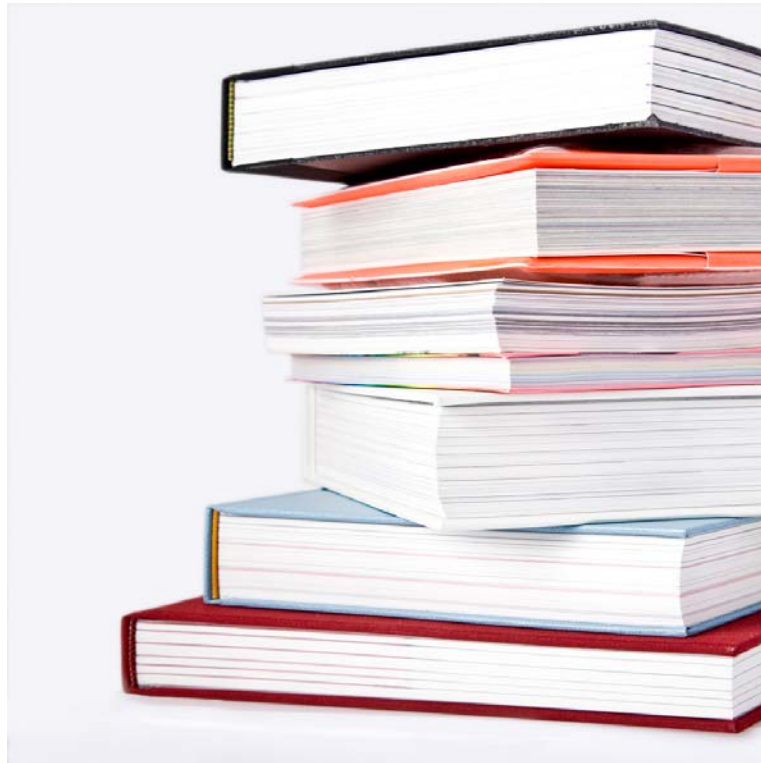
## Recommendations for Use

Nationally, CM@Risk procurements have been used on a very limited number of transportation projects and minimal information is available on the success of these projects. Until additional information is available, recommendations for use at MDOT will not be provided. If MDOT identifies a candidate for a CM@Risk transportation project, contact the Engineer of Design to discuss the potential benefits and drawbacks. CM@Risk is considered an experimental method by FHWA and their SEP-14 program must be followed to receive approval for using federal funds on the project.

## Implementation Steps

1. Initial project identification
2. Contact the Engineer of Design
3. FHWA SEP-14 approval process
4. Select A/E firm
5. Develop RFQ for CM@Risk services
6. Select CM
7. Develop plans and specifications
8. Receive and negotiate GMP
9. Complete design
10. Project construction

## Resources



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## Appendix A

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## Appendix B

### Sample Special Provisions

1. CPM Schedules
2. Accepted for Traffic (including sample Progress Clause)
3. Lane Rental
4. Extension of Time and Extra Cost

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## Special Provision - CPM Schedules

03SP102(C)

MICHIGAN DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**CRITICAL PATH METHOD NETWORK SCHEDULE**

C&T:JTL

C&T:APPR:JDC:PAL:07-24-02

FHWA:APPR:08-12-02

**a. Description.** In addition to the progress schedule provisions contained within this contract, the low bidder(s) for the work covered by the contract proposal will be required to submit a Critical Path Method Network Schedule (CPM Schedule) to the Engineer for approval. When approved, the CPM Schedule replaces and becomes the Progress Schedule. The CPM schedule shall contain all work under the contract including, but not limited to, the activities of subcontractors, vendors, MDOT, suppliers, permitting agencies, utility companies, and other Contract-related activities and the submittal and approval of plans and working drawings. The Contractor shall ensure that the schedule submitted meets specified overall contract and milestone dates. Milestone dates are dates within the contract that require some specific action by the Contractor. Examples of milestone dates include, but are not limited to, open-to-traffic dates.

**b. Preparation of Initial Schedule.** Prior to award, the Contractor shall submit a progress schedule on regulation form.

Within 15 calendar days of contract award, the Contractor shall submit a detailed initial schedule for the Engineer's approval. The schedule shall meet the requirements set forth in the contract.

Within seven (7) calendar days of the Contractor's submittal, the Engineer will review the schedule and provide the Contractor, in writing, corrections, questions, or comments to resolve before approval of the schedule. The Contractor must make all corrections and resolve all questions and comments within 30 calendar days of contract award for the Engineer to approve the schedule. If the schedule is not approved within 30 calendar days of contract award, the Department may withhold all or part of contract payments until the schedule is approved.

The approval of the schedule by the Engineer in no way attests to the validity of the assumptions, logic constraints, dependency relationships, resource allocations, manpower and equipment, or any other factor that went into the preparation of the CPM schedule. The Contractor is and shall remain solely responsible for the planning and execution of work in order to meet project milestones or contract completion dates and to conform to the contract plans and specifications.

**Schedule Requirements.** CPM Schedules shall be submitted using the standard activity-on-node or PERT diagramming method to describe all work activities to be accomplished and their

independencies. The schedule shall include all subcontractor, vendor, supplier, and Department contract-related activities. A sufficient number of activities (tasks) will be required with sufficient detail so that the controlling operation (critical path) may be identified. The work activities shall also be correlated on the diagram to the proposed sequence of construction operations included in the staging for the project. Notation on each activity shall include a brief work description and activity time duration.

**Additional Requirements:**

1. Each schedule activity shall be given a unique ID
2. Each schedule activity shall be given a unique description that includes the stage or phase of work and the type or nature of work.
3. Only start-to-start, finish-to-finish and finish-to-start relationships will be allowed. All logic shall show how the given activity is dependent on its preceding activities.
4. Duration (working days): No activity will have duration greater than 20 working days unless approved by the Engineer. Activities that will be allowed to exceed 20 working days include, but are not limited to, working drawing approvals or other activities not under the control of the Contractor. If requested by the Engineer, the Contractor shall explain the reasonableness of activity time durations. Such explanation may include, but not be limited to, estimated activity manpower, unit quantities, production rates, and equipment to be mobilized.
5. Procurement and Submittals: Separate procurement into at least two activities, fabrication and delivery. When the procurement also requires a submittal to and approval by the Department, such as shop drawings, ensure that these separate activities are shown in the schedule logic. Ensure all work activities that require a submittal are preceded by submittal and approval activities.
6. Constraints: Use contractual constraints in the schedule logic. Other constraints may be allowed when identified by the Contractor and approved by the Engineer.
7. Float: Float is defined in subsection 101.03 of the standard specifications.
8. The activities are to be described so that the work is readily identifiable and the progress on each activities can be readily measured. For each activity, the Contractor shall identify the work force involved by trade, subcontractor, equipment, work location and duration of activities in work days.
9. The Contractor shall also provide the following information: workdays per week, holidays, number of shifts per day and number of hours per shift.
10. Activity codes: Activities shall be identified by codes to reflect the following information related to an activity or other method as approved by the Engineer that is compatible with the computerized sort requirements below:

Stage/Phase  
Area/Location

11. Computer capability: The CPM Schedule must be processed through a computer and be compatible with the format section contained within this special provision. It is the Contractor's responsibility to ascertain with the Engineer the software compatibility.

**d. Initial Schedule Submittal Requirements.** Provide one reproducible original and three copies of each of the following to the Engineer for approval for both the initially submitted schedule and all updates:

1. A computer generated sequential activity-on-node diagram. Ensure that the diagram network is legible and easily understandable.
2. Computerized sorts by:

- Activity ID
- Predecessor/Successor sort
- Total float
- Early start
- Resource responsibility
- Area/Early start sort

3. 60-day look ahead bar charts by early start

**e. Schedule Updates.** The Contractor shall update the CPM Schedule monthly to show current progress. The update shall be submitted to the Engineer regardless of any unresolved requests for extension of time during this period. The update will include:

1. Dates of activities' actual start and completion
2. The percentage of each work activity remaining for activities started but not complete as of the update date.
3. Narrative report which includes a listing of monthly progress, the activities that define the critical path, and any changes to the path of critical activities from previous update, sources of delay, any potential problems, requested logic changes, and work planned for the next month.
4. If requested by the Engineer, the update submittal may include:

- Predecessor/Successor sort
- Total float sort
- Responsibility/Early start sort
- Area/Early start sort

5. Fragnet or logic diagram for all requested logic changes, including but not limited to, any of the events as addressed in subsection 102.14 of the standard specifications.
6. Updated logic diagram and time scale/logic diagram as required by the Engineer.
7. Regular job site progress meetings with the Engineer will be required to verify CPM Schedule accuracy. Update as required to reflect actual work modifications and progress and to document approved Contract modifications.

The Department may withhold all or part of the Contract payments if the schedule update is not submitted within 14 days of the date due.

**f. Schedule Revisions.** The Contractor will revise the CPM Schedule for the following: delay in completion of the project or contractual milestones; actual prosecution of the work which is, as determined by the Engineer, significantly different than that represented on the schedule; or the addition, deletion, or revision of activities required by contract modification. Time extensions will only be granted for Department-caused delays that affect specifically approved milestone dates, open-to-traffic date, or overall Contract completion date, except as otherwise expressly authorized in the contract. Include support documentation.

**g. Schedule Revisions to Utility Work.** The Engineer shall be provided with ten (10) days notice, with a copy of the notice to the utility company, when revisions in the schedule of work affect operations of a utility unless previous arrangements have been made with the utility company involved or there are other contract requirements that supercede this requirement.

**h. Format.** In addition to the above requirements, all CPM Schedules shall be submitted on a 3.5 inch floppy disk in accordance with one of the following formats. In lieu of the format requirements, the Contractor may submit for the Department's use, during the life of the project, one complete copy of the scheduling software used for this contract. Submittal shall be in accordance with the copyright requirements for the applicable software.

1. **Standard Electronic Media Format** is a standard ASCII text file containing the data elements below, in the order specified. This file can be created using any text editor or word processing application (i.e., MS-Word, WordPerfect, Notepad, or Write) but must be saved as an ASCII file.

The **first line** will provide a descriptive header describing the submittal and containing:

Control Section  
Job Number  
Contractor name  
Data as-of-date  
Report date

The next line will be **blank**, followed by multiple data lines.

Each **data line** will contain one record pertaining to one task of the job. Separate data fields by a comma. Fields within each task line are as follows:

(Note that the term "task" is synonymous with "activity." Leave fields that are not required blank.)

- A. Task number (Job number followed by a hyphen followed by this task's unique four-digit task number. This is the Preceding Event Activity Code).
- B. Description of task, milestone or hammock, blank if this record is a constraint
- C. Calendar (see attached list)
- D. Duration of task, blank for constraints
- E. Task number of the next task (succeeding event) - leave blank if this record is not a constraint or hammock
- F. Type of constraint (FS, SS, SF, HAM) - leave blank if this record is not a constraint or hammock. A hammock is a special type of constraint that groups several tasks together. The hammock starts with the first task in the group and finishes with the finish of the last task. (F = Finish, S = Start)
- G. Delay, if required
- H. Original "baseline" start date

- I. Original "baseline" finish date
- J. Current (forecast) start date (early start)
- K. Current (forecast) finish date (early finish)
- L. Estimated completion date (if different from early start + current duration)
- M. Late start date
- N. Late finish date
- O. Actual start date
- P. Actual finish date

Example - each line contains the following:

Task number (preceding event), description, calendar, duration, next task number (succeeding event), constraint type, delay, baseline start, baseline finish, estimated completion date, late start, late finish, actual start, actual finish, total float.

**2. Export Files:** If the Contractor chooses to use a package with export capabilities, it shall include all items listed in section (h.1) Standard Media Format above in a text or ASCII-type file.

**3. Michigan Department of Transportation (MDOT) Calendars:** The Contractor's calendar shall be based on a 4-, 5-, or 6-day work week in accordance with the attached MDOT calendars unless otherwise superseded by the contract requirements.

**i. Measurement and Payment.** The Contractor's cost to provide this information and software to the Michigan Department of Transportation will not be paid for separately, but shall be included in costs for other pay items.

**MDOT 4-, 5-, and 6-Day Calendars:**

<b>Calendar</b>	<b>Description</b>	<b>Start</b>	<b>Finish</b>
1	Std - Apr 16 - Nov 15 - 4 day	Apr 16	Nov 15
2	LP - Bit Stab - 4 day	May 15	Oct 15
3	UP - Bit Stab - 4 day	Jun 01	Oct 01
4	LP S of M-46 - Bit Pave - 4 day	May 05	Nov 15
5	LP N of M-46 - Bit Pave - 4 day	May 15	Nov 01
6	UP - Bit Pave - 4 day	June 01	Oct 15
7	LP - Bit Seal Coat - 4 day	Jun 01	Sep 15
8	UP - Bit Seal Coat - 4 day	Jun 15	Sep 01
9	Tree Planting - Deciduous - 4 day	Mar 01 Oct 01	May 15 Nov 15
10	Tree Planting - Evergreen - 4 day	Mar 01	Jun 01
11	South LP - Restoration - 4 day	May 01	Oct 10
12	North LP - Restoration - 4 day	May 01	Oct 01
13	UP - Restoration - 4 day	May 01	Sep 20
14	Full Year - Winter Work - 4 day	Jan 01	Dec 31
21	Std - Apr 16 - Nov 15 - 5 day	Apr 16	Nov 15
22	LP - Bit Stab - 5 day	May 15	Oct 15
23	Up - Bit Stab - 5 day	Jun 01	Oct 01
24	LP S of M-46 - Bit Pave - 5 day	May 05	Nov 15
25	LP N of M-46 - Bit Pave - 5 day	May 15	Nov 01
26	UP - Bit Pave - 5 day	Jun 01	Oct 15
27	LP - Bit Seal Coat - 5 day	Jun 01	Sep 15
28	UP - Bit Seal Coat - 5 day	Jun 15	Sep 01
29	Tree Planting - Deciduous - 5 day	Mar 01 Oct 01	May 01 Nov 15
30	Tree Planting - Evergreen - 5 day	Mar 01	Jun 01
31	South LP - Restoration - 5 day	May 01	Oct 10
32	North LP - Restoration - 5 day	May 01	Oct 01
33	UP - Restoration - 5 day	May 01	Sep 20
34	Full Year - Winter Work - 5 day	Jan 01	Dec 31
35	Full Year - Expedited - 6 day	Jan 01	Dec 31

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## Special Provision - Accepted for Traffic

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS  
SPECIAL PROVISION  
FOR  
**I-94 ACCEPTED FOR TRAFFIC  
INCENTIVE**

METRO: WRE

08/06/04

**a. Description.** The Department will pay the Contractor a Lump Sum Incentive if the work in the contract is Accepted for Traffic on or before the Accepted For Traffic Incentive Dates specified in the contract progress clause and subject to the conditions set forth below.

“Accepted for Traffic” for the July 7, 2005 Incentive Date shall mean completing all contract work required for Stage 3/ 3a, making both eastbound and westbound I-94 suitable for three lanes of traffic, and providing all access required by the plans and Maintaining Traffic Special Provision for the period from July 8, 2005 to July 13, 2005 (Stage 4).

“Accepted for Traffic” for the December 22, 2005 Incentive Date shall mean completing all contract work with the exception of landscaping, Stage 5/ 5a/ 6 slope restoration, and Stage 5/ 5a/ 6 permanent pavement markings, and making all lanes and shoulders (including ramps and affected local roads), suitable for use by traffic.

The Accepted for Traffic Incentive Dates indicated in the contract progress clause 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 shall not be grounds for extending the Accepted for Traffic Incentive Dates indicated in the contract progress clause.

Extensions of Time for impacts to the contract and the contract completion date will be allowed per Subsection 108.09 of the 2003 Standard Specifications for Construction, but **no extensions will be allowed for the Accepted for Traffic Incentive Dates** indicated in the contract progress clause.

Additional compensation for costs incurred by the Contractor required to keep the project on schedule to meet the Accepted for Traffic Incentive Dates 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" shall be as defined in Subsection 101.03 of the 2003 Standard Specifications for Construction.

#### Cost Increases due to Schedule Delays

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 Accepted for Traffic Incentive Dates in the progress clause, and one or more of the following conditions are met:

1. Right-of-way or right-of-entry required to perform the controlling operation was not available when stipulated in accordance with the contract provisions.
2. Utilities were not moved as indicated in the contract documents and the presence of these utilities created a delay in the controlling operation.
3. Other related contracts were not completed to a point where construction on the controlling operation could proceed
4. 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 Accepted for Traffic Incentive Dates. Only actual direct costs above those which would be necessary to complete the work will be considered. Examples of such actual direct cost increases include but are not limited to, concurrent work operations, additional personnel, additional work shifts, overtime, and 24 hour work days.

These cost increases must also be fully justified by the Contractor and approved by the Engineer prior to performing the work involving the 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.

#### Cost Increases for Increased Quantities

Cost adjustments for quantity increases required to meet the Accepted for Traffic Incentive Dates 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 Accepted for Traffic Incentive Date(s), and the quantity increase qualifies as a Significant Change as defined in Subsection 103.02 B of the 2003 Standard Specifications.

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 Accepted for Traffic Incentive Date (s). Only actual direct costs above that which would be necessary to complete the work will be considered. Examples of such actual direct costs include, but are not limited to, concurrent operations, additional personnel, additional shifts, overtime, and 24-hour work days.

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 Accepted for Traffic Incentive dates.

### Cost Increases for Extra Work

Extra Work shall be as defined in Subsection 101.03 of the 2003 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 Accepted for Traffic Incentive Date (s) shown in the progress clause.

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 Accepted for Traffic Incentive Date(s). Examples of additional costs for Extra Work that will be considered are costs for concurrent operations, additional equipment, additional personnel, additional shifts, overtime, longer work days, longer work weeks, or any other means that affect the Extra Work unit price.

Failure to provide the Engineer with justification for the additional costs of Extra Work, and failure to reach agreement on the price for the Extra Work prior to undertaking the Extra Work, will result in the Contractor being paid for the Extra Work by force account. If the Contractor is being paid for by force account, the Contractor will not receive any payment for additional costs to keep the project on schedule because of the Extra Work.

As conditions precedent to the Contractor's entitlement to any Accepted for Traffic Incentive, the Contractor must make the project "Accepted for Traffic" and open the project to traffic in accordance with the contract provisions on or before the Accepted for Traffic Incentive Dates in the progress clause. "Accepted for Traffic" will be as determined by the Engineer in accordance with the Standard Specifications and this document, and the Contractor shall obtain approval from the Engineer before the project can be considered "Accepted for Traffic."

The determination regarding whether or not the Contractor meets the Accepted for Traffic Incentive Dates will be made separately for each of the two dates provided in the contract progress clause. The Contractor is eligible for an incentive payment for making the project "Accepted for Traffic" on or before either of the two Accepted for Traffic dates in the contract progress clause.

The Contractor shall have no right to any payment whatsoever under this Special Provision, if the Accepted for Traffic dates in the contract progress clause are not met.

Should this provision conflict with any other provision of the contract, the contract shall be interpreted in accordance with this provision.

**b. Measurement and Payment.** The Contractor shall be paid an Accepted for Traffic Incentive for making the project "Accepted for Traffic" as described in the second and third paragraphs of this special provision, by the dates indicated in the contract progress clause. These incentives will be paid using the following contract items (pay items).

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Accepted for Traffic Incentive (July 7, 2005)	Dlrs
Accepted for Traffic Incentive (December 22, 2005)	Dlrs

### SAMPLE Progress Clause from the I-94 Project

**Progress Clause:** Start work within five (5) calendar days after receiving Notice of Award, or on the date agreed upon with the Engineer. In no case, shall any work be commenced prior to receipt of formal notice of award by the department.

This project is on an expedited schedule. The Contractor is expected to mobilize sufficient personnel and equipment and to work the required overtime to maintain the expedited schedule. It is anticipated that seven day work weeks will likely be required during the life of this contract, and that work during the winter months will be necessary to meet the project schedule.

There will be no seasonal suspension of work activities during the winter. The Contractor is responsible for all means to protect the work from the weather, and for all costs associated with cold weather construction. All costs of cold weather construction and complying with the requirements of the 2003 Standard Specifications for Construction for working during cold weather and on wet and frozen ground, shall be included in the Contractor's bid for the applicable items of work.

Additionally, the Contractor shall be required to continually monitor the in-place concrete temperatures in the field throughout curing to ensure the concrete does not freeze and achieves adequate strength gain.

Contract work shall be completed according to the following schedule:

1- The project shall be "Accepted for Traffic" as defined in the Special Provision for I-94 Accepted for Traffic Incentive, by **July 7, 2005**.

2- Slope Restoration associated with Stage 3/ 3a shall be completed by **July 7, 2005**.

3- The project shall be "Accepted for Traffic" as defined in the Special Provision for I-94 Accepted for Traffic Incentive, by **December 22, 2005**.

4- Stage 5/ 5a/ 6 slope restoration and Stage 5/ 5a/ 6 permanent pavement markings shall be completed by **May 15, 2006**.

5- Landscaping shall not begin until 2006, and shall be completed by **September 19, 2007**.

6- The entire contract shall be completed by **September 19, 2007**.

Failure to complete the work specified in number 1 above by the July 7, 2005 will result in the assessment of user delay costs of \$100,000 per day from July 8, 2005 to July 13, 2005, inclusive. Failure to complete the work specified in number 3 above by December 22, 2005 will result in the Contractor being assessed user delay costs of \$20,000 per day until the work is completed.

Failure to complete the work specified in numbers 2, 4, 5, and 6 above by the dates indicated, will result in the assessment of liquidated damages in accordance with subsection 108.11 of the 2003 Standard Specifications for Construction.

Additionally, the Department will pay the Contractor a lump sum incentive in the amount of \$2,000,000.00 if the Contractor makes the project "Accepted for Traffic" as defined in the I-94 Accepted for Traffic Incentive Special Provision, on or before the **July 7, 2005** Accepted for Traffic date.

The Department will also pay the Contractor a lump sum incentive in the amount of \$2,000,000.00 if the Contractor makes the project "Accepted for Traffic" as defined in the I-94 Accepted for Traffic Incentive Special Provision, on or before the **December 22, 2005** Accepted for Traffic date.

Additionally, the Contractor must take two mandatory safety breaks in 2005, each two days in duration. The dates for these breaks shall be agreed on with the Engineer and shown on the Contractor's Critical Path Network.

During the Easter (4/8/05- 4/10/05), Thanksgiving (11/23/05- 11/27/05), and Christmas (12/22/05- 12/26/05) holidays, no additional lane closures (other than permanent lane closures already in place for staging) are allowed and the Contractor's work operation shall not interfere with the through movement of traffic.

The following provisions also apply to this contract:

1- The low bidder (s) for the work covered by this proposal will be required to meet with Department representatives to work out a detailed progress schedule. The Region Engineer will arrange the time and place for the meeting. The named subcontractors for Designated and/ or Specialty Items, as shown in the proposal, are recommended to be at the scheduled meeting if such items materially affect the work schedule.

2- The progress schedule shall be in accordance with the applicable contract provisions. The two Accepted for Traffic dates contained in this progress clause shall be shown, as well as the contract completion date.

3- The low bidder (s) will be required to submit a **Critical Path Method (CPM) network** schedule to the Engineer for approval prior to beginning work. The Critical Path shall meet the requirements of the Special Provision for Critical Path Network Schedule (03P102C).

4- All local noise and dust ordinances shall apply to this project.

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## Special Provision - Lane Rental



MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**LANE RENTAL**

XXX:YYY

EMB:03-10-06

**a. Description.** This contract includes a procedure under which the Contractor is assessed lane rental for each hour or portion thereof for each lane closure on the mainline, ramp(s) or bridge(s) listed in this Special Provision. This Special Provision establishes the process and contract items to enable the Department to administer the lane rental procedure.

During the performance of work to which lane rental applies as listed in this Special Provision, the Contractor shall conform to the requirements of the Maintaining Traffic Special Provision contained in the contract documents.

**b. Proposal Submission, Award and Execution of the Contract.** The Contractor shall submit a lump sum bid for the item of Lane Rental as applicable to the contract. The Department will make payments under the item, Lane Rental Incentive as applicable to the contract. Details of the payment and assessment procedures are provided in section (e) of this Special Provision.

**1. Preparation of Proposal.** In addition to the requirements of subsection 102.05 of the Standard Specifications for Construction, the following shall apply to this contract. This contract includes Lane Rental, as a lump sum item. Lane Rental **must** be bid. **A negative amount will not be permitted for this item.** If the Contractor leaves this item blank, the Department will consider the proposal to be irregular as specified by subsection 102.06 of the Standard Specifications for Construction.

The amount bid for this item shall be based on the bidder's estimate of the number of lane closures on designated traffic lanes and the assessment values as described in this Special Provision.

The amount bid for this item will affect the determination of the lowest bidder. The Contractor should not include the anticipated lane rental assessments to the Department in other items of the contract, as unbalancing may occur and the bid may be rejected.

**2. Consideration of Proposals.** In addition to the requirements of subsection 102.13 of the Standard Specifications for Construction, the following shall apply to this contract. The item Lane Rental shall become part of the Contractor's total bid for the purpose of determining the low bidder. Each bid submitted shall contain the total of the following sections:

Section 1:	Dollar amount of the road work.
Section 2:	Dollar amount of the bridge work.
Section 3:	Lane Rental lump sum bid, plus other items as listed in the schedule of items for Section 3 if applicable.
	Total Bid = Section 1 + Section 2 + Section 3

The lowest total bid of these three sections, as verified by the Department, will be the apparent low bid and will be reviewed according to subsection 102.10 of the Standard Specifications for Construction.

It will not be necessary for the proposal guaranty to include the amount bid for the item of Lane Rental. The bid amount for the item of Lane Rental will not be used in the calculation of the Contractor's prequalification limit; the net classification for this contract; the subcontracting limitation for this contract or the original total contract amount that is used to determine payment for Mobilization according to subsection 150.02 of the Standard Specifications for Construction.

Any other reference in the plans and specifications to the total contract amount will be considered to be modified by this Special Provision and will not include the bid amount for the item of Lane Rental.

**c. Definition of Terms.** For the purpose of this Special Provision, the following definitions apply.

1. **Designated Traffic Lane** - Any traffic lane in use by traffic prior to the beginning of the project. Designated traffic lanes include lanes closed to traffic by any staging or Maintaining Traffic Special Provisions contained within this contract.

2. **Lane Closure** - For the purpose of assessing lane rental, lane closure shall mean denying traffic to any designated traffic lane or any portion thereof for mainline, ramp(s) and bridge(s) listed in this Special Provision. A lane closure will be required when the Contractor's operations have resulted in a traffic lane width less than 11 feet, or as shown on the plans, or a reduction in the minimum vertical clearance allowed of a traffic lane.

3. **Rental Assessment** - The amount, as shown Table 1 for Lane Rental Assessments, which represents the hourly cost for each designated traffic lane closure. Any portion of an hour that a designated traffic lane closure exists will be considered as a full hour for assessing lane rental.

4. **Total Contract Amount** - The total contract amount paid to the Contractor based on the contract unit prices for items of work included in Sections 1 and 2, any adjustments as provided for in the contract documents, any assessment of incentive, disincentive or liquidated damages as provided for in the contract documents.

**d. Lane Rental.** Lane rental applies at any time during the contract unless otherwise specified in the proposal or by the Engineer. Lane rental applies to lane closures during periods of work activity and no work activities unless otherwise specified.

**e. Measurement and Payment.** Lane Rental will be measured in hours, and will be the total count of hours that designated traffic lanes have lane closures within the project limits. Any incentive payment for Lane Rental will be made using the following contract items (pay items) and the procedures as detailed below.

<b>Contract Item (Bid Item)</b>	<b>Bid Unit</b>
Lane Rental .....	Lump Sum
Lane Rental Incentive .....	Dollar

1. **Assessments.** The Engineer will keep records of the hours assessed for lane rental. The Contractor and the Engineer shall compare records of the hours assessed for lane rental and bring these records into agreement at least once a week. The dollar value of lane rental assessments will be determined by multiplying the number of hours of lane closure for designated traffic lanes by the applicable rental assessment hourly rate from "Table 1 (Lane Rental Assessments)" and summing the products. A tally of cumulative lane rental assessments will be kept by the Engineer and will be subtracted from the original Lane Rental lump sum bid, on a biweekly basis. This process shall continue until completion of the contract work.

**Table 1: Lane Rental Assessments**

Lane Closures	Hourly Assessment
One lane (mainline, ramp or bridge)	\$_____
Two lanes (mainline, ramp, or bridge)	\$_____
Three lanes (mainline, ramp or bridge)	\$_____
Four lanes (mainline, ramp, or bridge)	\$_____

If the Contractor proposes changes in the stage construction plans or the maintaining traffic requirement, and these changes are approved by the Engineer, the cost of these changes will be the Contractor's responsibility.

**Lane Rental applies (*INSERT ADDITIONAL LANE CLOSURES INFORMATION HERE*)**

2. **Incentive Calculations.** If the cumulative lane rental assessments exceed the contract lump sum bid for Lane Rental, the difference will be offset against monies otherwise due the Contractor for other items of work, either in the biweekly estimate for which the contract Lane Rental lump sum is exceeded or in the final estimate. If the cumulative lane rental assessments do not exceed the contract lump sum bid for this item, no deduction will be made from the biweekly or final estimate against monies otherwise due the Contractor for other items of work for lane rental assessments, and the Contractor will be paid the difference, not to exceed **\$(Insert Maximum)**. The payment will be determined by taking the contract Lane Rental lump sum bid and subtracting the total lane rental assessments. Payment to the Contractor shall be made using the contract item (pay item) **Lane Rental Incentive**.

3. **Adjustments to Work That Affect Lane Rental.** When the Engineer makes adjustments to work quantities or changes to the work as defined in Division 1 of the Standard Specifications for Construction, consideration will be given to modifying the lane rental lump sum bid amount to coordinate with the changes made by the Engineer.

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## Special Provision – Extension of Time and Extra Cost



03SP108(A)

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**EXTENSION OF TIME AND EXTRA COST  
FOR INCENTIVE/ DISINCENTIVE PROJECTS**

MET:KS

C&T APPR:PAL:JTL 09-17-01

**a. General.** It is in the public's best interest to complete the Incentive/Disincentive portion of the project at the earliest possible date. This project is identified as fitting one or more of the following criteria generally associated with Incentive/Disincentive projects.

1. High traffic volumes generally found in urban areas.
2. Work that will complete a gap in the highway system.
3. Major reconstruction or rehabilitation on an existing facility that will severely disrupt traffic.
4. Major bridges out of service.
5. Lengthy detours.

Except for labor disputes or delays in materials deliveries as addressed in the Progress Schedule Clause, no extension of time will be allowed for any reason, including but not limited to weather, increases or decreases in contract quantities, or extra work. The Contractor will be expected to adjust his work forces or work hours to compensate for any increased quantities, extra work, or weather conditions. No cost increases to meet the Incentive/Disincentive date, other than as stated herein, shall be allowed for any reason. The only cost increases that may be considered shall be those increases within the limits defined here and associated with delays, increased quantities, and/or extra work.

All other increased costs shall be deemed to have been included by the Contractor in the original contract price. Other delays associated within the limits of the aforementioned items will not be paid for separately. These delays should be anticipated and included in the original contract price.

Controlling operation for Incentive/Disincentive projects will be defined as: The Contractor's controlling operation from the Contractor's updated and approved critical path which will be determined at the time that the work is done.

Major items for Incentive/Disincentive projects shall be defined as per section 101 of the standard specifications and must relate to the controlling operation that is affected.

**b. Delays.** Cost increases relating to the major item to keep the project on schedule may only be allowed due to one of the following reasons when not the fault of the Contractor;

1. Right-of-way or right-of-entry required to perform the controlling operation was not available when stipulated in accordance with the contract provisions.
2. Utilities were not moved in accordance with the contract that created a delay of the controlling operation.
3. Other related contracts were not completed to a point where construction on the controlling operation could proceed.
4. Suspension of the work ordered by the Engineer for reasons not provided for in the contract.

In addition to meeting one of the aforementioned reasons, the Contractor must also demonstrate that the alleged delay cost increase also related to those items defined above as major, affecting completion of the Contractor's controlling operations, from the Contractor's updated and approved critical path, which will be determined at the time that the work is to be done. The Contractor must also fully justify his costs to keep the project on schedule without any adjustment in the Incentive/ Disincentive date. Only actual direct costs above that which would be necessary to complete the work will be considered. Examples of such actual direct cost increases include, but are not limited to, concurrent work operations, additional manpower, additional shifts, overtime, 24-hour work days, or 7-day work weeks. These cost increases must also be fully justified by the Contractor and approved by the Engineer prior to performing the work involving the delay. No cost increase will be allowed for overhead. Failure of the Contractor to meet these requirements and provide the required justification will result in the Contractor not receiving payment for the cost increases to keep the project on schedule because of the alleged delay.

**c. Increased Quantity Cost adjustments.** Increased quantity cost adjustments will be allowed only on Major Items, affecting completion of the Contractor's controlling operations from the Contractor's updated and approved critical path which will be determined at the time the work requiring the increased quantity is done to meet the Incentive/ Disincentive date. The Contractor must demonstrate that the increased quantity meets the significant change criteria as defined in subsection 103.02 B of the standard specifications as it is related to the controlling operation. The Contractor must fully justify the adjusted unit price due to the quantity increase relative to keeping the project on schedule without any change in the Incentive/ Disincentive date. Only actual direct costs above that which would be necessary to complete the work will be considered. Examples of such direct costs include, but are not limited to, concurrent operations, additional manpower, additional shifts, overtime, 24-hour work days, or 7 day work weeks. These cost adjustments must be fully justified by the Contractor and approved by the Engineer prior to performing the work involving the increased quantity. 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 nonpayment of any cost adjustment for increased quantities to meet the Incentive/ Disincentive date.

**d. Extra Work Cost Increases.** Extra work shall be as defined in subsection 101.03 of the standard specifications. Extra work cost increases to meet the Incentive/ Disincentive date will be allowed only on major items affecting completion of the controlling operation(s) from the Contractor's updated and approved critical path which will be determined the time that the extra work is to be done. The Contractor must fully justify the cost of any extra work, including additional cost relative to keeping the project on the Incentive/ Disincentive schedule, without any adjustment in the Incentive/ Disincentive date, such as concurrent operations, additional equipment, additional manpower, additional shifts, overtime, longer work days, longer work weeks, or any other means that affect the extra work unit price, prior to doing the extra work. Failure to do so and/or to reach agreement on price for the extra work will result in the Contractor being paid for the extra work by force account. If the Contractor is being paid by force account, the Contractor will not receive any payment for cost increases to keep the project on schedule because of the extra work.

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## Appendix C

### Special Experimental Project No. 14 (SEP-14) Process

The following information on the SEP-14 process was obtained from the FHWA Construction Contract Administration website at [http://www.fhwa.dot.gov/programadmin/contracts/sep\\_a.cfm](http://www.fhwa.dot.gov/programadmin/contracts/sep_a.cfm):

Since 1990, the FHWA has allowed the State DOTs to evaluate non-traditional contracting techniques under a program titled "Special Experimental Project No. 14 - Innovative Contracting." Originally, the contracting practices approved for evaluation were: cost-plus-time bidding, lane rental, design-build contracting, and warranty clauses. After a period of evaluation, the FHWA decided that all four practices were suitable for use as operational practices (non-experimental). Today, SEP-14 remains as a functional experimental program that may be used to evaluate promising non-traditional contracting techniques. In fact, the term "alternative contracting" may be a better descriptor than "innovative contracting" as some of these techniques are widely used and are no longer considered to be innovative by some contracting agencies. Thus in 2002, the title of SEP-14 was changed from "Innovative Contracting" to "Alternative Contracting."

#### Background

The genesis for the FHWA's SEP-14 began in 1988, with the establishment of a Transportation Research Board (TRB) task force to evaluate Innovative Contracting Practices. The task force consisted of 23 representatives from state highway agencies, all segments of the industry, and others. Its mission was to:

- Compile and research information on contracting practices used by agencies in the United States and other countries
- Assess how current practices affect quality, progress, and cost
- Suggest measures for improving contracting practices and promoting quality in construction

The task force investigated four major areas:

- Bidding procedures
- Materials control
- Quality considerations
- Insurance and surety issues

Recommendations were made by the task force for each of the four major topic areas. Some of the more significant recommendations included:

- The cost-plus-time bidding concept should be considered for wider implementation
- The potential for use of warranties or guarantees and the design-build contracting concept should be investigated
- Attention should be given to the use of constructability testing during the design of projects
- A nationwide effort should be initiated to transition from method specifications to performance-related specifications and the performance-related specifications should include incentive and disincentive provisions to encourage better quality
- A national clearinghouse should be established for information on new materials/processes and the establishment of a national center, or regional centers, for product evaluation should be investigated

- Value engineering concepts should be investigated to identify ways to promptly approve successful innovative techniques.

The task force's findings are documented in Transportation Research Circular Number 386, entitled, "Innovative Contracting Practices," dated December 1991. The task force chairman, Dwight Bower, subsequently requested that FHWA establish a project to provide a means to evaluate some of the task force's more project specific recommendations and SEP-14 was initiated.

### Objective

The objective of SEP-14 is to evaluate "project specific" innovative contracting practices undertaken by state highway agencies that have the potential to reduce the life cycle cost of projects, while at the same time maintain product quality. Federal statutes and regulations do set forth specific federal aid program requirements; however, some degree of administrative flexibility does exist. The intent of SEP-14 is to operate within this administrative flexibility to evaluate promising non-traditional contracting practices on selected Federal-aid projects.

### When is FHWA SEP-14 Approval Necessary?

FHWA headquarters' SEP-14 approval is necessary for any non-traditional construction contracting technique which deviates from the competitive bidding provisions in 23 USC 112. Any contract which utilizes a method of award other than the lowest responsive bid (or force account as defined in 23 CFR 635B) should be evaluated under SEP-14. These non-traditional contracting techniques may include best value, life cycle cost bidding, qualifications based bidding, and other methods where cost and other factors are considered in the award process.

### How do I request FHWA's approval under SEP-14?

State DOTs or local public agencies may submit a SEP-14 work plan through the local FHWA division office. The division office reviews the request and, if appropriate, forwards it to FHWA headquarters (HIPA-30) for review and approval. Electronic copies of work plans and SEP-14 requests for approval are encouraged.

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## Appendix D

### White Papers on MDOT Material Performance Incentives

1. Hot Mix Asphalt
2. Permanent Pavement Markings
3. Portland Cement Concrete

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# White Papers - Hot Mix Asphalt



Quality Initiative Incentives  
for  
Hot Mix Asphalt  
Michigan Department of Transportation

By: Curtis Bleech  
March 12, 2010

## **Purpose**

This document summarizes the Michigan Department of Transportation's (MDOT) experience relative to quality initiative incentives for Hot Mix Asphalt (HMA). A brief history, current specifications and suggestions for future improvements will be discussed.

## **History**

Incentives used for material quality are based on compensating the contractor for material that exceeds specification requirements. It has been determined that if the contractor provides material qualities that exceed certain specification requirements the pavements performance will increase. Therefore, almost all projects are set up with the incentives for hot mix asphalt pavements.

In 1992, MDOT started using quality control/quality assurance (QC/QA) for HMA and offered a 6 % bonus for density. This process was invoked in order that contractors do more testing to control their product in the asphalt plant and at the paving site. It was also intended to supplement MDOT's testing responsibility for material acceptance on construction projects. In 1996, an additional 4% was added as a bonus for providing a high quality HMA mixture, in terms of uniform aggregate gradation and volumetrics. Therefore, the total available bonus per ton of HMA was 10% of the contract unit price and has been used on HMA projects through 2001 construction. The QC/QA specification has been changed for 2002 so that the total bonus is for density only and is set at 4%. A bonus for mixture quality is no longer available, although there still are penalties if mixtures are below the specification limit. HMA mixtures are designed to have 6% air voids when paving has been completed and compacted. This represents 94% compaction. The 4% bonus, applied to the contract unit price, is given to the contractor if 75% of the cores, used to measure density, in a lot (up to 6000 tons) are at 94% or greater.

Please note that there were no bonuses available for HMA Capital Preventive Maintenance (CPM) projects prior to 2010.

## **Current QC/QA Specifications**

In 2004 MDOT implemented the "Superpave Hot Mix Asphalt Percent Within Limits (PWL)" specification for acceptance of HMA. The specification has been revised several times and is the current specification used for HMA acceptance. This specification allows the contractor to earn up to a 5% incentive and also includes provisions for disincentive.

The PWL specification uses statistical methods to measure the uniformity of the HMA being produced and placed. The contractor can earn an incentive based upon the uniformity of the material and it's relationship to the specification limits for four quality parameters. These parameters are AC content, Air Voids, VMA and In Place Density.

The department is responsible for all QA testing and the contractor is required to perform QC testing. The contractor is allowed to dispute the departments test results provided that they have followed all QC sampling and testing procedures. In order for the dispute resolution process to be invoked the QC test results must indicate that a higher pay factor would have been achieved if the QC results had been used for pay.

In addition, starting in the 2010 construction season the PWL specification will be used on CPM projects. The CPM version of the PWL specification will be a slight modification of the version that is used on Rehabilitation and Reconstruction projects; however, the contractor will be able to earn incentives or receive disincentives.

### **Future Improvements**

The current version of the PWL specification has been in place since October 2007. It will be evaluated in 2010 for any potential revisions as a result of statistical analysis of the 2008 and 2009 project data along with any administrative revisions.

Currently two of the four quality parameters that are used for pay have a direct relationship to one another. These are air voids and VMA. It has been said that one of these parameters should be substituted with a different quality parameter because of their interrelationship. One such parameter that could be used is that of fines to affective AC.

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# White Papers - Permanent Pavement Markings



## MDOT's Quality Initiative Incentives for Permanent Pavement Markings

By: Jill G. Morena  
April 7, 2010

### **Purpose**

This document summarizes the Michigan Department of Transportation's (MDOT) experiences relative to quality initiative incentives for the annual permanent pavement marking re-stripping contracts, with additional suggestions for possible improvements.

### **History**

Each year, 80% to 85% of MDOT's trunkline system is re-stripped through TSC or Region-wide contracts. The other 15% to 20% of the system is under construction and is striped at the completion of each construction contract. Until approximately 1989, MDOT Maintenance personnel did the annual re-stripping, but due to downsizing, all pavement re-stripping since then has been contracted out.

As MDOT continued to downsize, fewer field personnel were available to properly inspect the annual re-stripping projects. Re-stripping is done 24 hours a day during much of the construction season and the projects can be expensive and time consuming to monitor. Because of this, inspection dollars were focused elsewhere.

In 1999, a requirement that all States must maintain a minimum retro reflectivity (brightness) for pavement markings was put in the Federal Register. This has still not been instituted to date due to the variability of conditions affecting pavement markings, but MDOT (aware of the addition to the Federal Register) turned to retro reflectivity contracts to assure the department would be ready when the time came. Retro reflectivity contracts also helped with MDOT's concern regarding reduced inspection. For the first time, the responsibility for the quality of the pavement markings fell to the Pavement Marking Contractors.

The first retro reflectivity readings were taken in 1998 and 1999. The first incentive/disincentive retro reflectivity contract was let in 2000. MDOT's pavement marking Retro reflectivity numbers saw a straight line increase from 2000 through 2007 and have remained consistent the past few years.

### **Current Specifications**

The MDOT Special Provision for Waterborne Paint and Sprayable Thermoplastic – Adjusted Pay has evolved over the years. Both the incentive and disincentive have been capped. The retro reflectivity ranges have changed as readings increased. MDOT also started reading pavement markings placed in rumble strips and the result rumble strips readings were an unknown. Reading dates were altered to allow the retro reflectivity Contractor to start working in the Upper Peninsula earlier since snowplows immediately start to damage pavement markings.

Weather depending, the Pavement Marking Contractors begin re-stripping on May 1st and end September 8th. Also weather depending, the Retro Reflectivity Contractors begin taking measurements

in mid-September and end by October 31. The Special Provision for Waterborne Paint and Sprayable Thermoplastic – Adjusted Pay requires the Retro Reflectivity Contractor to:

- Measure 20 percent of each route in approximate 2-mile segments, chosen to be representative of the entire route.
- Measure each 2-mile segment continuously with a mobile retro-reflectometer using 30 meter geometry.
- Complete measurements by October 31.

After completion of the measurements the Retro Reflectivity Contractor submits a report to MDOT. The report is reviewed and then sent to the Pavement Marking Contractors.

MDOT currently adjusts payment for marking quantities according to the following table:

White Lines		Yellow Lines	
Ave. Segment Reading (in millicand elas)	Adjustment Factor	Ave. Segment Reading (in millicand elas)	Adjustment Factor
≥321	+0.15	≥186	+0.15
240-320	0	140-185	0
175-239	-0.15	125-139	-0.15
101-174	-0.50	101-124	-0.50
≤100	-0.80	≤100	-0.80

### Current Status

Pavement Marking Manufacturers and Contractors have found the right materials and striping methods required to meet MDOT's required retro reflectivity and still make a profit. MDOT has developed a performance specification with an incentive/disincentive formula that the pavement marking community has not only accepted, but responded to in a positive way by raising statewide retro reflectivity to levels unimagined a few years ago. The initial goals of a performance-based contract have been attained.

### Recommendations for the Future

Recommendations are usually based on finding a deficiency in a program and suggesting methods to remedy the problem. The data shows the incentive/disincentive program has been effective, however, continuation of the statewide retro reflectivity measurements is recommended. Without constant monitoring, there is the possibility that the retro reflectivity values will slip back to where they were in past years.

Following are possible modifications to the incentive/disincentive program:

- 1) **Reduce statewide mobile retro reflectivity monitoring.** Select representative Regions or TSCs for yearly measurement under incentive/disincentive contracts. MDOT will still be able to evaluate pavement marking performance without measuring the entire state.
- 2) **Discontinue statewide sprayable thermoplastic measurements.** Limit measurements to Metro and/or Grand Region where the majority of the sprayable thermoplastic markings in the state are applied.
- 3) **Evaluate the retro reflectivity requirements for determining payments to pavement marking contractors.** MDOT should consider increased retro reflectivity readings and a lower cap on the amount of incentive to be paid. We need to assure there is still enough incentive to place

responsibility for marking quality on the Pavement Marking Contractor so that time consuming and costly inspection requirement is not increased.

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# White Papers - Portland Cement Concrete



## MDOT's Quality Initiative Incentives for Portland Cement Concrete

By: John F. Staton  
March 23, 2010

### **Purpose**

This document summarizes the Michigan Department of Transportation's (MDOT) experiences relative to quality initiative incentives for Portland cement concrete, with additional discussion toward suggestions for future improvements.

### **Background**

In 1992, MDOT embarked on development of Quality Control/Quality Assurance (QC/QA) specifications for field testing and acceptance of Portland cement concrete. Initial query of other state DOT specifications was conducted at that time in efforts to gain an understanding of the issues, as well as provide guidance for specification development. Ultimately, the New Jersey DOT approach was selected as a general model for the MDOT QC/QA specification platform.

### **History**

The MDOT Special Provision for Contractor Quality Control (QC) requires the contractor to establish an internal QC program, including a QC plan describing how it will be staffed in terms of a qualified QC manager to oversee operations, as well as the necessary certified concrete tester(s) to sample, test, and inspect the concrete production and placement in order to produce work of acceptable quality. A major aspect of the QC specifications is that the MDOT project staff will not engage in sampling or testing of the concrete for QC, nor assist in controlling the contractor's production operations. Further, there has never been a pay item associated with providing and maintaining this contractor-based quality control program; all associated costs are included in the applicable unit price for the concrete item.

Along with the Special Provision for Contractor Quality Control, the accompanying MDOT Special Provision for Concrete Quality Assurance (QA) was developed in efforts to define the process for acceptance and payment for furnishing and placing the Portland cement concrete. This QA protocol focuses on standard production grades of concrete (Grades P1, P2, S1, S2, S3, T, and D) having sufficient populations of historical data necessary to justify a statistical percent-within-limits (PWL) as basis for calculating levels of acceptability. Specialty concrete mixtures, where sufficient or reliable testing data are not available, are exempt from PWL provision requirements. In these cases, the standard linear-based acceptance formula is applied.

The Special Provision for Concrete Quality Assurance requires the contractor to:

- Develop concrete QA mix design and mixture proportions
- Submit the above for the Engineer's approval prior to concrete placement
- Perform initial acceptance for concrete temperature, slump, and air content prior to concrete discharge into the forms

- Sample concrete and fabricate 6 by 12 inch compressive strength test specimens at the specified minimum sampling rate
- Transport all compressive strength test specimens to the contractor's designated qualified laboratory for standard 28-day continuous wet curing
- Transport all compressive strength test specimens to the designated MDOT testing laboratory immediately prior to the 28<sup>th</sup> day after placement for MDOT acceptance testing

Concrete items are categorized into two groups, as follows:

- Critical Concrete QA Items - Concrete QA items that are subject to positive or negative pay adjustments based on 28-day compressive strength. Substructure concrete, superstructure concrete, and concrete pavement items including shoulders and ramps are critical concrete QA items.
- Non-Critical Concrete QA Items - Concrete QA items that are not eligible for positive pay adjustments, but are subject to negative pay adjustments based on 28-day compressive strength. Non-critical concrete QA items include, but are not limited to, curb and gutter, slope paving, sidewalks, and Grade T concrete.

The negative pay adjustments associated with strength and uniformity (PWL), as described above, can reduce the contract item bid amount by up to (minus)18 percent prior to possible removal and replacement. Re-evaluation of a production lot (via non-destructive testing) that does not meet the acceptable threshold of 90 percent-within-limits is at the engineer's discretion. The positive pay adjustment (in terms of quality initiative bonus, which is a budgeted amount for the project) can provide for up to 2 percent bonus based on 28-day compressive strength for critical QA pay items only, as described above.

Daily testing by MDOT for temperature, slump, and air content is required for each grade of concrete for QA verification purposes.

Pay adjustments for QA are based on: (the calculated pay factor) x (the number of cubic yards of concrete included in the respective production lot) x (the contractor's bid price for the associated contract item). Concrete QA for freeway shoulders follows similar calculation protocol, but uses square yards as the basis for unit measurement.

The above special provisions were subject to minor modifications during the 1990's, and were ultimately incorporated into the 2003 revision to the MDOT Standard Specifications for Construction, as follows:

- Section 604 - Special Provision for Contractor Quality Control
- Section 605 - Special Provision for Concrete Quality Assurance

### **Current Activities**

It has been observed over the past 10-plus years that contractor's have very seldom forfeited any portion of the 2 percent quality initiative bonus as a result of deficiencies in their 28-day compressive strength test results. This matter has prompted recent discussions between MDOT, the FHWA, and the Michigan Concrete Association (MCA) relative to whether strength-based metrics are appropriate means to quantify long-term concrete performance. With this in mind, current consensus is that future revisions to the MDOT concrete acceptance program should entertain quality in terms of durability-based considerations.

In light of the 2010 revisions to the MDOT Standard Specifications for Construction, the Federal Highway Administration (FHWA) informed the Division 6 team that major changes will be required in terms of MDOT's concrete acceptance program prior to their approval of the 2010 Standard Specifications for Construction. The FHWA concerns hinge on the fact that current concrete QA specification fosters an unacceptable breach in the chain-of-custody of the 28-day compressive

strength test specimens. In other words, the FHWA is of the opinion that they will no longer permit MDOT to delegate any aspect of the concrete acceptance process to the contractor.

With this in mind, the current sections 604 and 605 included in the 2003 Standard Specifications for Construction will be removed from the upcoming 2010 Standard Specification for Construction. The current specification language for each section will then be replaced with placeholder language directing the reader to the respective frequently used special provisions, which will be located in the contract proposal.

Currently, a team of representatives from the Construction and Technology Division (C&T), the FHWA, and the MCA are developing the necessary special provisions to accommodate future projects constructed under the jurisdiction of the 2010 Standard Specifications for Construction.

### **Future Initiatives**

For upcoming projects constructed in accordance with the 2010 Standard Specifications for Construction, the anticipated frequently used special provisions for QC and QA will be inserted into the contract proposal. The major change from the current protocol will be that MDOT construction staff will maintain full jurisdiction over acceptance sampling and testing, with continual custody of all 28-day compressive strength test specimens. Since the contractor will no longer be involved with these operations, it is anticipated that all associated Quality Assurance contract items will be eliminated as part of the specification. However, it is expected that the (budgeted 2 percent) Quality Initiative contract item will remain intact for critical concrete QA items only.

As previously discussed, the team of representatives from C&T, the FHWA, and the MCA are currently exploring durability-based considerations relative to concrete acceptance and quality initiative. Preliminary discussions are continuing toward developing a weighted PWL combined pay factor formula for acceptance, which could ultimately have its basis on 28-day compressive strength in conjunction with total air content. The team is currently in the process of mining selected project records to assemble a representative population of historical test data for a sensitivity analysis. Ultimately, the team's goal is to incorporate the combined pay factor (strength and total air content) protocol into a future revision to the Special Provision for Quality Assurance (Acceptance) for Concrete for project lettings in 2011 and beyond (under the jurisdiction of the 2010 Standard Specifications for Construction).