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16. Abstract

The interim report (4386-1) identified, described, and discussed expediting methods that could be used in various phases of highway construction. Continuing the objectives of the first-year research, a system has been developed for Area Engineers and assistants to select proven, yet innovative, methods to expedite highway project delivery. The system consists of both a paper and computer version. This report, as the conclusion of the research study, covers the development and validation of this Expediting Method Selection Tool. The final version of the tool evolved from feedback gathered from three demonstration seminars held with TxDOT Area Engineers and other TxDOT and industry personnel. The Project Director and Coordinator also provided feedback and guidance on the development of the final version of the tool. Recommendations for implementation of the tool are provided.

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Development and Validation of a Method Selection Tool for Expediting Highway Construction

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Introduction

1.1 Background and Motive

A declared goal of the Texas Transportation Partnerships report issued in August of 2001 is to "improve project delivery from project conception to ribbon cutting, on average, by 15 percent within 5 years" (TxDOT 2001b). This is a lofty but attainable goal. According to the Federal Highway Administration (FHWA), federally funded highway projects with significant environmental impacts may occupy 9-19 years from project conception to completion (GAO 2002). Given these long highway project durations, improvements in project delivery can and must be realized.

The degree of planning may be the single most important factor determining the success of a highway project. Of the projects studied by FHWA, no information was available relative to the amount of time spent on scope definition and planning (GAO 2002). Therefore, one may suggest that due to lack of controlled planning the duration of a project can occupy many years. In order to expedite highway construction, significant deliberation and implementation of expediting methods and strategies must occur early in the process, ideally in the planning phase.

Highway construction imposes real costs on drivers who are delayed, on local businesses which may be disrupted, and on the environment which could be disturbed. At the same time, the traveling public demands good roads delivered in a timely fashion. As a result, tremendous political and public pressure exists for the Texas Department of Transportation (TxDOT) to build highway projects better and faster. This pressure will continue to increase as traffic volumes increase, especially for high-profile, critical projects.

Control of project time, along with cost and quality, is essential for a successful highway construction project. Various expediting methods can be initiated at different project phases. Knowledge of these methods can play a critical role in project delivery time. Expeditious highway construction benefits the overall economy in terms of reduced road user costs and less frustration for the traveling public. Even though planning may be the single most important phase in determining the ultimate duration and cost of a project, methods may be instituted during other phases that result in time savings and cost reduction of these same components. A challenge exists in knowing the specific methods that can be used from conception to construction to significantly reduce project delivery time. Another challenge is knowing the optimal time to implement such a strategy. A final difficulty is the number of TxDOT personnel, districts, and divisions associated with highway project delivery. As of June 2003, TxDOT had 14,627 total employees; of these, about 36% or about 5,266 worked in planning, designing, and managing transportation projects (TxDOT 2003a). TxDOT is subdivided into twenty-five districts, each with a district engineer, director of construction, design engineers, area engineers (129 statewide), assistant area engineers, and other support staff. In contrast, the twenty-five districts in Texas is more than double the number of districts or regions in any other state. For instance, New York (NYSDOT) has eleven regions, while California (Caltrans) has twelve districts. For the 2001 fiscal year, TxDOT let $3.2 billion in highway construction contracts with 1,200 active state construction projects and 6,000 projects in developmental stages (TxDOT 2002b). The projected letting volume for 2003 will grow to more than $3.5 billion for construction contracts. While the average project size in 1999 was $2.0 million, these contracts represented only 27 percent of the sum of all contract costs (e-Texas 2000). Therefore, the challenge for TxDOT is the unique population density and immense size of the state plus total construction project volume. These challenges result in the need for a tool to expedite total project delivery.

To make the most efficient use of the available funds for highway construction projects, and to minimize total road life cycle costs, TxDOT needs a tool for selecting the most appropriate "state of the practice" methods to expedite planning, design, and construction of capital projects. Concurrently, value and quality must be maintained. To reach the stated goal of the Texas Transportation Partnership, TxDOT and FHWA funded research to develop and validate a tool which will expedite highway construction. This research explains the development and validation of such a tool.

1.2 Scope

The interim report identified, described, and discussed expediting methods that could be used in various phases of highway construction (Simon et al. 2002). The research team accomplished this through literature reviews and workshops held with TxDOT, FHWA, and industry personnel.

As stated previously, due to the size and breadth of TxDOT in terms of personnel, districts, and project volume, a system is needed for area engineers and assistants for selecting proven, yet innovative, methods to expedite highway project delivery. The system consists of both a paper version and computer version referred to as the tool. This report, as the conclusion of the research study, covers the development and validation of this Expediting Method Selection Tool. The computer version of the tool uses Microsoft® Excel and Visual Basic with macros. The tool was made to be simple and easy to use. The research team has also provided a paper version of the tool for those who prefer to use this medium. The prototype tool was developed based on feedback obtained from the initial workshops and an Internet questionnaire. The final version of the tool evolved from feedback gathered from three demonstration seminars held with TxDOT area engineers and other TxDOT and industry personnel. The project director and coordinator also provided feedback and guidance on the development of the final version of the tool. The demonstration seminars asked attendees for recommendations for implementation of the tool.

1.3 Objectives

The second-year objectives of this two-year study for TxDOT by The University of Texas at Austin / Center for Transportation Research are covered in this report. The primary objective of this report is to develop and validate the Expediting Method Selection Tool with which area engineers and assistants can easily determine the methods that are most appropriate given different project conditions. Along with this primary objective many other components guided this research:

- Identify needs and requirements of circumstances and their relationship with each expediting method
- Deliver additional information about expediting methods selected for inclusion in the Expediting Method Selection Tool
- Develop structure of tool
- Develop prototype tool
- Obtain feedback from project and TxDOT personnel
- Update prototype and validate final tool
- Obtain suggestions and develop guidelines to help implement the tool
- Deliver the final product (tool) on CDROM to TxDOT

The objectives for this project were developed mainly from the project tasks, although the objectives were more specific and contain fundamental goals. The project tasks were also used to develop the project methodology.

1.4 Development Methodology

Figure 1.1 illustrates the methodology followed to accomplish the objectives of this research. The shaded areas are tasks that were covered in the first year of the project and hence are covered only in limited fashion in this report in order to establish the background; additional information on this portion of the research maybe found in Simon et al. (2002). Primarily TxDOT personnel and the research team identified sixteen methods for inclusion in the method selection tool. These sixteen methods were selected from an original fifty methods based on high positive impact and high or medium doability. In other words, the method had to be currently available for TxDOT use and carry a benefit in terms of possible schedule and/or cost reduction.

Once the research team identified these sixteen expediting methods, more information was sought from experts within TxDOT. These experts classified project circumstances that may be used with each method that are typical for highway construction projects. With the circumstances defined, the research team selected an analytical method suitable for evaluating the applicability of each method, a compatible software program for embodying the analytical method, and a user interface. A preceding study was selected as a model for the software usage and user interface (Song 2002).

In order to determine the relationship between a method and relevant project circumstances, questionnaires were prepared and distributed to TxDOT personnel knowledgeable in the specific methods. Once the necessary number of questionnaires were collected and deciphered, the prototype Expediting Method Section Tool was designed. The tool was then presented to TxDOT and industry personnel in three demonstration seminars. As the primary focus of each seminar, the tool was tested on three separate TxDOT projects (one at each seminar) with different circumstances. Other projects provided by the project director also were used to test the tool. Much germane feedback received from these seminars and from participants' actual use of the tool was incorporated into revisions and changes to create the final tool. Concurrent with the testing of the tool, implementation procedures and suggestions were gathered from the seminar attendees. Further implementation procedures and recommendations are made in this report. The tool has been finalized and will be delivered from the Center for Transportation Research (CTR) to all TxDOT districts.

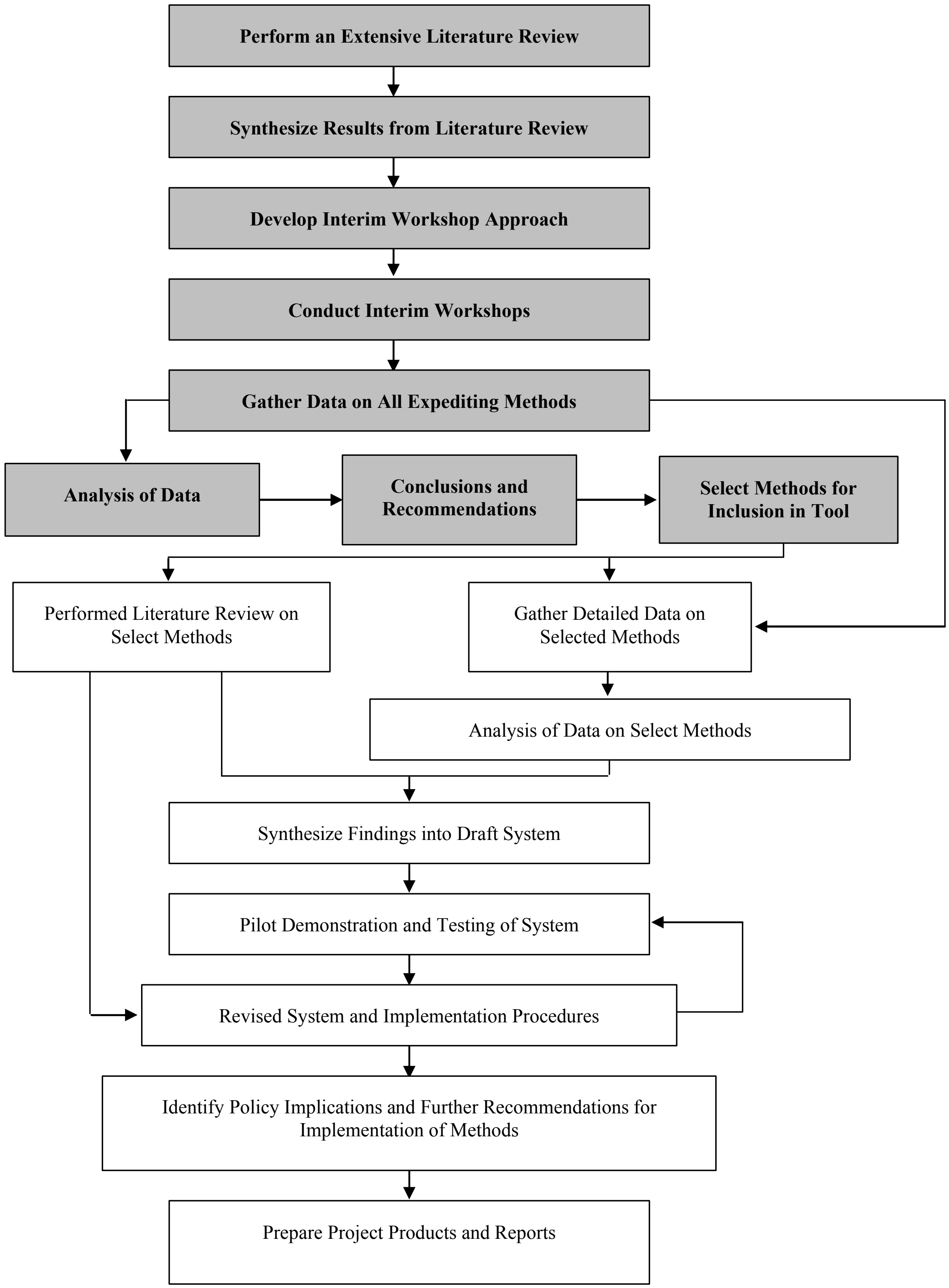


Figure 1.1 Methodology flow chart

1.5 Structure of Report

This report is organized into seven chapters. Chapter 2 presents an overview of the preliminary research in selecting the most appropriate expediting methods for the Expediting Method Selection Tool. It also describes the process of gathering more detailed data to formulate the method selection tool. More information about the preliminary research is found in the first year CTR report by Simon et al. (2002). Chapter 3 contains a detailed analysis of each expediting method, including description and usage of the methods within Departments of Transportation (DOTs) and especially within TxDOT. Chapter 4 provides the general structure of the final method selection tool. The prototype tool, modifications to the tool, and the final tool are presented in this chapter. Chapter 5 contains a summary description of the three demonstration seminars, actual projects tested at the seminars, and other projects demonstrated and tested with the project director. Chapter 6 delineates how to use the Expediting Method Selection Tool (EMST). The most important part of this chapter is the guidelines for implementation. The last chapter (Chapter 7) presents a review of project objectives, conclusions, and recommendations.

2. Literature Review & Preliminary Findings

2.1 Literature Review

During the preliminary (first-year) research an extensive literature review was conducted to investigate and describe proven methods for expediting highway construction. Sources for the review included Construction Industry Institute publications, industry journals and periodicals, conference proceedings, trade publications, Internet sources, and books on specific methods. A final list of fifty expediting methods that were found and categorized according to project phase is shown in Table 2.1. Overall, these methods were categorized into project phases based on an optimal time of initial performance. Note that the project phases changed somewhat as the tool progressed through revisions. These methods were further tabulated according to method descriptions, applicability and/or limitations, and pros and cons. The comprehensive background information on the fifty expediting methods can be found in the preliminary research report (Simon et al. 2002). The process of reducing the number of expediting methods to a more manageable number for inclusion in the tool will be detailed in this chapter. Once this selection process was complete the research team conducted another exhaustive literature search to aide in building the tool. In approximate order, the following sources were reviewed. Some of the sources contained limited or no information concerning the expediting methods. The most often used sources are listed first.

- TxDOT manuals and guidelines, special provisions and other specifications and other TxDOT publications
- FHWA publications
- Transportation Research Board Publications (TRR, NCHRP, etc.)
- Other Departments of Transportation (DOTs) or State Highway Agencies (SHAs) research and publications
- ASCE *Journal of Construction Engineering and Management*
- Construction Industry Institute publications
- Other government publications (GAO)

Table 2.1 Summary of expediting methods

Methods for Expediting Project Schedules Arranged by Relevant Project Phase for Implementation

I. Project Planning	***II. Project Design***	***III. Contracting & Procurement***	***IV. Construction***	***V. Other/Multiple***
1. Standardize Planning Approach; use comprehensive standard tools ensuring all areas are covered; 2. Programmatic (Corridor) approach to Planning, Design, and Construction; 3. Alternative Funding Methods; 4. Designate a single individual as Project Manager (PM) from early planning to construction; empower & equip PM with needed tools & data to select appropriate expediting methods; 5. Design-Build approach in various forms (Design-Build-Warrant, Design-Build-Maintain, etc.); 6. Formal partnering with design consultants, contractors, local authorities, and regulatory agencies; 7. Methods for expediting Right of Way (ROW) acquisition; 8. Methods for expediting utility relocation work; 9. Methods for improving environmental assessment during planning; 10. Intelligent Transportation Systems (ITS) & work-zone traffic control; 11. Public input on phasing of construction	1. Pavement type selection decisions; 2. Precast/Modular components; 3. Generate and evaluate multiple approaches to Traffic Control Plans (TCPs); 4. Develop a descriptive catalog of construction technologies that facilitate expedited schedules; 5. Phased-design to support phased-construction; 6. Develop Traffic Control Plans through partnering between TxDOT design & field organizations; 7. Increase levels of design component standardization; 8. Have Contractor prepare the Traffic Control Plan based on minimum requirements; 9. Using Linear Scheduling Method (LSM) & accurate productivity rate data to establish project target duration	1. A+B contracting; 2. Use of contractor milestone incentives; 3. Packaged multiple-primes approach to contracting; 4. Pre-qualify bidders on basis of past schedule performance; 5. Incentivize Traffic Control Plan development with a contractor Value Engineering cost-savings sharing provision; 6. Incentivize contractor work progress with a lane-rental approach; 7. Exploit e-commerce systems for procurement, employment, etc.; 8. Tools and best practices for implementing multiple work shifts and/or night work; 9. Increase amount of liquidated damages and routinely enforce; 10. Warranty Performance Bidding; 11. “No Excuse” incentives; 12. Change management practices; 13. Project-level dispute review board; 14. Alternative dispute resolution methods	1. Exploit web-based team collaboration system for project communications through all phases of the project; 2. Encourage use of automated construction technologies; 3. Employ methods for continuous work zones; 4. Use of windowed milestones; 5. Schedule Calendar Day projects; 6. Crash schedules with use of the Linear Scheduling Method; 7. Shorten construction time by full closure instead of partial closure of roadway; 8. Maturity Testing	1. Measure & track project schedule performance; use as basis for employee reward program as well as input to project duration database; 2. Track duration & productivity effects associated with different technologies; 3. Use pilot demonstration projects for introducing new methods for expediting schedules; 4. Create a “smart” database of activity productivity rates; 5. Study optimal approaches to crew shifts & scheduling; 6. Train all field personnel in scheduling methods and schedule claims; 7. Create a lessons-learned database on ways to expedite schedules; 8. Incentive-based pay for retaining key TxDOT personnel

These references are included in the Reference section of this report and many are included on individual method reference worksheets within the Expediting Method Selection Tool (see Chapter 4).

2.2 Interim Workshops and Analysis of Results

The second phase of the project involved getting practitioners' input into the methods by using interim workshops. The objectives were to rank the expediting methods, gather feedback on applicability, encourage participant involvement, and illustrate expediting methods to all districts. A total of three workshops were conducted in early to mid-2002. The workshops were held in Dallas (one) and Austin (two) to accommodate as many of the TxDOT district and division office personnel as possible. A total of sixty-two personnel, representing twenty-four TxDOT districts and five non-TxDOT agencies, participated in the workshops. The format of the workshops mainly consisted of the participants' assessment of 1) relevancy to TxDOT; 2) doability; and 3) positive impact of the fifty expediting methods. Breakout sessions were also held to allow the participants to further discuss the methods and reveal their opinions in an open and non-hostile environment.

The workshops provided useful data for the subsequent phases of this research project. The workshops helped the research team to clarify the methods that are included in the Expediting Method Selection Tool, and to identify particularly problematic expediting methods.

The results collected from the workshops were analyzed to determine the expediting methods that are incorporated into the method selection tool. Based upon the number of votes each method received, a new score was calculated and a level (high to low) classification assigned to each method based on the range of the score. In the investigation, the research team found that the criteria "relevancy to TxDOT" and "positive impact" were highly correlated, therefore "relevancy to TxDOT" was dropped from the raw score. In the end, only "positive impact" along with "doability" was used to categorize the methods.

2.3 Selected Expediting Methods and Others Requiring Management Action

The following list contains the sixteen methods that were included in the Expediting Method Selection Tool. Chapter 3 of this report provides an in-depth description and discussion of each of these methods. Again these methods were selected based on high "positive impact" along with high or medium "doability". In general, the methods are listed according to "positive impact" score in descending order.

1. Use a Calendar Day Schedule
2. Precast/Modular Components
3. Use of Contractor Milestone Incentives
4. Generate and Evaluate Multiple Approaches to Traffic Control Plans
5. A+B Contracting
6. Incentivize Contractor Work Progress with a Lane Rental Approach
7. "No Excuse" Incentives
8. Maturity Testing
9. Formal Partnering
10. Set Liquidated Damages to the Appropriate Level and Enforce
11. Pavement Type Selection Decisions
12. Seek to Maximize Work-Zone Size
13. Full Closure Instead of Partial Closure of Roadway
14. Implement Multiple Work Shifts and/or Night Work
15. Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations
16. Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention

The titles of some of the methods changed somewhat as the tool progressed through revisions. A final criterion in selecting methods for the Expediting Method Selection Tool was to separate those methods which require long-term policy changes. Three methods, not shown in the sixteen method list, were eliminated from the final checklist of the methods for the decision tool. Those methods were: Standardize Planning Approach, Alternative Funding Methods, and Create a Lessons-Learned Database.

Some of the methods with high potential impact scores were considered to have low "doability" due to legislative and other constraints. Those methods were emphasized by many workshop participants as some of the most promising methods in terms of expediting highway construction. Unfortunately, although the following list of methods is promising, the fact that they require further management actions in order to become applicable has presently left them out of the Expediting Method Selection Tool. However, the expandability of the decision tool will make it possible to incorporate those methods, once the necessary actions are taken by the Texas legislature and TxDOT management. The methods that need further management emphasis and long-term policy changes are the following, listed in no particular order (Simon et al. 2002):

- Standardize planning approach; use comprehensive standard tools ensuring all areas are covered
- Programmatic (Corridor) approach to planning, design, and construction
- Designate a single individual as Project Manager (PM) from early planning to completion of construction
- Alternative funding methods
- Methods for expediting Right of Way (ROW) acquisition
- Methods for expediting utility relocation work
- Methods for improving environmental assessment during planning
- Pre-qualify bidders on basis of past schedule performance
- Create a lessons-learned database on ways to expedite schedules
- Incentive-based pay for retaining key TxDOT personnel
- Design-Build approach in various forms (Design-Build-Warrant, Design-Build-Maintain, etc.)

2.4 GAO Report

Other agencies have also sought for strategies and ranked the strategies in an effort to expedite project delivery. Recently, the General Accounting Office (GAO) reported the views of thirty-three officials from interviews with forty-two organizations on the most promising approaches for reducing completion time for federally funded highway projects. The report did not consider other types of projects outside of this federally funded area.

> To perform the report GAO reviewed laws and regulations governing the construction of federally funded highway projects. GAO discussed these requirements, the time required to complete projects, and initiatives to reduce this time with officials from the Federal Highway Administration (FHWA), the Advisory Council on Historic Preservation, the Environmental Protection Agency, the Army Corps of Engineers, the

> Coast Guard, the Fish and Wildlife Service, the American Association of State Highway and Transportation Officials, the American Road and Transportation Builders Association, the American Society of Civil Engineers, private transportation engineering firms, and others. GAO also interviewed officials from California, Florida, North Carolina, Texas, Vermont, Washington, and Wisconsin departments of transportation about highway project completion time and initiatives to reduce the completion times of these projects. GAO chose these states either because they spent the most federal-aid highway funds or because officials interviewed identified these states as making efforts to reduce project time. GAO also reviewed federal and private studies on highway project completion (GAO 2003).

Initially the GAO report detailed forty-nine approaches as identified by the same number of respondents as attended the TxDOT workshops (sixty-two) that would reduce project completion time. More structured and detailed data gathered from interviews indicated that thirteen approaches, if more widely adopted, would reduce project completion time. The report recommends that FHWA consider the benefits of the thirteen most promising approaches and take actions needed to foster more widespread adoption of those that appear to be the most cost effective. Figure 2.1 displays the thirteen most promising approaches with other data specific to the report:

Nature of Approach	Approach	Percent of respondents rating approach highly[a]	Average rating[b]
Improving project management	Establish early partnerships and coordination	90	4.5
	Revise section 4(f)	70	4.0
	Use geographic information systems	63	3.5
	Establish time frames for environmental reviews	60	3.6
	Prepare preliminary environmental assessment reports	53	3.6
	Establish project milestones and performance monitoring systems	52	3.6
	Employ context sensitive design	50	3.5
	Hold public information meetings early	50	3.5
Delegating review and permitting authority	Use programmatic agreements	68	4.0
	Unify Clean Water Act section 404 and NEPA reviews	58	3.7
	Employ wetlands banking	46	3.5
Improving agency staffing and skills	Use interagency funding agreements	59	3.6
	Provide training	53	3.7

Source: GAO

Figure 2.1 Thirteen recommended approaches from GAO (2003)

Note that of the thirteen highly recommended approaches, eight of the approaches involve environmental or historical aspects of highway projects. The remaining five are general enough to be applied to federal highway construction projects down to local municipality building projects.

The TxDOT research team identified and catalogued fifty methods for expediting highway project schedules. Interestingly, about sixteen of these fifty methods were more or less studied as approaches to reduce completion time in the GAO report. In Appendix A, the TxDOT 0-4386 methods are displayed by overall score (rank) as determined by three workshops with TxDOT and other transportation personnel. Comparable GAO approaches are displayed with their rank.

Of the sixteen methods included in the Expediting Method Selection Tool for TxDOT personnel, five of these were considered as part of the GAO report. Three of the five methods were in the thirteen most promising approaches recommended by GAO. In Table 2.2, the three coinciding methods, indicated in bold, are approaches covered by the two studies and include: use of contractor milestone incentives (establish project milestones and performance monitoring systems), partnering (early partnership and coordination), and train selected field personnel (training). Note that partnering and partnership are not exactly the same because partnering is a management process whereas partnership is a form of business and legal organization. In Table 2.2, an asterisk in the impact rank column indicates that those methods require management action and further study by TxDOT. Again, methods with an impact rank from 1 to 16 are part of the TxDOT Expediting Method Selection Tool.

Table 2.2 Summary of methods in TxDOT EMST for further study, and GAO approaches

0-4386 TxDOT Research	Impact Rank	GAO Report	Rank
Improving environmental assessment during planning	*	Various environmental approaches; Unify NEPA processes, Est. time frame for NEPA process, Pre. environ. assessment reports, context sensitive design, GIS, Wetlands banking, Environ. Information Center, etc.	4, 6, 8, 10, 13, 21
Expediting utility relocation work	*	Utility relocation contracts and (SUE)	45, 35
Expediting ROW acquisition	*	Allow early right-of-way acquisition	18

Use of contractor milestone incentives	**3**	**Establish project milestones and performance monitoring systems**	**5**
Use of contractor milestone incentives	3	Incentive/Disincentive construction contracting	37
Standardized planning approach	*	Single agency point of contact	27
A + B Contracting	5	A + B bidding for construction contracts	40
Incentivize contractor work progress with a lane-rental approach	6	Lane rental construction contracts	43
Partnering	**9**	**Early partnership and coordination**	**1**
Train selected field personnel in scheduling methods and schedule claims prevention	**16**	**Training**	**9**
Design-Build approach	*	Design build contracting	39
Alternative funding methods	*	Interagency funding agreements	7

2.5 Gathering More Detailed Data

As evidenced from the diversity of approaches and strategies in these two studies (this report and GAO), every project is different in nature and has its own unique characteristics. This creates a wide range of possibilities for the use of expediting methods.

After the selection of expediting methods for incorporation into the Expediting Method Selection Tool, the research team started to collect more data regarding the chosen methods and their applicability under different project circumstances. Different circumstances might have different effects on the use of an expediting method. Certain project circumstances can increase the benefit of using a method whereas some circumstances can completely preclude that method from being used. In order to define the typical project circumstances that can be faced during a highway construction project, the research team decided to use expert knowledge. During the interim workshops, the participants who wrote down credible comments on assessment sheets and/or spoke up giving valuable information regarding specific expediting methods were considered as knowledgeable points of contact (KPC) for those methods. In follow-up work, each KPC was asked for opinions regarding the expediting methods with which they were familiar. "Method synopses" and "ballots" were prepared and sent to KPCs to serve this purpose.

2.5.1 Method Synopses

To determine as many different project circumstances which might affect the use of expediting methods as possible, "method synopses" were prepared for each expediting method. A method synopsis consists of a single page which contains the following information for each expediting method (see Appendix B for all of the method synopses):

- A list of "Project Characteristics That Would Leverage Benefits" whenever that method is used
- A list of "Constraints / Limitations in Implementation"
- A small table listing the KPCs who received the respective method synopsis.

A method synopsis was prepared by the research team, for each of the sixteen selected expediting methods, taking into account the comments (from breakout sessions and assessment sheets) collected during the workshops. Later on, each method synopsis was faxed to two or three KPCs. Faxed packages included a cover letter, in which the research team asked the KPC to add to or edit the above mentioned lists (including the KPC list) and fax back their edits to the research team.

A total of twenty-five KPCs were contacted this way. Although the research team tried to make the method synopses simple and not time consuming to revise, the resulting response ratio from the KPCs was not very satisfactory. Only 48% (improved from its initial value of 36% by the help of follow-up calls) of KPCs responded to the fax request. Moreover, most of the returned responses contained no revisions. While this could legitimately be interpreted as approval, the team was looking for more critical feedback. Thus, the research team decided that only using the method synopses on hand to determine the impact of different project circumstances on expediting methods could result in a misleading tool. As a consequence the team agreed to collect more detailed data in order to thoroughly determine the relationships between project circumstances and expediting methods. This time the team decided to use ballots in the form of a questionnaire.

2.5.2 Ballots

Due to the limited response from KPCs to method synopses, the research team initiated a new approach in order to better identify project circumstances that might affect the use of expediting methods. The new approach was to prepare a ballot for each expediting method addressing the project circumstances that may occur during a construction project and asking the KPCs to assess the impact of these circumstances on the potential effectiveness of each expediting method.

The project circumstances considered relevant to each expediting method were selected from the original method synopses and from further literature review. They were then built into the ballots. For review purposes, the following pages show a hypothetical general ballot for a “generic” method with all the project circumstances included (Figures 2.2 to 2.4).

The analogous project circumstances are organized under related categories, such as Project Type, Project Location, Construction Duration, etc. Initially the ballots contained two more categories, Project Phase and Road User Cost, which are still included in the Expediting Method Selection Tool. At that time, the team decided to leave these categories out of the ballots because the answers to these questions could be found from literature review and expertise of the project team. By doing so the ballots became shorter and easier to fill out.

Expediting Method: ALL

Project Circumstances		Precludes Method	Reduce Benefit	Does Not Matter	Increase Benefit
1. Project Type	a) Sealcoat				
	b) Overlay				
	c) Rehabilitate existing road				
	d) Convert non-freeway to freeway				
	e) Widen freeway				
	f) Widen non-freeway				
	g) New location freeway				
	h) New location non-freeway				
	i) Interchanges				
	j) Bridge widening/rehabilitation				
	k) Bridge				
	l) Upgrade freeway to standard				
	m) Upgrade non-freeway to standard				
2. Project Location	a) Rural				
	b) Suburban				
	c) Urban				
3. Construction Duration	a) Short construction duration (<6 months)				
	b) Medium construction duration (6 months - 2 years)				
	c) Long construction duration (>2 years)				
4. Total Project Cost	a) Low contract amount (<$5M)				
	b) Medium contract amount ($5M-$40M)				
	c) High contract amount (>$40M)				
	d) Significant cost uncertainties exist				
	e) Additional funding is not readily available for method implementation				
	f) Other funding problems are anticipated				
5. Construction Schedule	a) Construction completion date is critical				
	b) Intermediate milestones are critical				
	c) End date of project is not clearly defined				
	d) Project is an emergency situation				
	e) Subsequent project(s) exist				
	f) Schedule is not realistic				

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Figure 2.2 General ballot – page 1 of 3

Expediting Method: ALL

Project Circumstances		Precludes Method	Reduce Benefit	Does Not Matter	Increase Benefit
6. Materials & Equipment	a) Project has few concrete structures				
	b) Optimum pavement type is not determined				
	c) There is not enough data to predict material performance				
	d) Material & Equipment logistics are difficult				
	e) Equipment (cranes, bulldozers, etc.) are not readily available				
	f) Dimensional flexibility for concrete structures is needed				
	g) Costly future maintenance and rehabilitation is anticipated				
7. Contractor	a) Conflicts between TxDOT and contractor are likely				
	b) Conflicts between consultant and contractor are likely				
	c) Conflicts between contractor and subcontractors are likely				
	d) Many change orders are anticipated				
	e) Contractor's quality performance on past projects was not to the desired level				
	f) Contractor is not familiar enough with the method for implementation				
	g) Systems are not in place to ensure good communication				
	h) Incentives/disincentives are not well defined				
	i) Systems are not in place to manage incentives/disincentives				
	j) Contractor resistance (on method or other matters) is anticipated				
8. Construction Site	a) Significant ROW acquisition issues exist				
	b) Significant utility relocation issues exist				
	c) The project consists of multiple work faces				
	d) Adverse weather conditions are anticipated				
	e) Lane closures are unavoidable				
	f) Safety hazards are frequent and/or severe				
	g) Project involves many lateral streets, driveways, etc.				
	h) Project involves many adjacent business owners				
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.				
	j) Extreme environmental issues exist or are anticipated				
	k) There is only one apparent Traffic Control Plan option				

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Figure 2.3 General ballot – page 2 of 3

② ③ ④ ⑤

Expediting Method: ALL

Project Circumstances		Precludes Method	Reduce Benefit	Does Not Matter	Increase Benefit
9. Personnel	a) Availability of skilled labor is an issue				
	b) Night or multiple work shifts are not possible				
	c) Personnel resistance to the method is anticipated				
	d) Designers' construction knowledge is not to the desired level				
	e) Field/local level has difficulty in enforcing liquidated damages				
	f) Consultants are not available to help implement method				
	g) Project based TxDOT resources are inadequate (number and/or capability)				
	h) Additional training is needed to implement method				
10. Complexity	a) Roadway geometry is complex				
	b) Geotechnical conditions vary significantly across the site				
	c) Traffic Control Plans are or will be overly complex				
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.				
	e) Project involves girders, bridge decks, retaining walls, piping, etc.				
	f) Project involves underground, earthwork, and pavement activities				
11. Others	a) Public resistance to the method is anticipated				
	b) Lack of technology available to implement method				

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Figure 2.4 General ballot – page 3 of 3

As seen above, the main portion of the ballot consists of five major columns:

Column 1 – Project Circumstances: A number of different project circumstances that can be faced during the execution of a highway project are listed in this column. Each circumstance is grouped under a major category (e.g., Project Type > Sealcoat).

Column 2 – Precludes Method: The first goal of the ballot was to determine whether or not an expediting method is applicable under a particular circumstance. Each circumstance has a “Precludes Method” box next to it. If the circumstance described precluded the use of the method being analyzed, the person completing the ballot was expected to check this box; otherwise it was to be left empty.

Columns 3, 4, 5: This section was divided into three different levels of effect: "Reduces Benefit," "Does Not Matter," and "Increases Benefit" considering the influence of the specific expediting method under a particular circumstance (indicated on the row). Again, if the method was not precluded by the circumstance considered, the person completing the ballot was expected to check one of the three boxes.

Some of the project circumstances shown in Figures 2.2 to 2.4 were found to be completely unrelated to several expediting methods, therefore the research team decided to prepare method-specific ballots which covered only the circumstances that might have an affect on the use of the expediting method being analyzed.

Instead of asking whether or not the methods were applicable under certain project circumstances, the research team assigned different levels of impact (Precludes, Reduces Benefit, Does Not Matter, and Increases Benefit) to each circumstance versus expediting method. The idea was to determine the strength of the relationship between a specific circumstance and a particular method. This could help the team to establish the algorithm for the decision tool. Benefits of this approach are explained in Chapter 4.

To bolster the amount of feedback, the research team sought to find other procedures that might provide more and earlier feedback. To begin with, the number of KPCs that would be asked to fill out the ballots per expediting method was increased to at least four . With help from the project director and coordinator the original list of KPCs that completed the synopsis was refined to target certain designated individuals. The research team decided to build a web site to make ballot completion more convenient, hoping to receive more feedback. A letter informed KPCs of the website and solicited their assistance. Each KPC received the faxed letter and paper ballot (Appendix C). The website and paper ballot contained the same questionnaire; some screenshots of the website are shown in Appendix D. The website ballot sped up the data accumulation process since the data submitted reached the research team instantaneously. Another benefit from the website was that it displayed a list of all sixteen methods and the KPCs were free to choose the ballot(s) for the method in which they are most knowledgeable. This resulted in some KPCs filling out more ballots than initially requested by the research team.

A total of twenty-three KPCs (55% of the initial list) responded to the request, filling out a total of seventy-three ballots. Therefore, the number of assessments per method was about 4.5 [Appendix E shows the sixteen completed method-specific ballots]. When the number of ballots completed reached at least three KPCs per method, the research team used the information to finalize the prototype tool. On average, the KPC's had 16 years of experience and about 5 years of experience with each method. Nineteen of the twenty-three KPCs had participated in the interim workshops. Obviously, the number of ballot assessments per method could be used substantially to refine the tool.

In summary, this chapter described the preliminary research efforts including the results from the initial literature review, the interim workshop approach, and how the information collected in the workshops was used to categorize and select expediting methods that were most beneficial to TxDOT. A list of methods, that require further management actions in order to become applicable, was also presented. More information regarding the preliminary research is found in Simon et al. (2002). This chapter also described the process of gathering more detailed information using method synopses and an Internet ballot. The next chapter (3) contains a detailed description of the sixteen methods included in the Expediting Method Selection Tool. Specifications (special provisions) needed to implement the methods and the current relative frequency of use of the methods is articulated.

3. Analysis of Expediting Methods

3.1 Classification of Methods

Once the initial research was completed, the research team decided to further investigate the sixteen selected methods in order to facilitate tool building operations. Overall, of the sixteen methods included in the method selection tool, seven are initially implemented during late design, five during early design, three during construction, and one during planning and at other times. The phase categories indicated in Table 3.1 are listed according to the optimal time of initial implementation. Note that partnering is usually started in the planning phase but may be convened during other phases. Similarly, training select field personnel generally transpires during the construction phase but could be undertaken in the planning or other phases. To clarify, the project phase categories vary from those presented in the initial research because they were changed to correspond with the phase labels generally used by DOTs and in turn with those used within the tool. Approximately three of the methods are strictly technical/material related and the majority of the methods (eight) involve contract management. The other five methods are a hybrid or mixture of technical and management aspects, mainly involving traffic control.

Table 3.1 Classification of methods by phase and type

Methods	Project Phase	Method Type
Use a Calendar Day Schedule	Late Design	Contract Management
Precast/Modular Components	Early Design	Technical/Materials
Use of Contractor Milestone Incentives	Late Design	Contract Management
Generate & Evaluate Multiple Approaches to Traffic Control Plans	Early Design	Traffic Control
A+B Contracting	Late Design	Contract Management
Incentivize Contractor Work Progress with a Lane Rental Approach	Late Design	Contract Management
"No Excuse" Incentives	Late Design	Contract Management
Maturity Testing	Early Design	Technical/Materials
Partnering	Planning (other phases)	Contract Management
Set Liquidated Damages to the Appropriate Level and Enforce	Late Design	Contract Management
Pavement Type Selection Decisions	Design	Technical/Materials
Seek to Maximize Work-Zone Size	Construction	Traffic Control
Full Closure Instead of Partial Closure Roadway	Construction	Traffic Control
Implement Multiple Work Shifts and/or Night Work	Late Design	Contract Management
Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations	Early Design	Traffic Control
Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	Construction (other phases)	Management

3.2 Individual Method Descriptions

Once a minimum (four) number of ballots were completed for each method, the research team examined usage of the methods within TxDOT, other DOTs, and FHWA on specific projects, TxDOT and FHWA provisions/specifications, and provided a broader description of the methods than had previously been given in the initial research. The coverage of information, references, and data varies greatly depending on the method; therefore the quantity of information examined for one method may differ from that of another. In general, much information was found relative to methods that are undertaken in the late design phase which involves contract management. On the other hand, not as much information was found relative to methods in the construction and early design phases, particularly the four methods that involve traffic control.

Along with a detailed description of each of the sixteen methods, an analysis of the expediting methods was completed to determine key project circumstances that promote use of the methods. An investigation was also conducted to ascertain key project circumstances that act as barriers to the use of the methods. This analysis used the data gathered from the Internet ballots to determine promoters and barriers to use of the expediting methods.

Each method analysis contains a table that displays circumstances that predominantly increase benefits, reduce benefits, and preclude the method. The table for the first method (Use a Calendar Day Schedule) is displayed in the body of this report. All other method ballot analyses are contained in Appendix F. Due to the diversity of the ballot responses and sometimes lack of consensus, the tables only list the circumstances for which a 2/3 majority of ballot respondents agreed. In addition, the tables only list the circumstances for which there existed a clustering of votes in only two adjacent columns within the ballot. In other words, only responses grouped in the following columns were considered: 1) precludes and reduces benefit; 2) reduces benefit and does not matter; and 3) does not matter and increases benefit. For the purposes of categorization, the circumstances that increased benefits are viewed as promoters of the method, whereas circumstances that reduce or preclude that method are generally viewed as barriers to use of the method.

The methods in this section are listed in order of positive impact, as measured in the first-year research, in descending order. Again, a description of each method is listed first and an analysis of each method next. Most of the analyses of method tables are listed in the appendix.

3.2.1 Use a Calendar Day Schedule

This method necessitates scheduling the project according to every day on the calendar. Many times this translates to a 7-day work week. TxDOT special provisions stipulate 5, 6, or 7 calendar days per week and add daily road user definition. Refer to TxDOT Special Provisions SP001-100, SP001-109, SP001-110 for additional information (TxDOT 2003d). Six legal holidays are not counted as working days under the specification definition. Time is charged for all working days without regard to weather conditions and procurement and delivery problems. The time charge may however be suspended by the engineer due to critical activities outside contract control and increased holiday traffic volume. Daily road user costs may be used in conjunction with contract administration liquidated damages as established in the special provisions. Use of calendar days is required with other acceleration strategies such as lane rental, A + B Bidding, and milestone incentives. In the absence of a need for acceleration strategies and for most projects a 5-day per week definition is used (TxDOT 2001a). Other DOTs have similar definitions of calendar days, although some allow suspension of work for weather conditions.

A total of six KPCs or experts completed ballots for Use of a Calendar Day Schedule. An analysis of their responses for this method indicated the following results discussed by category and circumstance. The use of this method was designated as a promoter (increases benefit) for the following Project Types:

- Widen Freeway
- Interchanges
- Bridge widening/ rehabilitation
- Bridge

Some other project type circumstances were shown to increase benefit; however, there were at least 1/3 of the questionnaire participants who felt that these circumstances did not matter. The two project circumstances that fell into this category were "upgrade freeway to standard" and "upgrade non-freeway to standard." For the category Construction Duration none of the methods was determined to be either beneficial or to reduce the benefit as the answers were divided between the different categories. Under this category, the "long construction duration (>2 years)" circumstance was listed as "increases benefit" for 2/3 of the questionnaire respondents and "does not matter" for the remaining 1/3. Under the Total Project Cost category, the categories were all listed as "does not matter." For the Construction Schedule category several showed an increase in benefit, while two had mixed results, with the majority choosing "reduces benefit." Those circumstances that increase benefit include:

- Construction completion date is critical
- Intermediate milestones are critical
- Project is an emergency situation

In this category the circumstance “subsequent project(s) exist” had the majority ballot participants answering that it would increase benefit; however, there were 1/3 of the respondents who chose “does not matter.”

In the final category, Materials and Equipment, the circumstances had mixed results with the majority of votes favoring “reduces benefit” for both circumstances: “material and equipment logistics are difficult” and “equipment are not readily available.” An insignificant number stated that neither of these project circumstances mattered in expediting the process. The previous data is summarized in Table 3.2.

Table 3.2 Promoters to use of calendar day schedule

Use a Calendar Day Schedule	
Category	**Level of Effect/Circumstance**
Project Type	Increases Benefit • Widen freeway • Interchanges • Bridge widening/rehabilitation • Bridge
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation
Construction Site	Increases Benefit • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hours, etc.
Complexity	Increases Benefit • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc. • Project involves underground, earthwork, and pavement activities

3.2.2 Precast/Modular Components

Construction work zones can maximize concurrent work activity with the use of modular, prefabricated components. Precast modular components such as girders, pavement sections, culverts, and retaining walls are common examples. Other examples include concrete bridge segments, noise barriers, traffic barriers, drainage boxes, and other geotechnical materials such as geofoam (FHWA 2003; Merritt et al. 2001). Many TxDOT special provisions establish specifications for usage of the myriad precast/modular components available for a highway project. Some specific special specifications in this area include SS4629 and SS4631 from the Dallas High Five Project (TxDOT 2003d). These specifications establish contractual language for post-tensioning tendons and cast-in-place segmental bridge construction. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F. Subsequent promoter and barrier tables are also contained in this appendix.

3.2.3 Use of Contractor Milestone Incentives

Contractors are financially rewarded for on-time delivery of specific work tasks. This strategy is intended to motivate the contractor to complete the work on or ahead of schedule. It allows a contracting agency to compensate a contractor a certain amount of money for each day identified that critical work is completed ahead of schedule and assess a deduction for each day the contractor overruns the critical work time (Arditi et al. 1997; Arditi and Yasamis 1998; Gillespie 1998). Most DOTs place an upper limit on the total incentives paid based on a maximum number of days for early completion or as a percentage of total construction cost (Herbsman et al. 1995; Jaraiedi et al. 1995; NCHRP 2000).

Many state DOTs used incentive clauses under FHWA's National Experimental and Evaluation Program No. 24 in the early 1980s. The use of incentive/disincentive (I/D) clauses became operational in 1989. A 1991 survey by the Iowa DOT showed that thirty-five states have used incentive provisions (Herbsman et al. 1995). TxDOT did not indicate participation in the survey but has since used incentives in contracts. Little data was found relative to the current extent of use of incentives but it is believed that most DOTs currently employ some type of I/D provision in construction contracts.

Since 1996, TxDOT has used incentive clauses on at least twelve contracts and developed standard provisions for district-wide use (e-Texas 2000). Incentives are established based on Road User Costs (RUC); therefore, RUCs must be significant to merit use of incentives. TxDOT policy establishes that road user costs be considered for projects that add capacity, impact local communities and businesses, and rehabilitate roadways in high traffic volume areas (TxDOT 2002a). If those primary criteria are met then incentives may be used. Other secondary considerations include examining that conflicting utilities are relocated, right-of-way is clear, adequate inspection forces are available, or 25% of daily road user cost is greater than contract administration liquidated damages (CALD). TxDOT special provisions stipulate the assessment of road user costs and CALD for these types of projects. Incentives or credits for substantial completion of the project or phase ahead of time are also covered in special provisions SP008-151 and SP008-152 (TxDOT 2003d).

Recent examples of use of incentive payments are the Dallas High Five (DHF) Project and Loop 1 in Austin. Daily incentive payments are $32,000 and $14,000 on these respective projects for early completion of the project. This daily incentive and a time cap dictate the maximum allowable bonus payment and the number of days payable. For the DHF project the maximum total incentive is $11,520,000. Maximum milestone incentives for the DHF project range from $5,000 to $100,000 according to SP008-194 (TxDOT 2003d). For projects that include incentives, the amount and road user cost are shown on the plans in accordance with TxDOT special provisions. An adequate inspection force must be available due to the requirements of a critical path method schedule by the contractor. Disincentives may be used alone without incentives on projects with high risk of utility conflicts (TxDOT 2002a). Other types of incentives such as "no excuse" and substantial completion incentives may also be used with or without milestone incentives. Note that "no excuse" incentives and liquidated damages are described later in this chapter. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.4 Generate and Evaluate Multiple Approaches to Traffic Control Plans

Traffic control plans drive both the project schedule and the impact of construction in traffic operations. Many times the use of incentives and disincentives depends on the effectiveness of the traffic control plan (TxDOT 2003e; Graham 1994). Some TxDOT guidelines for traffic control plans are established in the *Project Development Process Manual* (TxDOT 2003c). According to this manual the traffic control plan consists of a sequence of construction plan, detour plan, temporary signing, striping, and pavement markings, and contract provisions. A review of the plans must be conducted. The manual only refers to generation of a single traffic control plan; however, this may be due to final approval of only a single traffic control plan for a given project. Special provisions may address work hour restrictions, lane closure restrictions, access to work area, and use of law enforcement personnel.

A specific case illustrates the need to generate and evaluate multiple TCPs. The Mockingbird Bridge, located on the North Central Expressway in Dallas, involved replacement of a bridge in a dense urban area and was accompanied by a complex TCP. Although the designer had expended much time and money on the TCP, the reconstruction plans were too complicated. Because of this and a tight project schedule, TxDOT and the contractor were compelled to evaluate other TCPs prior to construction. The investigation produced a final TCP with fewer steps, and most importantly significant cost and time savings. Additional cost and time savings would likely have resulted if the designer had originally performed such a thorough analysis of the TCP (O'Connor and El-Diraby 2000). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.5 A+B Contracting

A+B contracting (also called A+B bidding and cost plus time) is a procedure that incorporates the lowest initial cost, but also factors into the selection process the added cost of time to complete the project. The time cost for bidding is calculated by multiplying the estimated time of the project by a set daily road user cost (RUC). The bid for award consideration is based on a formula comprising the traditional bid price by the contractor (A) and the amount of time allowed for the project (B), and is computed as: award bid = (A) + (B) x (RUC/day). This formula is used to determine the lowest effective bid for award, and not contractor payment (El-Rayes 2001; FHWA 1998b; Herbsman 1995).

Under FHWA Special Experiments Projects No. 14 (SEP-14), twenty-seven states and the District of Columbia used the A+B contracting method, including TxDOT. Currently, A+B contracting is no longer considered experimental, having gone through a 5-year test period and then declared operational on May 4, 1995. To date, thirty-eight state DOTs and the District of Columbia have used the A+B contracting method. At least six states have used this contracting strategy on an active basis: Maryland, Michigan, Missouri, New York, Oregon, and South Carolina (FHWA 1998b). New York has used the method on at least sixty-five projects and reportedly saved an estimated 8,500 contract days or the equivalent of $100 million (NCHRP 2000, NCHRP 2001a).

TxDOT has made very limited use of A+B contracting. Between 1983 and 1987, TxDOT used A+B contracting on at least ten projects (McFarland et al. 1994). However, there is no record of TxDOT using A+B contracting over the next 10 years. Moreover, subsequent to 1997, there have been only three projects let using A+B contracting (e-Texas 2000). One of these projects was located on I-10 Loop 410 in San Antonio which is discussed later in this section. The reason behind the limited use of A+B contracting within TxDOT is unclear. Herbsman et al. indicated that TxDOT experienced significant friction from the contractor on at least two different projects (1995). Perhaps one limiting factor is the use of A+B contracting only on projects with a high construction contract amount and high road user costs. A report for the Texas comptroller indicated that between the years of 1995 and 1999 only fourteen contracts were let that had costs in excess of $50 million (e-Texas 2000). With projects such as Dallas High Five and Austin Loop 1 and SH-45, as well as other projects let since 1999, the number of projects over $50 million has increased and will increase in the future. This contrasts with findings by Herbsman et al., who studied 101 A+B contracts and found that there was no special trend between construction contract amount and the use of this method (1995). Another significant barrier to use of this method may be the calculation of RUC.

Current TxDOT policy establishes that A+B provisions should be considered for large and/or highly critical projects in high volume traffic areas. Furthermore, projects that require early completion are recommended to use this method (TxDOT 2001a). A+B bidding may be applied to an entire project, project phase, and/or critical portion of the project. To use the method effectively the contractor and TxDOT must have maximum controls over the project. All right-of-way needs to be acquired and utilities adjusted before construction commences. In general, A+B contracting should include incentive and disincentive milestones. Therefore, all of the provisions and stipulations established for incentives, and covered earlier in this chapter apply to A+B contracting. A maximum allowable bonus or incentive payment must be set based on the road user cost. An additional stipulation on use of this method is that the project must have an RUC above $40,000 per day or have a significant impact on local businesses (TxDOT 2002a). Specifications in addition to those used for milestone incentives must be included for A+B contracting. Special provisions require the contractor to submit the number of working or calendar days to substantially complete the project. Other provisions indicate contractual modifications to include multiple time elements for various phases. Refer to TxDOT SP002-085, SP003-041, and SP009-054 for more information (TxDOT 2003d). A customized schedule of liquidated damages may be required for A+B contracting (TxDOT 2003b). Ultimately, the district engineer makes the decision to utilize this method.

A recent application of cost plus time bidding was on two major interchanges on I-10 Loop 410 in San Antonio. The project cost was $50 million with 805 days allotted for construction. The contractor may earn $33,500 per day in incentives for each day up to 45 days that the project is completed early. Likewise, a disincentive of $22,500 per day exists for every day construction is late. The contractor believes that the A+B method will save 25% off the schedule (ENR 2000). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.6 Incentivize Contractor Work Progress with a Lane Rental Approach

In general, lane rental provisions assess the contractor daily or hourly fees for each lane, shoulder, or combination taken out of service during a project to minimize the time that roadway restrictions impact traffic flow. Similar to A+B bidding and milestone incentives, the aim of lane rental is to compel the contractor to minimize road user impacts during construction. The lane rental fee is established from the estimated cost of delay or inconvenience to the traveling public. In general this amount is calculated from the road user cost. The contractor is informed of the use of the lane rental fee by contract provision. Deduction of the fee from the monthly progress payment occurs when the contractor uses or obstructs part of the roadway. The units used for lane rental fees are typically dollars per lane per time, which could be quarter hours, hourly, or daily. Lane rental rates vary depending on the time of day and location of lane closure and a detailed rate, time, and location schedule is typically established in the contract specifications (NCHRP 2000). Because road user costs dictate lane rental fees, they may cover a broad range of values from several hundred dollars to several hundred thousand dollars per hour. Overall the intent of lane rental is to encourage contractors and subcontractors to schedule work to keep traffic restrictions to a minimum, both in terms of duration and number of lane closures (FHWA 1998b).

Lane rental strategy has been used extensively by the British Department of Transport and in fact originated in the United Kingdom about 1984 (Herbsman et al. 1995). This department has used lane rental on at least thirty-one projects with an average daily lane rental fee of about $13,000/day (Herbsman and Glagola 1998). In the United States, FHWA began evaluation of the lane rental technique in about 1990. Under Special Experimental Project No. 14, five states assessed the strategy including Colorado, Indiana, Maryland, Oklahoma, and Oregon. Currently lane rental is no longer considered to be experimental, having gone through a 5-year test period and then declared operational on May 4, 1995. At least six states, including Texas, have experimented with and or used the lane rental strategy (FHWA 1998b; Herbsman and Glagola l998).

Lane rental is being utilized with increasing frequency within TxDOT. Both the Houston and Dallas districts have used or are using lane assessment or rental on multiple projects. The Houston District prefers to use the phrase lane assessment instead of lane rental due to possible liability problems. Under the Houston special provision (SP008-231) the assessment fee, peak hour traffic times, and other stipulations are shown on the plans (TxDOT 2003d). For the Dallas District and the Dallas High Five project, hourly lane rental fees are displayed in a table in SP008-193 (TxDOT 2003d). This document establishes an hourly rental fee of $110,000 for closure of three or more lanes during peak hours. The credit hours are provided to be used initially at the start o f the contract and the contractor won't be charged any lane-rental fees (or assessments) until he runs out of credit hours. The credit hours are transferable between different time categoriess (peak, off-peak, etc.) based on their value. Using a similar format to that of Dallas, the Austin District is using lane rental fees on at least three contracts associated with SH-130. These three contracts include extension of Loop 1 and two segments of the north portion of SH-45. The hourly lane rental fees on these projects are considerably smaller, on the order of several thousand dollars per hour, than those of the Dallas High Five project. Refer to SP008-268, SP008-269, and SP008-273 (TxDOT 2003d).

In order to implement the lane rental method the engineer is encouraged to modify SP008-151, usually used for milestone incentives. Other sample special provisions include 008-193 and 008-268. According to TxDOT policy, disincentives should be based on road user cost which may vary considerably for daytime and nighttime work. TxDOT endorses the use of this strategy for reconstruction, rehabilitation, and restoration projects affecting normal lane usage and traffic flows (TxDOT 2001a). Careful planning for use of lane rental must begin in the early phases of a project to strategically develop traffic control plans and road user costs (Herbsman and Glagola 1998). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.7 "No Excuse" Incentives

In this method the contractor is given a "drop dead" or "firm delivery date" with no excuses for missing the date. The method may be used for completion of an entire project or phase. If the work is completed prior to this date, the contractor will receive an incentive or bonus payment. The method is implemented to provide the constructor with a substantial bonus to complete the project within a specified time frame regardless of unforeseen conditions or any other problems. There are no excuses for reasons such as ordinary weather delays (excludes hurricanes and other catastrophic events) for not making the completion date. Award of the incentive is predicated on meeting the firm delivery date that is established on the plans or in the specifications. The amount of the award is calculated based on road user costs, construction contract amount, and the added value of use of the project by a critical date. Generally there are no disincentives for not meeting the firm delivery date other than contract administration liquidated damages (FHWA 1998b). However, TxDOT specification on the Dallas High Five project specifies calendar days for computation of Incentives only. For the purposes of computing disincentives (either CALD or RUC) modified contract duration is to be used. Modified contract duration provides additional days to account for delays due to utility conflicts, ROW delays and other things like that. The Dallas High Five is using a firm calendar duration of 1800 days for computing incentives. The incentive for substantial project completion is the most expensive in the history of TxDOT. It is $32,000/day for a total of 360 days and if the contractor meets the deadline he can potentially earn $11.52 million.

"No excuse" incentives were first approved for use on federal aid projects within Florida (FDOT 2000). This approval was granted by FHWA on September 12, 1996 (FHWA 1998b). The North Texas Tollway Authority uses "no excuse" incentives on many of their contracts. TxDOT is currently using the method on at least two construction projects for the completion of Loop 1 and SH-45, concurrent with work on SH-130 in Austin. The first two projects have special provisions that stipulate substantial completion by July 14, 2006 for a total of $3,700,000 in incentives between the two contracts, according to SP008-369, SP008-268 (TxDOT 2003d). These provisions are very strict and no excusable delay will be granted for "archeological investigations, delays due to change orders, utilities, right-of-way, railroad issues" (TxDOT 2003d). The contractor is also barred from submitting a claim for the incentive if substantial completion is after the drop dead date. Currently, TxDOT does not have a generic sample special provision to implement this method. However, one manual provides some formal guidance on the use of "no excuse" incentives (TxDOT 2002a). As described previously in this chapter, TxDOT uses milestone incentives with or without "no excuse" incentives. Within TxDOT, the substantial completion incentive is very similar to the "no excuse" incentive. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.8 Maturity Testing

Maturity testing allows an engineer or manager to make appropriate decisions considering the speed at which the concrete can achieve a certain strength. Initially, various concrete placement and sequence options may exist, and with the use of maturity testing on significant concrete items on the critical path the project can proceed more quickly. Maturity testing consists of sensors placed in the concrete and hand-held readers to measure the temperature and then with calibration predict the in-place strength gain. The method measures temperature and strength at the project site as opposed to conventional testing and measurement in the laboratory.

FHWA reports that the maturity concept was first proposed about 1945, however interest in the method revived considerably in the mid-1980s (FHWA 2002b). A significant number of states currently use maturity testing. A study conducted by the Pennsylvania Transportation Institute found that thirteen states had a procedure for use of maturity testing and many had used the method (Tikalsky and Tepke 2001). Nine states known to have used the maturity method include Pennsylvania, Oregon, New Jersey, New York, Florida, New Mexico, Oklahoma, Iowa, and Texas. The most common use of maturity meters is on concrete pavements but they are also used on bridge columns and caps to open the pavement or structure earlier to the public.

TxDOT began use of maturity testing in 1995 on the Dallas North Central Expressway and has continued use of the method on the Dallas High Five project. Overall the wait on some structures to mature has been cut 2-5 days. Recent use of maturity testing on an emergency bridge reconstruction in eastern Oklahoma (I-40) allowed rapid form removal and completion of the project 10 days ahead of schedule (FHWA 2002b).

Within TxDOT, material and testing requirements are established in the *Manual of Testing Procedures* (TxDOT 2002d). The specific procedure, Tex-426-A, explains the development (calibration), estimation, and verification of the strength-maturity relationship. Note that this procedure still requires physical tests such as the minimum casting of either three cylinders or beams and the measurement of temperature, slump, and air content at time of placement (TxDOT 2002d, ASTM 1998). Any alterations to the mix design must be closely tracked and new strength-maturity relationships developed and calibrated. Other TxDOT special provisions such as SP420-017 and SP420-014 establish other minimum testing requirements such as the necessity of core testing and payment procedures (TxDOT 2003d). Maturity testing has been used extensively on the Dallas High Five project to ascertain the strength in all structural and miscellaneous concrete including cast-in-place bridge slabs, tie beams, columns, caps, and box culverts. Other districts such as Houston, El Paso, and Lubbock have also used maturity testing. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.9 Partnering

Partnering is generally a formal management process in which all parties to a project voluntarily agree at the outset to adopt a cooperative, team-based approach to project development and problem resolution. Conferences, meetings, and workshops can be used to promote partnering concepts. In contrast with arbitration and mediation that involve dispute resolution, many view partnering as a dispute avoidance technique that can help to remedy the adversarial relationships that often exist in construction contracts. From a legal standpoint partnering is not a form of organization or association; however, it is a "concept that every contract has an implied covenant of good faith and fair dealing" and that stakeholders strive for the mutual achievement of goals and objectives (Nelson 2002). Along with the essential elements already mentioned, a partnered project must have the commitment of top management from each contractual party; then disputes that arise must be resolved at the lowest organizational level in the course of the project (Carr et al. 1999; NCHRP 2000, Thompson et al. 1996).

The U.S. Army Corps of Engineers first used partnering in the late 1980s, with the U.S. Naval Facilities command following shortly thereafter. Grajek et al. reported that by 1999, forty-seven DOTs were using partnering on highway projects (2000). Leading state DOTs in terms of usage and effectiveness of partnering are Arizona, Florida, and Texas (Grajek et al. 2000). Partnering was introduced in TxDOT in the spring of 1992 on five pilot projects. From 1992 through 1995, TxDOT partnered 210 projects with a reduction in project cost and duration

(Grajek et al. 2000). Some studies have advocated use of partnering on virtually all TxDOT contracts, while others recommend use on projects over $5,000,000. Most studies agree that partnering should be applied to expensive and complex projects (Grajek et. al. 2000; Gransberg et al. 1999).

According to TxDOT special provisions, partnering promotes trust, mutual respect, integrity, and fair dealings; these characteristics have remained constant. However, many other aspects of partnering have changed over the last ten years (NCHRP 2001b). Partnering specifications have changed at least six times in the last decade. TxDOT Special Provision SP000-2169 no longer mandates either formal or informal partnering as was the case under partnering plus, SP000-1754. As stipulated by the most recent special provision, partnering is handled on a voluntary basis and may be initiated by TxDOT or the contractor (TxDOT 2003d). An exception to this is indicated on the plan or in the bid advertisement. The partnering workshop may last from a few hours to two days and utilizes a TxDOT or outside contract facilitator to guide discussions. The contractor and TxDOT equally share the cost of partnering. Partnering should address issue escalation and review potential problems, also referred to as "Rocks in the Road." Representatives from all project stakeholders should attend partnering workshops especially utility companies, city and community agencies, businesses, and business associations (TxDOT 2002a). Partnering may also be used to establish relationships with new or previously used contractors or consultants. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.10 Set Liquidated Damages to the Appropriate Level and Enforce

The liquidated damages provision allows a contracting agency to reduce payment to the contractor by a certain amount of money for each delayed unit of time, usually measured in days. Normal liquidated damages represent the additional administrative and supervisory costs incurred by contracting agency to support the contract beyond the established completion date. Normal liquidated damages do not consider impact to the traveling public (Gillespie 1998). Liquidated damages always act as a contractual disincentive and never provide an incentive. Liquidated damages, although not labeled as such, have existed for hundreds of years under English common law. Damages of this type were first enacted in Texas courts in the late 1890s and early 1900s. Highway contracts used liquidated damages with increasing frequency in the

1960s, although schedules of liquidated damages were used later in the 1970s, as developed and promulgated by FHWA.

In order for courts to enforce liquidated damage clauses the actual damage amount must be difficult to estimate and not viewed as a penalty. Courts have generally examined four items to resolve liquidated damages disputes: 1) Existence of a liquidated damage clause; 2) Intentions of the owner; 3) Difficulty of predicting actual losses; and 4) Reasonableness of liquidated damage sum (Thomas et al. 1995). Few court cases exist that set precedent within DOTs regarding liquidated damages. This is probably because state DOTs possess near immunity from litigation and many allowed claims are resolved before reaching an appellate court level. This definition and court enforcement relates to normal or standard liquidated damages.

Within TxDOT there are two types of liquidated damages. The first is called contract administration liquidated damages (CALD), which is the same as normal or standard liquidated damages. The second type is defined as road user cost liquidated damages (RUCLD). Contract administration liquidated damages are based on the size of the project in terms of the amount of the construction contract.

The CALDs are used to compensate TxDOT for administration and staff support on a project site beyond the original completion date. The TxDOT Finance Division establishes these rates yearly based on previous construction engineering costs, which are historical direct costs based on the dollar size of construction projects (TxDOT undated). Special provisions, usually in the form of a table, reflect the magnitude of CALD per working day. Table 3.3 illustrates the fluctuation in CALD over the past 20 years.

Table 3.3 TxDOT contract administration liquidated damages (CALD) by contract amount from 1982 to 2002

Contract Amount (1982 to 2001)		CALD Amount Per Working Day ($/day)									Contract Amount (2002 to Present)	
From More Than	To and Including	Date of Special Provision									From More Than	To and Including
		Jan-82	Mar-93	Nov-94	Mar-96	Nov-96	Nov-97	Apr-00		Jan-02		
$0	$100,000	$63-$154	$250	$300	$350	$450	$350	$350		$250	$0	$100,000
$100,000	$500,000	$210	$450	$500	$600	$450	$450	$450		$400	$100,000	$500,000
$500,000	$1,000,000	$315	$600	$800	$800	$700	$650	$650		$600	$500,000	$1,000,000
$1,000,000	$2,000,000	$420	$750	$1,000	$1,000	$850	$750	$800		$700	$1,000,000	$2,000,000
$2,000,000	$5,000,000	$630	$950	$1,200	$1,200	$1,200	$1,000	$950		$900	$2,000,000	$7,500,000
$5,000,000	$10,000,000	$840	$1,250	$1,500	$1,600	$1,550	$1,350	$1,250		$1,100	$7,500,000	$10,000,000
$10,000,000	$15,000,000	$1,050	$1,300	$2,000	$2,200	$2,000	$1,800	$1,600		$1,500	$10,000,000	$17,500,000
$15,000,000	$20,000,000	$1,260	$1,450	$2,100	$2,300	$2,350	$2,200			$1,900	$17,500,000	over $17,500,000
$20,000,000	over $20,000,000	$1,500	$2,000	$2,500	$3,400	$3,100	$2,700	$2,700				
	Special Provision	(McFarland et. al 1987)	SP000-011	SP000-573	SP000-1444	SP000-1781	SP000-2047	SP000-2693		SP000-3352		

Note: This table only includes contract administration liquidated damages (CALD) and does not reflect road user cost liquidated damages (RUCLD).

Over the past ten years TxDOT has adjusted the amount of CALDs at least seven times. The highest CALD was established in 1996 at a level of $3,400 for contracts in excess of $20,000,000. Current (2002) CALDs range from $250 to $1,900 for contracts less than $100,000 to more than $17,5000,000 (TxDOT 2003d). The magnitude in the decrease of the highest amount of CALD is somewhat perplexing, but could be based on diminished construction engineering costs over the last five years. As dictated by TxDOT policy, CALDs are used in the majority of TxDOT projects (TxDOT 2002a, TxDOT 2003b). Many individuals hold the opinion that CALDs, used alone, are insufficient to encourage contractors to complete large, mainly urban projects on schedule (TxDOT undated).

For this reason and others a second type of liquidated damages is necessary. Road user cost liquidated damages (RUCLD) are based upon delays and inconvenience that the users of the facility experience due to delayed project completion. Road user costs may also be referred to as travel delay cost because of the driver's lost time. Road user costs include the cost of driver's time, vehicle operation, accident clean-up, and sometimes environmental factors (TxDOT 2002a). Stated another way, "road user costs are the difference between the cost of operating through the construction zone and the cost of operating through the same highway segment with the construction project completed" under optimal circumstances (McFarland et al. 1987). The calculation of road user cost requires computation and sometimes extensive traffic modeling. The main variables in the computer programs are traffic volumes, percent trucks, and geometric conditions before, during, and after construction. At least eight different computer programs have been used to calculate road user costs. No single official TxDOT publication was found that established guidelines for use of these programs; however, other TxDOT guidelines establish the use of a manual method (TxDOT 1999a; TxDOT 1999b). On the high end, it is common for road user costs to range from $30,000 to $300,000 per day in urban areas. On the other end, road user costs may only be several hundred dollars per day (McFarland et al. 1987; TxDOT 1999b).

As with milestone incentives and A+B contracting, certain TxDOT criteria must be met for use of road user costs. If the initial criteria are met, then RUCLD are calculated and implemented as 25% of the calculated road user costs. The total liquidated damages are then calculated by adding CALD and RUCLD. RUCLD may be used with or without incentives, dependent on the existence of extremely high road user cost, more than $40,000 per day, and possible utility conflicts (TxDOT 2002a).

Within the Houston and Dallas districts where heavy traffic congestion may exist, RUCLD limits between $10,000 to $15,000 per day have been used over the last five years on various projects (ENR 1998; TxDOT undated). Rates in excess of these amounts may have seemed to be penalties or strictly unjustified. However, Texas Transportation Code section 223.012 (a)(1) requires development of liquidated damages that accurately reflect not only costs associated with administrative support, but also road user costs (TxDOT 2003b). To this end, TxDOT recently awarded a contract for the extension of Loop 1 and FM 1325 in Austin with total liquidated damages of $31,900 per diem. Reviewing the calculation of this amount one may conclude that CALD are less than 6% ($1,900) of the total, with RUCLDs of $30,000, and therefore actual road user costs of $120,000. For additional information refer to SP008-269 (TxDOT 2003d).

To clarify this method, setting liquidated damages to the appropriate level refers only to RUCLD and not CALD, since these are set by specification. Total liquidated damages must be enforced by use of a CPM schedule and concomitant increased support personnel in sufficient numbers to assist the owner and contractor (TxDOT 2003d). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.11 Pavement Type Selection Decisions

The two types of pavement generally considered are rigid and flexible pavements, as typified by Portland cement concrete pavement (PCCP) and asphalt concrete pavement (ACP), respectively. Quick-curing concrete, other flexible pavements, and in-place recycling may also be considered as pavement designs. An innovative pavement that may reduce traffic delay and road user cost is the use of precast concrete panels. The panels may be set in place, assembled quickly, and post tensioned with grouting done at a later time. The precast concrete panels were recently used on a pilot project in Georgetown, Texas (Merritt et al. 2001). On some projects, pavement and subbase costs typically constitute the single largest project expense, but these items may not be on the critical path. Even so, life cycle cost analysis using the selected pavement usually determines the feasibility and ultimate priority of the project (AASHTO 1993;

Haas et al.1994; Peterson 1985). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.12 Seek to Maximize Work-Zone Size

Larger work zones can be developed in the traffic control plan and generally result in lower unit costs and schedule compression because the relative impacts of mobilization and demobilization are reduced. Effects to the drivers of the road due to added congestion and impacts to adjacent businesses must be considered (FHWA 2001, Graham 1994). Over all, the safety of both the construction worker and the driver is the key factor in determining work-zone layout and size. In the United States in 2000, there were 1,026 persons killed in work zones, with drivers accounting for 84 percent of the total. These statistics, though somewhat surprising, show that drivers are at a much higher risk of injury than construction workers. Recently the North Carolina DOT, FHWA, and law enforcement from North Carolina met in a workshop to examine how to make work zones work better (FHWA 2002a; FHWA 1998a). The use of innovative traffic control devices, new technologies, and traffic modeling were covered in the FHWA workshops. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.13 Full Closure Instead of Partial Closure of Roadway

Closing the roadway completely instead of partially may increase efficiency and decrease duration significantly by allowing full site access and reducing interferences. Full closure may be especially applicable to low volume or rural roads with the availability and capacity of alternative routes as the primary decision factor. On the other hand, a lack of public support may be the single largest deterrent to use of full closure. Full closure need not be used over the entire project duration, but could be used for off-peak or night-time closures (TxDOT 2003c; TxDOT 2003e). Reconstruction of Interstate 15 in Salt Lake City, prior to the 2002 Winter Olympics, utilized full closure of the roadway on primarily weekends and some weekday nights (Schexnayder 1999). This method worked well on this project, reducing construction completion time significantly. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.14 Implement Multiple Work Shifts and/or Night Work

This method calls attention to safety and night traffic control plans. The traffic control used for night work is often the same as that used for daytime work zones, despite the potential adverse conditions that may be encountered. Another consideration is the difference in road user costs that exist from day to night-time due to traffic volume and composition (Elrahman and Perry 1998; Hancher and Taylor 2001). This factor alone may warrant use of different TCPs for day and night-time work. The deployment of multiple work shifts may also depend on the magnitude of road user cost. Another significant issue during night-time construction is noise (Schexnayder 1999). In general, higher RUCs occurring on large, complex, urban projects nearly always require multiple work shifts. The Oregon DOT conducted research that showed that six factors are most important to examine when considering night work: safety, quality, public relations, worker conditions, productivity, and scheduling. This research developed a decision-making model to determine when to conduct night-time or daytime work (Douglas and Park 2003). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.15 Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations

Partnering between TxDOT and contractors for the purpose of developing and reviewing traffic control plans could lead to a more schedule-efficient approach and hence more efficient design and construction. Partnering in this application seeks to promote a harmonious relationship where TxDOT and contractor adopt a team- based approach to development or revision of traffic control plans (Carr et al. 1999; Graham 1994). Consultants or researchers may also be hired to analyze and evaluate the plans. These researchers may even propose the final TCP. An example of this type of partnering occurred on the Mockingbird Bridge, North Central Expressway, Dallas. The original reconstruction plans were too complicated in terms of the construction sequence. With project construction looming, TxDOT personnel, with the use of an outside research team, met with contractor representatives to discuss many ideas regarding the bridge reconstruction. The partnering team examined the alternatives by several criteria including: traveler safety, worker safety, accessibility, carrying capacity, project duration, and project direct cost. In the end, many suggestions were reduced to two, and then based on the criteria a final plan was selected. The result of the partnering was a single bridge construction plan that involved fewer steps; most importantly, significant cost and time savings were realized. The partnering teams' plan also ameliorated constructability issues that existed in the original plans (O'Connor and El-Diraby 2000). For further discussion of the partnering process review the partnering section in this chapter. An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.2.16 Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention

Quick schedule adjustments and short interval planning can minimize schedule delays due to missing materials or information. Having trained personnel who can assess schedule impacts and make sound decisions may help to expedite schedule performance and lead to more effective and realistic time estimates. According to TxDOT special provisions, the use of CPMs is required for milestone incentives, A+B contracting, and "no excuse" incentives (TxDOT 2003d). Training field personnel would certainly help improve the accuracy of contract time determination when using these types of incentive-based methods (CII 1988; NCHRP 1981). TxDOT offers a training course in critical path scheduling for design and construction personnel (TxDOT 2002c). An analysis of the ballot results relative to promoters and barriers for this method is contained in Appendix F.

3.3 Method Specifications and Other Rankings

Derived from the individual method descriptions, Table 3.4 presents a collection of all methods listing pertinent TxDOT special provisions and special specifications as used on statewide or multi-district level and one-time or past use. These provisions are neither exhaustive nor comprehensive; in some instances no provisions were found for a given method. Additional guidance on the use of some of the methods can be found in the TxDOT *Accelerated Construction Strategies Guideline* manual (TxDOT 2001a; Gibson et al. 2001). This manual contains guidance on the use of contracting strategies that use incentives and disincentives such as milestone incentives, lane rental, calendar day schedule, A+B contracting, and road user cost liquidated damages. Within this manual is a table with notations that provide guidance on contracting strategies and contract provisions (TxDOT 2001a). Additional sources of information are provided in the Expediting Method Selection Tool (EMST), including web links. Tables 3.5 and 3.6 provide a subjective ranking of the approximate current use of the methods and TxDOT personnel familiarity with the methods. These ranks were partially assembled from data gathered in the interim workshops relative to relevancy, doability, and impact. These ranks also consider the comments from the ballot respondents and demonstration seminar participants as well as information amassed from the literature search and method analysis results.

Table 3.4 Compilation of TxDOT specifications

Methods	Statewide or Multi-District Use	One-Time or Past Use
Use a Calendar Day Schedule	SP001-108, SP001-109, SP001-110	
Precast/Modular Components		SS4629, SS4631
Use of Contractor Milestone Incentives	SP008-151, SP008-152	SP008-194, SP008-269
Generate & Evaluate Multiple Approaches to Traffic Control Plans		
A+B Contracting	SP002-085, SP003-041, SP009-054	
Incentivize Contractor Work Progress with a Lane Rental Approach	SP008-231	SP008-193, SP008-268, SP008-269, SP008-273
"No Excuse" Incentives		SP008-268, SP008-269
Maturity Testing	SP420-014	SP420-017, SS5459
Partnering	SP000-2169	SP000-1754
Set Liquidated Damages to the Appropriate Level and Enforce (RUCLD)	SP000-3352, SP000-151	SP000-2693
Pavement Type Selection Decisions		
Seek to Maximize Work-Zone Size		
Full Closure Instead of Partial Closure Roadway		
Implement Multiple Work Shifts and/or Night Work		
Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations		
Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	SP008-118	

Table 3.5 Approximate current use of methods within TxDOT

Ranked from Most to Least Frequently Used	
Method	**District**
Pavement Type Selection Decisions	All
Precast/Modular Components	All
Use a Calendar Day Schedule	All
Seek to Maximize Work-Zone Size	All
Generate and Evaluate Multiple Approaches to TCPs	All
Implement Multiple Work Shifts and/or Night Work	All esp. Houston, Dallas, San Antonio, Austin
Partnering	All
Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	All
Set Liquidated Damages to the Appropriate Level & Enforce (RUCLD)	All
Use of Contractor Milestone Incentives	Houston, Dallas, San Antonio, Austin, Others
Incentivize Contractor Work Progress with Lane Rental Approach	Houston, Dallas, San Antonio, Austin
Maturity Testing	Dallas, Houston, El Paso, Lubbock
Develop Traffic Control Plans through Partnering between TxDOT Design & Field Organizations	Dallas
Full Closure Instead of Partial Closure of Roadway	
A+B Contracting	San Antonio, Dallas, Houston, Austin
"No Excuse" Incentives	Austin

Note: Does not include use of methods within North Texas Tollway Authority or other toll authorities; methods are ranked in rough order with the most commonly used methods first; methods used most frequently on TxDOT projects during the last five years.

Table 3.6 Approximate rank of familiarity of method within TxDOT

Listed from Most to Least Familiar Methods
Method
Use a Calendar Day Schedule
Partnering
Pavement Type Selection Decisions
Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention
Seek to Maximize Work-Zone Size
Use of Contractor Milestone Incentives
Implement Multiple Work Shifts and/or Night Work
Precast/Modular Components
Incentivize Contractor Work Progress with Lane Rental
A+B Contracting
Generate and Evaluate Multiple Approaches to TCPs
Develop Traffic Control Plans through Partnering between TxDOT Design & Field Operations
Full Closure Instead of Partial Closure of Roadway
Set Liquidated Damages to the Appropriate Level & Enforce (RUCLD)
Maturity Testing
"No Excuse" Incentives

Note: Does not include use of methods within NTTA or other toll authorities.

3.4 Collective Circumstances Analysis for All Methods

Once the individual methods were described and scrutinized, the circumstances were ranked and compared to each other. This analysis was used to validate the collective ballot results. The coefficients are a numerical value assigned to each circumstance which correlates with ballot results and represents relative effectiveness of use. The process of generating the coefficients is described in Chapter 4. The circumstances were ranked by the sum of coefficients from highest to lowest sum. An additional qualifier catalogued the circumstances into two groups. One group was organized with categories that exist for all projects (categories 1-6); the second group contains categories unique to projects (categories 7-14). The two groups of categories made analysis easier. Categories are broken down into smaller components called circumstances. In general the order of the circumstances parallel what logic and common sense would dictate. The project team interpreted this initial order as significant in that the tool appears to provide valid recommendations. From the first six categories the circumstances planning, high road user cost, and design ranked the highest. Eight of the next nine highest circumstances were from the Type of Work category. In descending order these Types of Work include:

- Interchanges
- Widen freeway
- Upgrade freeway to standard
- Convert non-freeway to freeway
- Bridge
- Bridge widening/rehabilitation
- Upgrade non-freeway to standard

The Project Location was also significant with urban and suburban locations ranking next. High contract amount and long construction duration were not as significant as originally surmised but ranked next. These high-scoring circumstances are promoters to expediting project delivery.

The lowest-scoring circumstances from categories one through six are not from a single category; in fact, these circumstances come from all six categories. The lowest-scoring circumstances from lowest to highest include:

- Low road user cost
- Sealcoat
- Overlay
- Low contract amount
- Rural project location
- Medium contract amount
- Short construction duration
- Construction phase

These low-scoring circumstances are barriers to expediting project delivery. The rank order of all of the circumstances from categories 1 through 6 is shown in Appendix G.

An analysis of categories 7 through 14 proved useful in that it found two common barriers that hinder project delivery and completion. The analysis of promoter and barrier circumstances is discussed and displayed next. Again the order of the circumstances parallel what logic and common sense would dictate. In general the highest scoring circumstances from these categories came from Construction Schedule, Construction Site, and Complexity. The nine promoter circumstances from these three categories in descending order of score:

- Construction completion date is critical
- Intermediate milestones are critical
- Traffic patterns involve dominant traffic periods, rush hour, etc.
- Project is an emergency situation
- Project involves bridges, ramps, frontage roads, elevation differentials, etc.
- Subsequent projects(s) exist
- Project involves underground, earthwork, and pavement activities
- Lane closures are unavoidable
- Project involves girders, bridge decks, retaining walls, piping, etc.

Perhaps not surprisingly, both of the first two categories, Construction Schedule and Construction Site, also had circumstances that scored very low. The ten greatest barrier circumstances from lowest to highest in terms of score:

- Significant ROW acquisition issues exist
- Significant utility relocation issues exist
- Project based TxDOT resources are inadequate (number and/or capability)
- Additional funding is not readily available for expediting methods which may need it
- Other funding problems are anticipated
- Schedule is not realistic
- Equipment (cranes, bulldozers, etc.) are not readily available
- Personnel might be resistant to trying new expediting methods
- Systems are not in place to ensure good communication
- End date of project is not clearly defined

Use of many of the sixteen expediting methods under these barrier circumstances may significantly reduce or even eliminate potential benefits realized. Of the ten barrier circumstances listed above, three were proposed by Simon et al. as methods with high potential impact to shorten construction duration and cost. Due to the need for policy changes, these three were designated as needing management and/or legislative action (2002). These circumstances include methods for expediting right-of-way (ROW) acquisition, methods for expediting utility relocation work, and alternative funding methods.

Once each of the methods was thoroughly researched and the ballots completed and analyzed, the research team proceeded to create the initial or prototype Expediting Method Selection Tool. The next chapter (Chapter 4) investigates the tool methodology, describes elements included in the final tool, and describes the scoring approach used to rank the expediting methods. A section within Chapter 5 contains the modifications that were made to the prototype tool, through many iterations, to formulate the final tool.

4. Expediting Method Selection Tool (EMST) Methodology

4.1 Systems Model

During the interim workshops, the participants were informed that the outcome of this research project would be an Expediting Method Selection Tool. Since TxDOT personnel would be the immediate users, they were asked for their expectations from such a tool. Different answers given to this question were analyzed during routine project meetings with the project director and the project coordinator, whose involvement from the outset played a major role in project development. As a result of these meetings the following requirements were developed for the expediting tool. The structure of this chapter and the prototype tool was prepared by Somali for inclusion in this report (2003). The expediting tool should be (not in order of priority):

Computerized: All TxDOT district offices have access to personal computers. Using a simple and easy-to-learn computer program is much more desirable and efficient than using tables and summing numbers.

Transparent: Although the tool is primarily a computer program, a paper version has been prepared for explaining the reasoning behind the selection of expediting methods, for reference, and for people who wish to use that version. Appendix H contains a paper version of the tool.

User friendly: The interface of the expediting tool appears to be easily understandable by any level of computer user. Because of its simplicity the tool should not cause frustration to the user with rigorous computations.

Expandable: Ongoing and future research efforts to expedite highway construction and legislative/managerial changes will allow additional methods to be used by TxDOT. If warranted, these methods will easily be incorporated into the decision tool and obsolete methods will be removed without difficulty.

With the requirements defined, the research team developed the tool structure, an analytical method suitable for evaluating the applicability of expediting methods on a particular project, compatible software for embodying the analytical method, and a user interface.

Assigning scores to each expediting method under user-defined project circumstances was considered the most suitable approach for recommending specific expediting methods for a particular project. The tool first accumulates user input and then uses simple spreadsheet software (an "engine") to select the recommended methods and display the results as an output. The engine is used to transform user input into numerical values and then display the recommended methods ranked in order of final score. Figure 4.1 shows a flowchart of the tool structure and function. As shown in the figure, the tool consists of three major parts: Input, Engine, and Output. In the Input part, the user is first asked to enter general information regarding his or her project, i.e., project name, project number, etc. Once this basic information is collected the tool then displays instructions to the user to complete a questionnaire. The questionnaire consists of potential project circumstances which may be faced during a highway construction project. Here, the user is asked to select the project circumstances that currently exist in his or her project.

Using the input (selection of current project circumstances) provided by the user, the engine part of the tool assesses scores to each expediting method versus circumstance and tallies them to assign a total score for each expediting method. Then the engine uses the total scores to determine which methods are most applicable to the project and ranks and displays all sixteen methods with the associated score. An expediting method with a negative or precluded total score is displayed at the bottom of the list of recommended methods. The methods with positive to zero total scores are recommended to the user and ranked at the top of the list. (This process is explained further in the final section of this chapter.) The final list of recommended expediting methods is presented in the Output part, which consists of result and reference pages. The references page includes descriptions of each method and references on execution such as special provisions and other standard TxDOT manuals. Other references regarding the interim research for this project and TxDOT road user cost are linked to this page. The general project information entered by the user during the Input part is also displayed again on the results page.

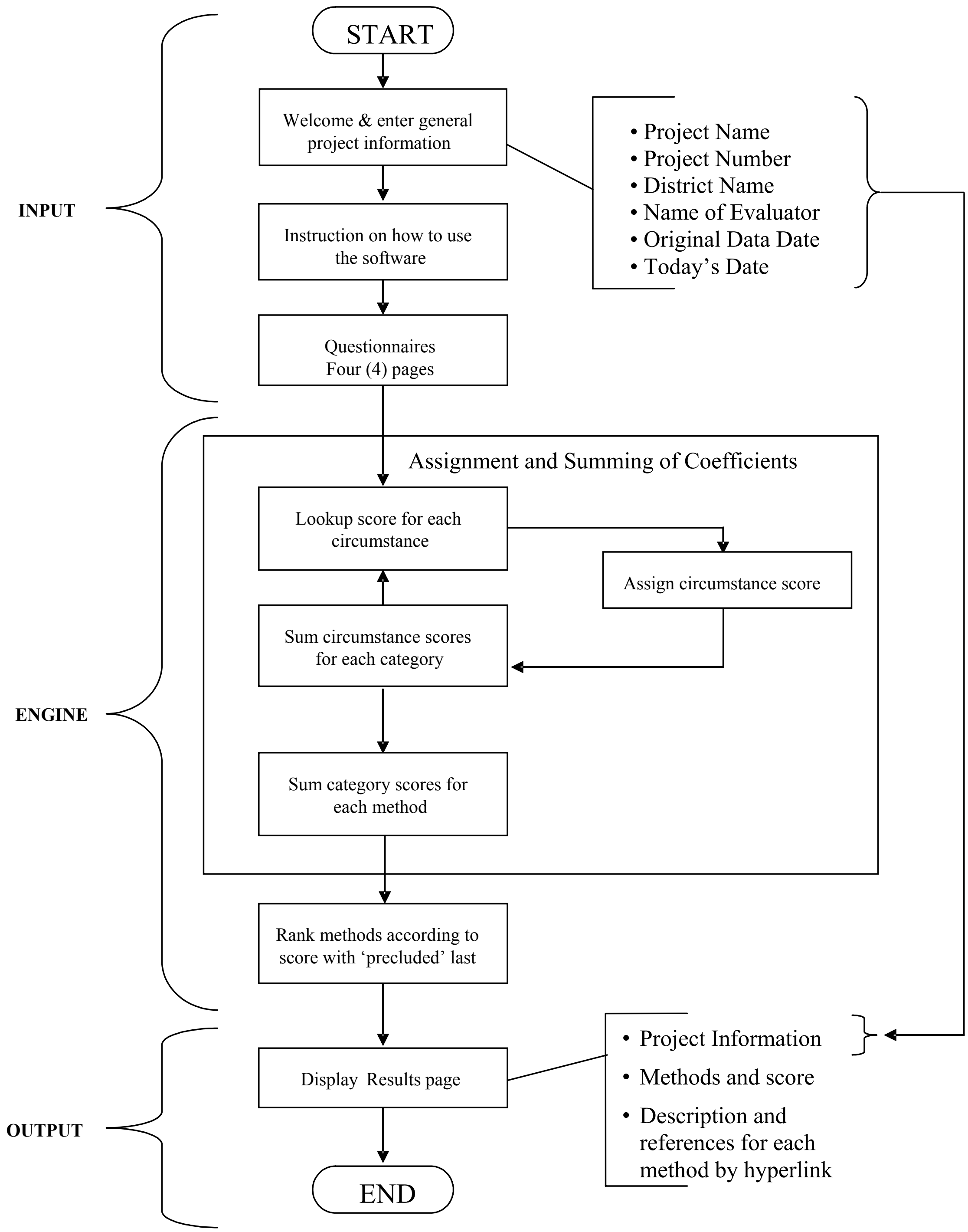


Figure 4.1 Tool flowchart

4.2 Scoring Approach

In order to create the tool, the ballot data was used to link circumstances with methods. An analytical method was designed which would assimilate ballot data to a useful quantitative value. A simple arithmetical method satisfied the user-friendliness, transparency, and expandability requirements of potential users. For this purpose the research team decided to link each project circumstance with an expediting method using a point system. The research team followed a process of assigning constants for each level of effect, calculated average coefficients for each method, and then normalized the coefficients.

The values of constants are used to explain the relationship between a project circumstance and a method. A constant's value was established independent of the responses to the ballots. The constants established for each level of effect are as follows: +10 for "increases benefit," 0 for "does not matter," -10 for "reduces benefit," and -25 for "precludes." These constant values were set to reflect a positive number for "increases benefit" and negative numbers for "reduces benefit" and "precludes." The magnitudes of the value constants were determined after experimentation with smaller numbers from +3 to -3. The project team sensed that larger values, closer to a total scale of 100, would be more meaningful for the users. The magnitude of the "precludes" constant was set to be substantially more than the "reduces benefit" to reflect the significant implications of precluding a circumstance.

Based on the ballot response, the number of votes under each level of effect was multiplied by the corresponding constant value and then divided by the total number of votes; this results in the calculation of an average coefficient for each circumstance. The equation for calculation of the average coefficient is as follows:

$$\left[\frac{(v_{IB})\times(+10)+(v_{DM})\times(0)+(v_{RB})\times(-10)+(v_{P})\times(-25)}{v_{IB}+v_{DM}+v_{RB}+v_{P}}\right]$$

where: v_{IB} is the number of votes for increases benefit
v_{DM} is the number of votes for does not matter
v_{RB} is the number of votes for reduces benefit
v_{P} is the number of votes for precludes

For example; if all the responses from the ballots indicated that a project circumstance increases the benefits from using a certain expediting method, the average coefficient for that circumstance has a positive number, +10. Likewise the average coefficient has a value of -10 if all votes are recorded in the "reduces benefit" effect. In most situations, the actual ballot responses were highly varied and the average coefficients had values between -25 and +10 according to the tendency of the responses.

Additionally, if more than two-thirds (2/3) of the responses to ballots indicated that a circumstance precludes the use of a certain method, then the average coefficient was labeled as "precludes" and given a very large negative number, i.e., -500. This large negative number aided in ranking the methods and secured placement of the "precluded" method at the end of the recommended methods list. For example, under the A+B contracting method, five of seven ballot respondents indicated that for the circumstance Sealcoat (under category Type of Work) the method was precluded. The other two respondents disagreed on the effect of A+B contracting on a Sealcoat project. Therefore, because more than 2/3 of the ballot votes precluded the circumstance, the average coefficient was indicated at -500 and Sealcoat was precluded for that method. Later it was determined that the tool is somewhat sensitive to the "two-thirds preclude" rule.

Due to the variability in method type ranging from planning to construction and the customization of each ballot for each method, the average coefficients for applicable circumstances covered a range of numbers from close to -19 to +10. The boundary on the negative number changed due to the "precludes" formula already mentioned. The possible minimum and maximum score is defined as the summation of all negative and positive average coefficients, respectively, for a given method. Again due to this variability the possible minimum and maximum score for a method was uneven and at different scales. For categories 1 through 6, the minimum and maximum scores were assigned only for the lowest and highest ranking average coefficient circumstance, because within the tool structure, only one circumstance may be selected from these categories. Categories 7 through 14 allow the potential selection of all circumstances; for this reason a total of all the negative and positive average coefficients was used to generate the minimum and maximum scores. The final minimum and maximum scores were obtained by summing the category minimum and maximum scores. Table 4.1 displays the total minimum and maximum scores for each method prior to normalization, and excludes the value of precluded methods.

Table 4.1 Total maximum and minimum coefficient values before normalization

Methods	Minimum Score	Maximum Score	Difference
Use a Calendar Day Schedule	-69	148	218
Precast/Modular Components	-143	130	273
Use of Contractor Milestone Incentives	-198	133	330
Generate & Evaluate Multiple Approaches to Traffic Control Plans	-70	182	252
A+B Contracting	-234	111	344
Incentivize Contractor Work Progress with a Lane Rental Approach	-134	118	251
"No Excuse" Incentives	-219	85	304
Maturity Testing	-94	92	186
Formal Partnering	-34	223	256
Set Liquidated Damages to the Appropriate Level and Enforce	-84	132	215
Pavement Type Selection Decisions	-56	138	194
Seek to Maximize Work-Zone Size	-53	132	185
Full Closure Instead of Partial Closure Roadway	-130	101	230
Implement Multiple Work Shifts and/or Night Work	-185	150	335
Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations	-45	173	218

The difference between the minimum and maximum values is displayed in the right-most column of the table. A small difference (i.e. 185 for Seek to Maximize Work-Zone Size) relative to the other methods may indicate some degree of consensus, familiarity, ease of use, and general propensity for use from those who completed the ballots. Whereas, a large difference (i.e. 344 for A+B Contracting) may indicate some degree of discord, unknowns, difficulty of use, and little interest in use of the method. The difference is also dependent on the number of circumstances that were applicable and scored for a given method and could simply be a product of the ballot format (see Chapter 2, section 2.5).

The project team determined that for the sake of ranking the methods, the same scale was needed for all methods. For this purpose the team decided to normalize the average coefficients using a scale ranging from -100 to +100. Another advantage of normalization was that all circumstances were "weighted" equally within each method. The interpretation of the score for several pilot projects from the demonstration seminars is given in Chapter 6. With the scoring approach in place, the final tool was completed.

4.3 Final Tool Description

To embody the selected analytical method and user interface into the preliminary decision framework, a spreadsheet program sufficed for generating the tool. The analytical method selected is not computationally rigorous and only needs a look-up table for circumstance coefficients. It may be handled most efficiently in a spreadsheet format. Therefore the research team decided to develop a Microsoft® Excel-based tool. Excel is one of the most familiar computer programs to potential primary users of the tool and is widely used by TxDOT personnel. Excel provides capabilities to develop a customized application by using the Visual Basic for Applications (VBA) programming language. Working directly with a variety of hierarchical Excel objects, VBA can make the user interface flexible, simple, easy to use, responsive, and self-explanatory (Albright et al. 2002; Albright 2001; Song 2002).

Based on the tool requirements and selections by the research team, a prototype was designed. The prototype was subsequently beta tested by potential users and the final product prepared based on the feedback from this testing. Guidelines were documented to help implement the tool. Finally the tool will be distributed to all TxDOT district offices.

Combining the preliminary research results (from interim workshops) with information gathered from knowledgeable points of contact (KPCs), the prototype tool was developed through the processes described in Chapters 3 and 4. Once the tool was beta tested by the project team and during the demonstration seminars, the tool then was updated and the final version prepared through the processes described in Chapter 5. The tool described in this section is the final computer version of the tool and has gone through beta testing (updating.) The prototype version of the tool differed considerably from the final version presented here. At least twenty versions of the Expediting Method Selection Tool were completed between the prototype and final tool.

Within the tool, the user answers basic questions that are common to virtually all highway construction projects. The user is then asked yes or no questions about different situations or circumstances present in highway construction projects. The tool will allow the user to select “Yes” (true, generally) or “No” (false, generally) for each question. The tool then screens these answers through the coefficient tables (data acquired from KPCs) and assesses a score for each method. All methods are ranked and displayed in the tool. Relevant and instructive resources, associated with each method, are displayed for the tool user's reference. A more detailed format of the final EMST follows.

The ballot (questionnaire) mentioned in previous chapters is put in the form of a spreadsheet program. The tool's introductory worksheet is presented in Figure 4.2. In this Welcome page, general project information which is also displayed in the results page is asked of the user. After clicking on "Start," the program then takes the user to an Instructions page (Figure 4.3) where they are informed about the use of this software and guided through the evaluation process.

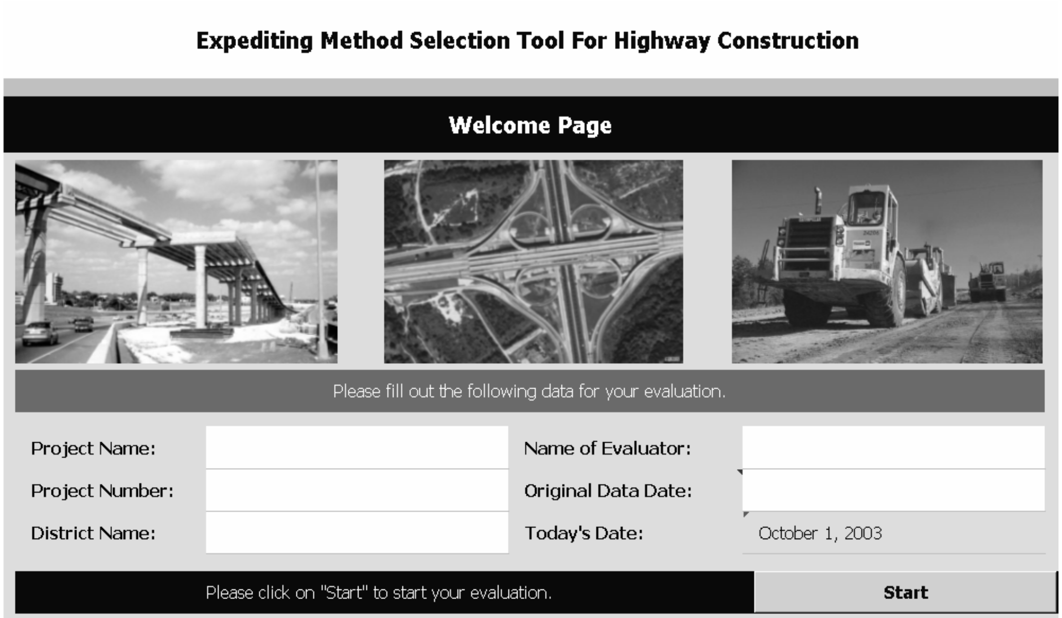


Figure 4.2 Introductory page EMST

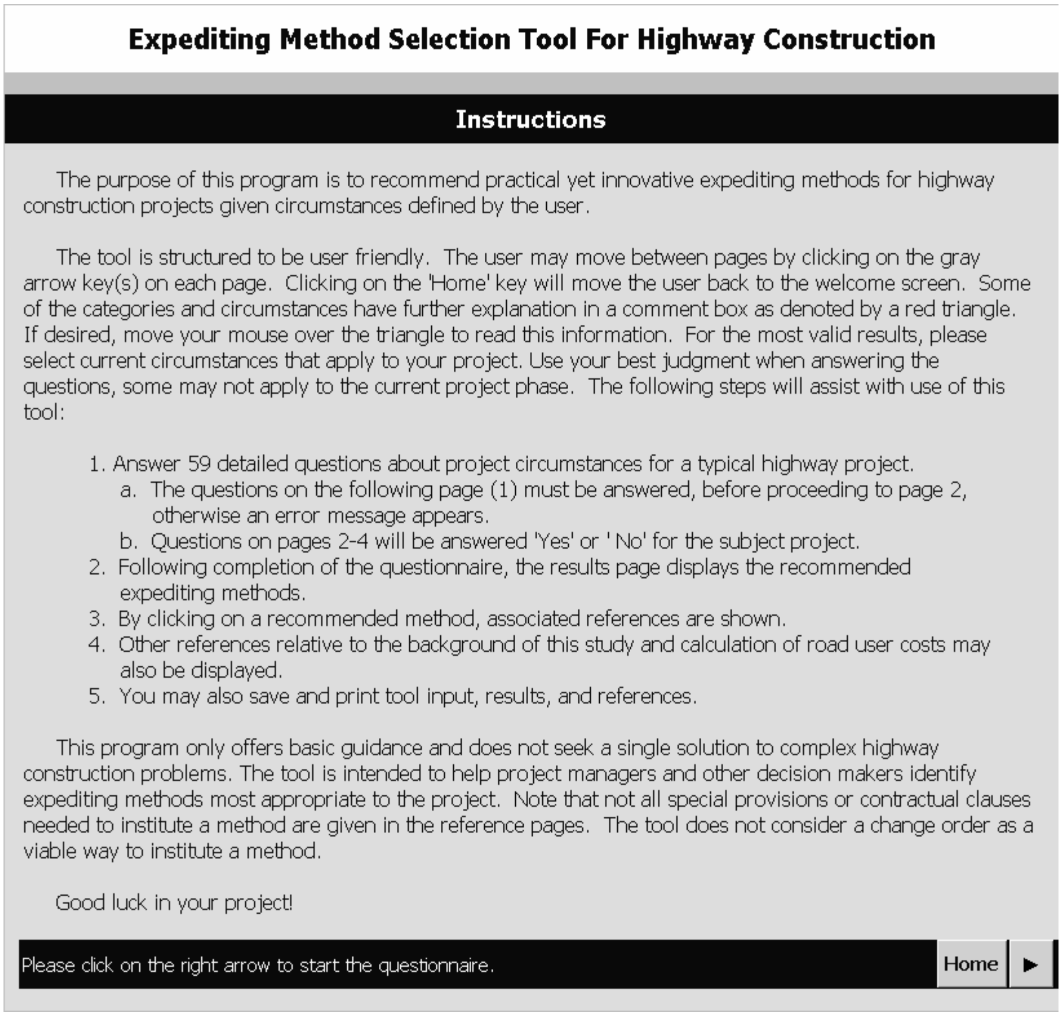


Figure 4.3 Instructions page EMST

Once the instructions to use the software are displayed, the user then is taken to the Questionnaire pages. The questionnaire is divided into fourteen different categories with fifty-nine project circumstances (Table 4.2).

Table 4.2 Questionnaire categories

Project Phase	Construction Schedule
Road User Cost	Materials and Equipment
Types of Work	Contractor
Project Location	Construction Site

Construction Duration	Personnel
Total Project Cost	Complexity
Other Project Costs	Others

The first page of the questionnaire, which covers the first six categories, is somewhat different compared to the rest. Figure 4.4 shows the first page of the questionnaire. In the first page, the user is asked a different question for each category and is expected to answer all the questions before moving on to the next page. If the user omits one of the questions, an error message appears directing the user to answer all of the questions. The circumstance questions should be answered based on knowledge of the project under consideration. If the answer is not known, the user simply picks the answer that most closely resembles present information about the project. Note that the individual circumstances within the "types of work" category are based on the thirteen project types used by TxDOT within the Design and Construction Information System (DCIS).

Expediting Method Selection Tool For Highway Construction

Questionnaire - Page 1 of 4 Home ◄ ►

Please answer the following questions by clicking on the circles next to the options.

1. Project Phase - What is the current phase of this project?

- a) Planning
- b) Early Design
- c) Late Design
- d) Construction

2. Road User Cost (RUC) - What is the estimated level of RUC during construction?

- a) Low
- b) Moderate
- c) High
- d) Very High

3. Project Type - Please select the predominant type of work covered by this project.

- a) Sealcoat
- b) Overlay
- c) Rehabilitate existing road
- d) Convert non-freeway to freeway
- e) Widen freeway
- f) Widen non-freeway
- g) New location freeway
- h) New location non-freeway
- i) Interchanges
- j) Bridge widening/rehabilitation
- k) Bridge
- l) Upgrade freeway to standard
- m) Upgrade non-freeway to standard
- n) Other

4. Project Location - What is or will be the construction site location?

- a) Rural
- b) Suburban
- c) Urban

5. Construction Duration - What is the estimated construction duration?

- a) Shorter than 6 months
- b) 6 months to 1 year
- c) 1 year to 2 years
- d) Longer than 2 years

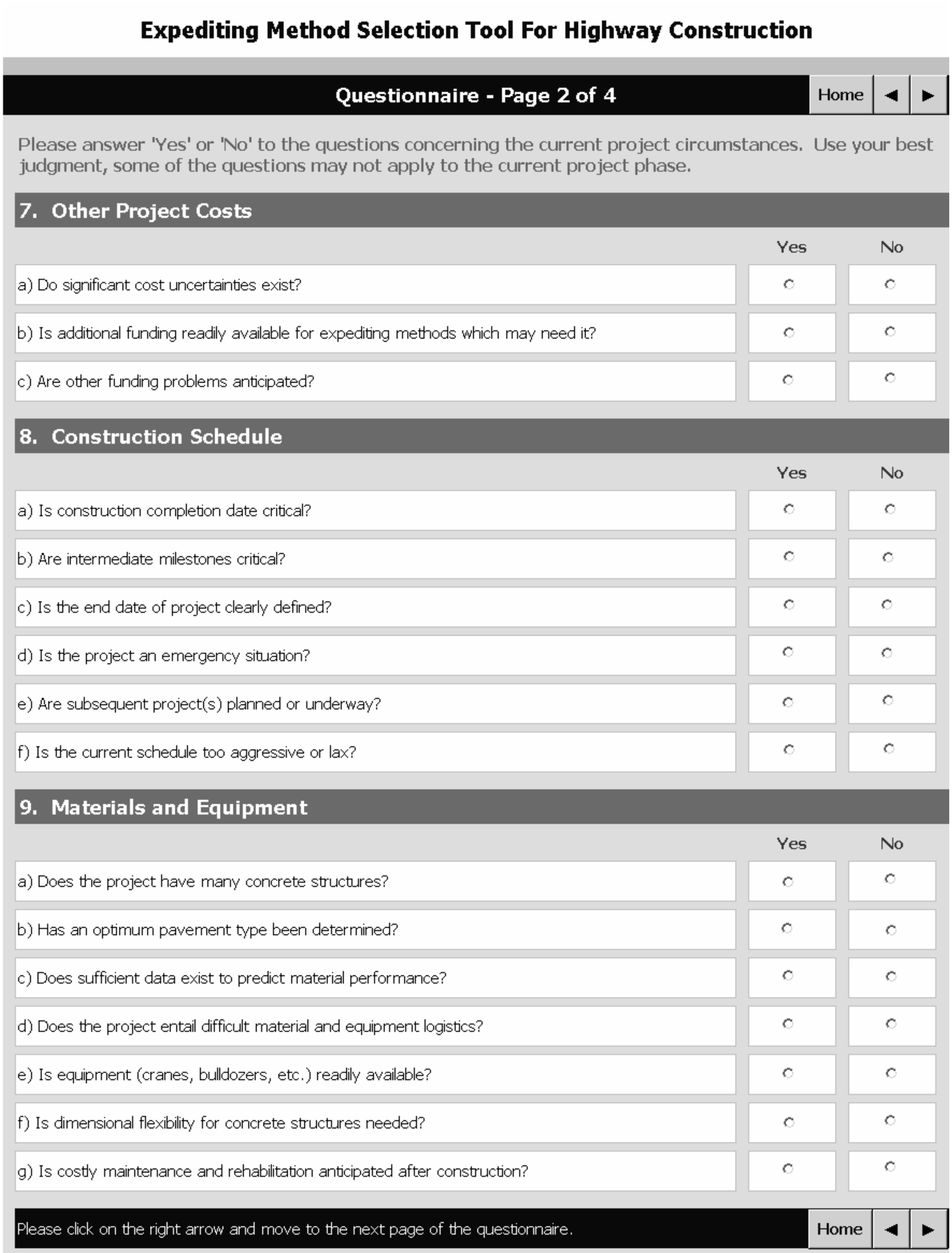
6. Total Project Cost - What is the estimated project cost?

- a) Lower than $5 Million
- b) $5 Million to $15 Million
- c) $15 Million to $50 Million
- d) Greater than $50 Million

Please click on the right arrow and move to the next page of the questionnaire. Home ◄ ►

Figure 4.4 First page of the questionnaire

The other three pages of the questionnaire delve into circumstances unique to the project and are quite straightforward to complete in the sense that the user is only asked to answer "Yes" or "No" depending on the applicability of the existing project circumstances under each category. Again the selection should be based on current knowledge regarding the project under consideration. Depending on the response, the program may or may not take that circumstance into account during the ranking and scoring of expediting methods. Figure 4.5 shows the second page of the questionnaire; the third and fourth pages can be seen in Appendix I.



Expediting Method Selection Tool For Highway Construction

Questionnaire - Page 2 of 4 Home ◄ ►

Please answer 'Yes' or 'No' to the questions concerning the current project circumstances. Use your best judgment, some of the questions may not apply to the current project phase.

7. Other Project Costs

	Yes	No
a) Do significant cost uncertainties exist?	○	○
b) Is additional funding readily available for expediting methods which may need it?	○	○
c) Are other funding problems anticipated?	○	○

8. Construction Schedule

	Yes	No
a) Is construction completion date critical?	○	○
b) Are intermediate milestones critical?	○	○
c) Is the end date of project clearly defined?	○	○
d) Is the project an emergency situation?	○	○
e) Are subsequent project(s) planned or underway?	○	○
f) Is the current schedule too aggressive or lax?	○	○

9. Materials and Equipment

	Yes	No
a) Does the project have many concrete structures?	○	○
b) Has an optimum pavement type been determined?	○	○
c) Does sufficient data exist to predict material performance?	○	○
d) Does the project entail difficult material and equipment logistics?	○	○
e) Is equipment (cranes, bulldozers, etc.) readily available?	○	○
f) Is dimensional flexibility for concrete structures needed?	○	○
g) Is costly maintenance and rehabilitation anticipated after construction?	○	○

Please click on the right arrow and move to the next page of the questionnaire. Home ◄ ►

Figure 4.5 Second page of the questionnaire

Once the questionnaire is completed, the program starts accumulating the input provided by the user to assess a score and rank the expediting methods, using a separate worksheet with established coefficients which are hidden from the user. These coefficients are hidden in the software, but a paper version is available for reference or completion. They can also be viewed in the software. This worksheet contains the coefficients (explained in the previous section of this chapter) which link project circumstances with expediting methods. As indicated, the tool will allow the user to select "Yes" (true, generally) or "No" (false, generally) for each question. For the majority of circumstances, a "Yes" response is set to true, which is the default setting. For about fifteen circumstance questions the "No" answer is set to true as the default. This is simply due to the difference in the format of the questions from the Internet ballot to the final tool format. A score for each expediting method is assessed by comparing the user's input with the coefficient values (normalized). If the question is answered as true, then a value is assigned to the circumstance. Figure 4.6 shows a portion of the coefficients table.

Circumstances		- - Coefficients - -	
		A + B Contracting	Develop Traffic Control Plans (TCP's) through Partnering
1. Project Phase	a) Planning	9	6
	b) Early Design	6	6
	c)Late Design	3	6
	d) Construction	Precludes	6
Category Score - Project Phase		**0**	**0**
2. Road User Cost (RUC)	a) Low RUC	-4	-22
	b) Medium RUC	5	0
	c) High RUC	6	3
	d) Very High RUC	9	6
Category Score - Road User Cost		**0**	**0**

Figure 4.6 A portion of the coefficients table

The calculation process for assigning scores to expediting methods is fairly simple. If a circumstance under a certain category is selected by the user and assigned a true value, the coefficient is added to that category's score. For example, looking at Figure 4.6, if the user selects "Planning" as the project phase, the category score for the project phase category will be 9 for the A+B Contracting method. Conversely, under categories 7-14, if the user answers two questions “No,” then false is assigned to the value coefficients and it is left out of the calculation for the category score. The user may choose not to answer circumstance questions in categories 7-14, and then these are not included in the final method score. Once the circumstances are scored, the sum of all category scores is added to obtain the total score for the expediting method being analyzed. This process is repeated for each expediting method.

With the total scores for all sixteen expediting methods calculated, the scores are compared to each other, and the program ranks the methods accordingly. The method with the highest positive score is selected as the first recommended method, and other methods are ranked sequentially from highest to lowest negative score, with precluded methods listed last. Figure 4.7 shows a blank sample Results page (i.e., no scores are given).

The Results page has multiple functions. This page has four buttons: “Arrow” back, “Home,” “Save,” and “Print.” The arrow button allows users to navigate to page 4 of the questionnaires. The “Home” button transports the user to the initial Welcome or introductory page. Similar use of these two buttons is employed at the top and bottom of pages 1-4, to allow the user to easily navigate between pages and modify circumstances. The “Save” button leads users to Excel’s built-in “Save As” dialog box in which they are prompted to provide a different file name (since the spreadsheet tool is opened as read-only, it may not be saved as the same name). These functions may be particularly useful when using the tool intermittently through multiple phases of a single project. The “Save” function permits the user to save the data that was originally entered as input, open it at a later date, and then modify it to the present project phase.

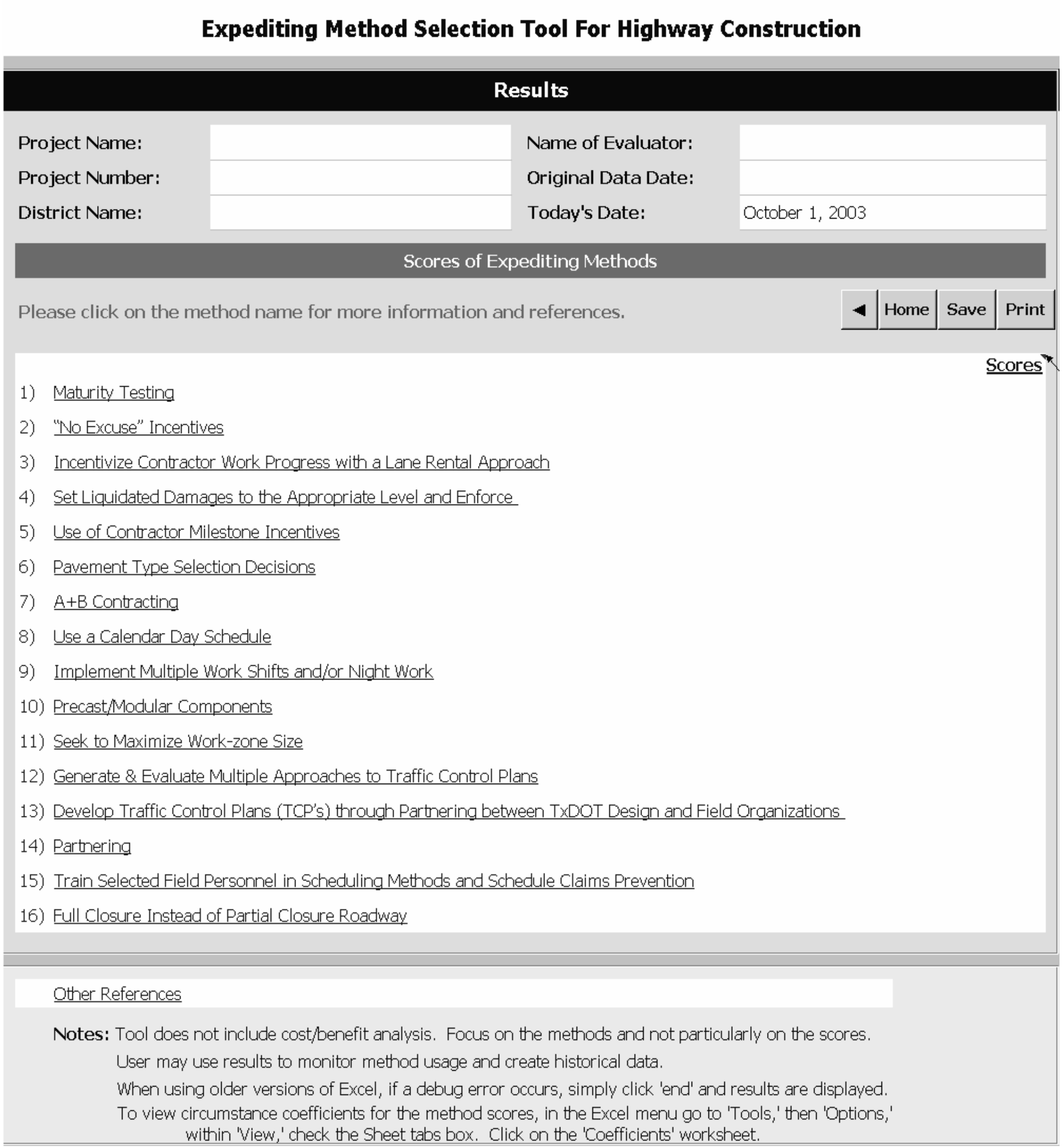


Figure 4.7 Sample Results page

The "Print" button guides users to a customized dialog box in which they can select pages to print (Figure 4.8). Pressing the "OK" button shows the users which pages they have selected for printing (Figure 4.9). They may now click on the "Yes" button to proceed with Excel's built-in print dialog box to make further options, or press "No" to make changes to selected pages.

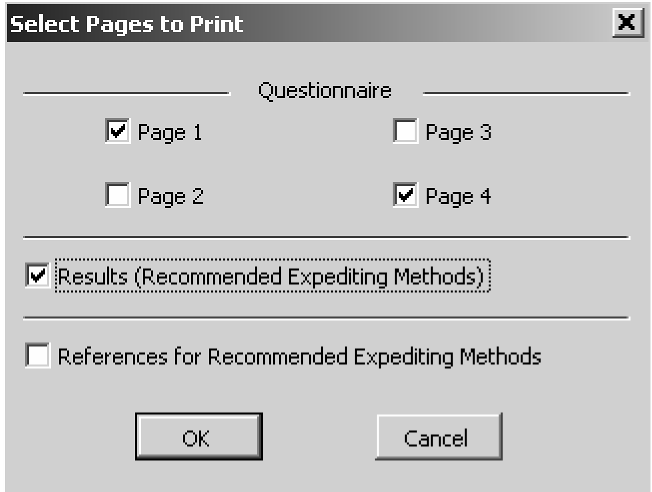


Figure 4.8 Print dialog box

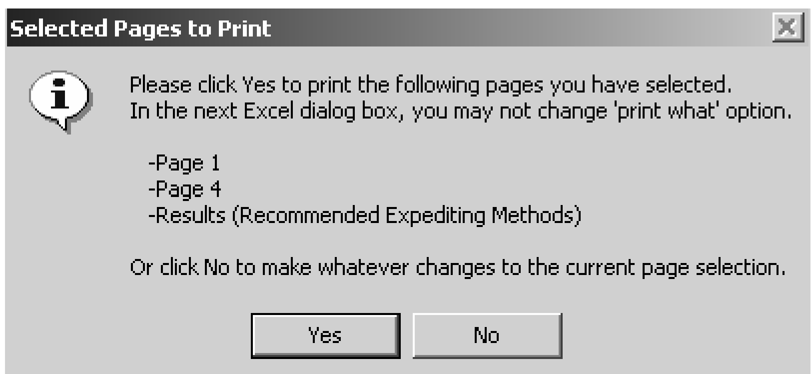


Figure 4.9 Print approval box

The references for each expediting method can be viewed separately by clicking on the method name in the Results page. This takes the user to a different worksheet in which a brief description of the method with references for implementation can be found. Where applicable, TxDOT specifications are displayed with other references in reverse chronological order. The user can go back to the Results page any time when the "Go back to the 'Results' page" hyperlink is clicked (Figure 4.10). Appendix I shows the final VBA code for the EMST.

Expediting Method Selection Tool For Highway Construction

References

A + B Contracting:

A+B contracting (also called cost plus time) is a procedure that incorporates the lowest initial cost, but also factors into the selection process the time to complete the project. Contract is awarded based on the lowest combination of these two factors.

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Go back to the "Results" page

Figure 4.10 Sample Reference page

The paper version of the tool consists of the list of the coefficients table and brief instructions for calculation. Although the analytical method described in this chapter can be easily implemented on paper, using the computerized tool saves time and makes the evaluation much more efficient. Therefore the research team strongly recommends use of the computerized version of the Expediting Method Selection Tool for implementation, and use of the paper version for reference.

In summary, the scoring approach reflects the amount of influence that a circumstance has on an expediting method, which depends on the magnitude of the normalized positive or negative coefficients. The larger the normalized coefficient value, the greater the influence of that circumstance on the use of method being considered.

Each method within the tool was scored independently of the others even though some select methods, especially those that are more contract based, may have influence on each other in the real world. Method scoring is not mutually exclusive. Within the coefficient table, coefficients are assigned to each circumstance and method based on the relative agreement of the ballot respondents or KPCs. Hence a circumstance allocated a high score (9 to 12) had KPCs who voted that the use of the method benefits the project or "does not matter" under the given circumstance. Methods with a high output score could indicate KPCs' consensus. The final ranking is somewhat fuzzy and final point totals may not be as important as relative rank and whether the method is positive or negative.

Ideally each circumstance would have a weight or multiplier proportional to its significance, which could indicate its importance relative to other circumstances. Normalization attempts to approach this situation by comparing each method based on the same scale. The data, time, and expertise needed to assign such weights did not exist in this project. Highway construction is so variable that it would be difficult to assign such weights, especially with such diverse methods included in the Expediting Method Selection Tool. The tool is still useful, as indicated by the next chapter which discusses tool demonstration, testing, and validation.

5. EMST Validation

5.1 Pilot Demonstration Seminars

Once the prototype tool was completed, it and subsequent revisions were presented to TxDOT and industry personnel in three demonstration seminars. Thus the prototype evolved into the final tool, as existing features were upgraded and new features added. The major goal of the seminars was to disseminate information about the tool and obtain feedback to prepare the final tool. As the primary focus of each seminar, the EMST was tested on three separate TxDOT projects with different circumstances. Other projects supplied by the project director were used to test the tool. Much germane feedback received from these seminars and from participants' actual use of the tool was incorporated as revisions and modifications to create the final tool.

The demonstration seminar phase of the research involved obtaining users' input into the final tool appearance and content. A particular focus of the seminars was the demonstration of the tool on a project volunteered by one of the participants. Specific objectives of the seminars were as follows:

- To share information of the background of the research and tool development. A few of the participants did not attend the first-year workshops or had been referred to the seminars by a colleague or supervisor, so it was important to establish the research background.
- To share instructions for tool usage, which was accomplished by giving an overview of the tool structure and most importantly a live demonstration of the tool. Within the second objective, the participants were expected, by the end of the seminar, to be able to use the software on an actual project at their own office to assist in selection of expediting methods.
- To gather feedback for tool refinement and/or enhancement. More than 80% of participants provided feedback.
- To provide recommendations for tool implementation. The project participants that provided feedback also offered implementation suggestions.

The demonstration seminars were held in Houston, Dallas, and Austin, on July 24, 2003, August 18, 2003, and August 20, 2003, respectively. Initially, a total of fifteen districts with fifteen district engineers and eighty area engineers were invited to attend the demonstration seminars. As a basis of percentages, TxDOT has a total of twenty-five districts each with a district engineer and, as of the writing of this report, a total of 129 area engineers. The fifteen districts were selected for the demonstration seminars based on their close proximity to the three host cities. A total of 177 invitation letters were distributed by email, and included in these were letters to the sixty-two individuals who had participated in the interim workshops and/or ballot completion (Appendix K contains a copy of the invitation letter). Others included in the invitation were TxDOT division construction and design personnel. Participants were given the choice of which seminar to attend based on their schedule. Thus if an individual was unable to attend a seminar on a given day, two other alternatives were given. The participants were expected to respond to the email by July 17, 2003 so that sufficient venues could be reserved and reference material prepared.

In the end, a total of thirty-seven participants attended the demonstration seminars. The seminars were about one hour in duration; discussion and testing of an actual project occupied an additional half hour at two of the seminars. Just as the objectives for the three seminars were the same, the demonstration seminars followed the same agenda format:

- Welcome and Introduction
- Background and Overview of Study and Tool
- Instructions on Tool Usage
- Software Demonstration
- Questions and Discussion
- Return Evaluation Forms
- Distribution of Disks and Feedback Forms

At the beginning of the seminar, each individual was given an evaluation form to provide feedback for tool refinement and/or enhancement and implementation recommendations. Other open-ended questions on the evaluation form inquired about what attendees liked about the tool. Two questions with a Likert scale format were used to gauge how the participants viewed the tool's usefulness and ease of use. A "yes"/"no" question asked if the attendees would use this tool or recommend it to others on future projects. The evaluation forms were collected at the end of the seminars. A sample evaluation form is included in Appendix L. The evaluation form also asked participants sundry information such as name, title, district or organization, phone number, email address, and number of years with TxDOT or in industry.

In addition, each seminar participant was given a compact disc that contained the latest version of the Expediting Method Selection Tool, instructions for use of the tool, and a feedback form to complete after use of the tool on a project with which the participant had been involved (Appendix M). The seminar attendees were encouraged to test the tool on their own office computer. The feedback form was provided to enable the participants to provide feedback from actual use of the tool on a project and give comments about the tool results and how they compared with experiences on their project.

Sixteen of the thirty-seven participants in the demonstration seminars had participated in either the interim workshops or the ballot responses. Fifteen of the sixteen individuals had participated in the original interim workshops, while six of the sixteen completed ballots. Only four individuals participated in all facets of the research: i.e., interim workshops, ballots, and demonstration seminars. Eleven districts and two divisions participated in the three demonstration seminars. Of the thirty-seven participants, at least eight area or assistant area engineers attended the demonstration seminars. Three of the thirty-seven individuals were from consulting companies in the Dallas area. A listing of all of the demonstration seminar participants is contained in Appendix N.

5.2 Demonstration Projects and Feedback

Near the conclusion of each of the demonstration seminars, an actual project was used to beta test and gain feedback concerning the Expediting Method Selection Tool. Thus during the seminars three extemporaneously volunteered projects were captured and used to modify the prototype tool to the final version.

All of the demonstration projects were in the planning or design phase and ranged in estimated cost from $9 to $25 million, with construction duration of between 12 and 24 months. The projects were designated as having moderate to high road user costs. The projects were volunteered by area engineers or project managers, with others within the district or area assisting in scoring. For the three projects, final scores displayed on the Results page ranged from 63 to -18, with two methods precluded. Given the early phase of the projects used in the assessment, the tool seemed to execute in a logical fashion by precluding only two methods between the three projects. Generally the participants agreed that the tool provided a reasonable ranking of appropriate expediting methods for consideration. In one seminar, a TxDOT director of construction pointed out that a method was scored too low, which indirectly helped to detect an error in a formula used within the coefficients spreadsheet.

Additional information about the demonstration projects and tool result pages are contained in Appendix O. The amount of time used to score the projects from beginning to end ranged from 20 to 30 minutes. Note that these seminars were the first time that TxDOT and industry personal had used the tool, and the tool questions were completed vocally as a group. Hence, use of the selection tool on an individual's personal computer would likely take less time.

In the end, the demonstration projects provided a means for obtaining valuable feedback in terms of both statistics and written feedback recorded on the evaluation form. A brief analysis of the evaluation form revealed the relative success of the demonstration seminars and the tool testing. Table 5.1 displays the participant's response to questions 1-3, contained on the evaluation form. Seven of the thirty-seven participants did not complete the evaluation form. Observing the responses to question 3, two seminar participants left the question blank, likely reserving judgment pending use of the tool or perhaps overlooking the question entirely.

Table 5.1 Analysis of evaluation form responses (n=30)

Question	**Number of Responses by Category Type**				
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. Is the tool useful?	0	0	1	25	4
2. Does the tool appear to be easy to use?	0	0	1	21	8
				Yes	**No**
3. Would you use this tool or recommend it to others on future projects?				28	0

To recap, the evaluation form statistics (Table 5.1) showed that nearly 97% of the seminar attendees agreed that the tool was useful with the same percent agreeing that the tool appears easy to use. Ninety-three percent (93%) of the participants answered that they would use the tool or recommend it to others on future projects. While these numbers are encouraging, it should be recognized that these statistics were obtained during the demonstration seminars and prior to actual use of the tool by the participants.

Perhaps even more valuable than the statistics, the seminars provided a setting for participants to articulate and explore helpful suggestions for tool improvements. Other verbal comments, that in some instances were not written on the evaluation form, were recorded by the research team because many of the individuals gave their comments either during question completion within the tool format or when critiquing and assessing the veracity of the method ranking on the Results page. The specific comments from seminar attendees were grouped into the following strengths of the tool:

- Simple and user friendly
- Utilizes references and use of links to explain methods further
- Uses Excel and can be used anywhere
- Comprehensive and establishes set of initial project criteria which may be used to choose methods to expedite construction
- Ability to use at different phases and save changes
- Use of DCIS (Design Construction Information System) types within tool
- Seems quite useful for less experienced personnel

Suggestions for improvement in terms of refinements or enhancements were gleaned from the evaluation form, comments of seminar attendees, and during the project team meetings included:

- Add commentary on final scores; more explanation on how results were obtained.
- Change all the questions to be positive and add a disagree button. Or agree and disagree boxes should be changed to "yes" and "no" to make the questionnaire portion of the tool clear.
- Some questions need to be worded differently and, in places, need additional categories or circumstances.
- Need explanation in terms of comment or pop-up box on some or all of the circumstances.
- The program questionnaire could be customized for construction, design, and planning.
- Change RUC categories to a word description such as low, moderate, high, and very high. (Initial suggestion was made for ranges of $25,000 for the RUC but it was

determined that this may not be applicable for rural or suburban districts. The entire list of comments from the seminar attendees is contained in a table in Appendix P.)

In addition to testing the Expediting Method Selection Tool on three projects during the demonstration seminars, the tool was tested on two other projects in the Dallas area with very high road user costs. The projects are both currently in the construction phase. The two projects are the Dallas High Five Project and the Bush North Texas Tollway 332. Although both projects are currently in the construction phase, both were scored for planning, design, and construction so a total of six Result pages were generated. This was done to check the validity of the tool through the various phases.

In general, the method scoring and ranking corresponded well with the actual usage of the methods within the two Dallas projects. The score of Contractor Milestone Incentives was somewhat low for the Dallas High Five Project; however this project utilized at least twelve of the sixteen methods within the tool. One point of discussion was that "Incentivize Contractor Work Progress with a Lane Rental" may not be precluded even during the construction phase because a change order can be generated to force the contractor to use this method. Clearly, some of the methods could be deployed, however inefficiently, by use of a change order, but later it was determined that the tool should not consider a change order as a viable way to institute a method.

5.3 Modifications to EMST

The research team met on multiple occasions to discuss incorporation of feedback, gained from the demonstration seminars and other projects, into the final discussion tool. A few of the suggestions for improvement, though valid, were not undertaken due to time and tool constraints. These mainly stemmed from having insufficient data in terms of the number of ballot responses and a general lack of data concerning the connectivity between project phases and methods due to the ballot configuration. However, most suggestions were incorporated into the final Expediting Method Selection Tool. Specific changes that were implemented into the final tool included the following:

- Clarified date fields on Welcome page of Expediting Method Selection Tool
- Rewrote entire Instruction page to make it easier to follow and more clear

- Added explanation and comment boxes to some categories and circumstances as designated in the seminars
- Changed phases to more closely match DOT terminology
- Removed the "Not Known Yet" option from some categories, road user cost (RUC), construction duration, and total project cost
- After much discussion, maintained a strict word description for the RUC category
- Expanded and modified categories on construction duration and total project cost to four ranges
- Rephrased many of the project circumstances
- Deleted the word "formal" from "formal partnering" to match DOT terminology and modified other method terminology
- Revamped format of questions on Questionnaire pages 2-4 to "Yes" or "No" response
- Added arrows and "Home" buttons to the tops of pages 1-4 and the Results page so that the user might navigate more easily between pages
- Changed format of Results page so that all sixteen methods and corresponding scores are displayed
- Added provision to Results page that explains some limitations of the tool
- Added commentary on ranking of methods and classification of score
- Doubled the number of references included in the tool to include many TxDOT references
- Additional references on background of tool (first-year study) and RUC were included
- Added instructions describing how to access the look-up table (coefficients) used for determining the scores.

The prototype tool served as an effective starting point for the development of the final tool. The research team invested significant time gathering data for and designing the prototype tool in order that the tool would be easier to modify and update to create the final tool. The three demonstration seminars and other projects provided key feedback items. The project team found that the seminars were especially useful for disseminating and discussing information. Feedback, from both the seminars and project team, was used to upgrade and modify the prototype tool through subsequent versions and to the final EMST. To help with deployment of the tool, Chapter 6 provides guidelines and instructions for use of the EMST.

6. EMST Use

6.1 Context of Tool Usage

Use of the Expediting Method Selection Tool is definitely most beneficial in the earlier stages of the design process. The earlier the tool is used, the easier it is for the project participant to incorporate the selected method into plans, specifications and estimate. During the demonstration seminars, an area engineer suggested that the tool be used at the 10%, 30%, 60%, 90% review stages during the plan, specification, and estimate (PS&E) process. The project team strongly recommends use of the tool at the beginning of every major phase, especially planning and early design, but not excluding late design and construction phases. Equivalent TxDOT descriptions that are closely synonymous with these tool phases include the feasibility study, design summary report, and PS&E. The tool may provide some important method recommendations even when used during the construction phase. Recognize that the number of expediting methods available (i.e. not precluded) are significantly narrowed during this late phase of the project delivery life cycle. Planning is therefore the optimum phase for utilization of the EMST.

One of the main objectives of this research was to establish a tool that may be used by all twenty-five TxDOT districts regardless of the district size in terms of personnel or project volume. The final version of the tool is designed such that it caters to all TxDOT districts in that it contains features that extend from rural to urban project settings and from low to very high road user costs. The tool can be utilized on any and all project types within TxDOT due to the fact that the tool contains data on all thirteen project types as prescribed by the DCIS. Although the tool is targeted toward the 129 TxDOT area engineers and their assistants, the tool may also be used by a much wider group. This is due, in part, to the fact that the tool contains methods that span from planning to construction. The tool may be deployed by district engineers, construction engineers, and others at the division level to foster alignment between project teams. Consultants, outside of TxDOT, may benefit from using the tool as a learning device to find out basic yet essential information from TxDOT and other references provided within the tool. The use of the tool for alignment and training purposes may be two of the greatest values of the tool.

The final version of the tool is designed such that it accommodates four different levels of road user costs. The tool may cater to projects that anticipate or have high or very high road user costs. Logically, use of nearly all of the methods is promoted by high or very high road user costs. This is not to indicate that the tool should not be used on projects with low or moderate road user costs. As demonstrated by the structure of the EMST (Questionnaire page 1), the tool may be used on projects with a wide range of road user costs.

At one of the demonstration seminars an area engineer indicated that engineers within that district "all consider this stuff [expediting methods] anyway." In other words, there is probably no method or few methods recommended by the tool that senior practitioners do not already have some knowledge, training, or experience using. The tool attempts to organize categories and circumstances in a manner that provides a useable framework for selection and implementation of applicable methods to expedite major highway projects.

6.2 Instructions

This section outlines the instructions for use of the tool. Prior to use of the tool, Excel macro security levels must be set to the correct level or the tool will not run. Certain older versions of Excel will cause portions of the tool to not function completely. Initially, set macro security levels to medium at startup or the tool will not run. To accomplish this within Microsoft® Excel go to the "tool" menu then scroll down to "macro" and then over to "security." Once the user clicks on security, the security dialogue box will open. Within this box, select the "medium" level radial button for use of the tool. Each time the user deploys the tool this macro security level must be maintained. On subsequent uses of the tool, a dialogue box will automatically appear when the tool is opened; select "enable macros" at the beginning of each session.

Similar instructions to those presented here are contained on the second screen of the Expediting Method Selection Tool (Figure 4.3). The user is informed that the purpose of the software is to recommend practical yet innovative expediting methods for highway construction projects given circumstances defined by the user. The tool is structured to be user friendly. The user may move between pages by clicking on the gray arrow key(s) located near the top and bottom of each page. Clicking on the "Home" key will move the user back to the Welcome screen. Some of the categories and circumstances have further explanation in a comment box as denoted by a red triangle in the upper right corner of the cell. If desired, the user may move the mouse over the triangle to read this information. For the most valid results, select current circumstances that apply to the project. The user is encouraged to use their best judgment when answering the questions; since some may not apply to the current project phase. The following steps assist with use of this tool:

1. Answer fifty-nine detailed questions about project circumstances for a typical highway project.
    a. The questions on page 1 must be answered, before proceeding to page 2. If all six questions are not answered, an error dialogue box will appear.
    b. Questions on pages 2-4 will be answered "Yes" or "No" for the subject project.
2. Following completion of the questionnaire, the Results page displays the recommended expediting methods and associated score.
3. By clicking on a recommended method, associated references are shown.
4. Other references relative to the background of this study and calculation of road user costs may also be displayed.
5. The user may also save and print tool input, results, and references.

The user is reminded that this program only offers basic guidance and does not seek a confined or narrow solution to complex highway construction problems. The tool is intended to help area engineers, project managers, and other decision makers identify expediting methods most appropriate to the project.

During the testing and validation of the tool, the research team discovered that the tool has at least two limitations when using older versions of Excel. The tool printer executable (Figure 4.8) will not run on the Excel 97 version of this spreadsheet program due to problems reading digitally signed macros. Other problems may occur with Excel 2000. On the Results page, if a debug error appears, the user is instructed to simply click "End" and the tool results are displayed nonetheless. A quick poll of the demonstration seminar attendees indicated that most if not all TxDOT employees utilize Excel 2002 or Excel XP, so the tool should function on these computers without error or need for debugging.

6.3 Score Interpretation

The Results page of the tool displays each of the sixteen methods in rank order from highest positive score to lowest negative score. Precluded methods are listed at the bottom of the ranking. A comment box with the score interpretation, as shown in Figure 6.1, is displayed to the right of the ranked methods on the Results page of the tool. Due to the normalization of the average coefficients the maximum possible score is +100 and the minimum possible score is -100. Based on the projects tested during the demonstration seminars and other projects tested by the research team, the ranges for the score interpretation were established. A total of eight projects were used to set the ranges for the score interpretation. Five of these projects were tested for all four phases possible. The highest positive score observed in testing was +78 and the lowest was -60. Nine methods were precluded during the construction phase of one of the tested projects. More projects could be analyzed and additional data gathered for statistical comparison in future research efforts. On the Results page the user is reminded to focus on the methods and not particularly on the scores. However, once executed, the user may track the tool results to monitor method use and perhaps create historical data encompassing many projects. More about the limitations of the scoring approach is explained in last section of this chapter.

Score Interpretation:

- \> 50: Method needs to be used
- 50 to 30:Method is strongly recommended
- 30 to 0:Method is recommend
- < 0: Method is not beneficial under selected circumstances

Precludes:

The use of method is precluded under selected circumstances

- •Maximum Possible Score: + 100
- •Minimum Possible Score: - 100
- •All factors weighted equally within each method

Figure 6.1 Score interpretation within Expediting Method Selection Tool

6.4 Guidance for Updating/Modifying the Tool

As described at the beginning of Chapter 4 and based on initial input from the project team and potential users, one requirement for the tool was that it be expandable. Ongoing and future research efforts to expedite highway construction and legislative/managerial changes will allow additional methods to be used by TxDOT. If warranted, these methods can easily be incorporated into the tool and obsolete methods removed without difficulty. This section details the steps needed to update and/or modify the tool to add or delete a method from the tool.

Overall, the general steps needed to add data include the process to obtain the data using the ballot form as outlined in Chapter 2, review and normalize the data using basic Excel functions, transfer the normalized coefficients to the "Coefficients" worksheet within the tool, establish formula link between "Coefficients" and "Scores" worksheets, update the macro modules in the tool, establish a hyperlink for new method(s), and add description and reference material to the "References" worksheet of the tool. The process for deleting obsolete methods is similar to that for adding.

6.5 Tool Implementation and Follow-up

A major component of this research is to provide procedures for implementation of the Expediting Method Selection Tool and the sixteen methods contained therein. Procedures and suggestions for implementing the tool were gathered from the demonstration seminars and the research team. Specific actions for implementation were collected from the participants near the close of each of the demonstration seminars. These primary actions were refined by the research team and included:

- Burn a number of CDROMs with the tool for the project director and coordinator. They will distribute the tool to the TxDOT Design and Construction Divisions. Included on the CDs will be the EMST (tool), interim report (pdf), and readme file with basic instructions for tool use.
- Email final copy of the tool to seminar, ballot, and workshop participants (between eighty and ninety individuals). In addition to the tool the email will also include the interim report and readme file. In turn, have these participants email the tool to interested colleagues.

- Seek to present the background of this research and EMST at the next TxDOT Design and Construction Division Conferences. The focal point of these presentations should be on use of the tool during design and planning.
- Obtain an OPR (Office of Primary Responsibility) contact to act as advocate or champion for tool usage. An OPR such as the TxDOT Design or Construction Division will be utilized. Individuals acquainted with project team will be contacted.
- Prepare short course curriculum and conduct multiple short courses to train appropriate personnel. These short courses may be similar in format to the demonstration seminars in Houston, Dallas, and Austin, except much longer in duration; and may highlight a predetermined and already scored project. Since these courses are outside the scope of this project, funding and assistance with the short course curriculum will be sought through the TxDOT Professional Development office. The short courses may also take the form of an on-line or video conference.
- Write and distribute a memo, through appropriate TxDOT channels, describing the tool and its use to the twenty-five district engineers (DE). Assistance may also be solicited to introduce the tool at the quarterly meeting of the DEs.

Other secondary suggestions for implementation were generated by the research team. These actions include the following items, but are not limited to:

- Mail the final tool version, on CD, to other interested TxDOT employees and/or prior project participants.
- Deploy the tool via the TxDOT intranet system so that all employees with computer access may use.
- Use the tool predominately as a training mechanism to assist younger, recently hired, and/or less experienced personnel.
- Use the tool as an advocate to obtain support for incorporation of expediting methods into projects.
- Use the tool to track use of methods on certain projects, collect additional data, and use to weight categories and circumstances in future versions of the tool.

6.6 Limitations

The EMST only offers basic guidance and does not seek a confined or narrow solution to complex highway construction problems. The tool is not a decision-making tool; it is only a decision-assisting or support tool. The tool is intended to help area engineers, project managers, and other decision makers identify expediting methods most appropriate to the project. However by using a scoring mechanism, the tool does provide some quantifiable rationale to the evaluation process that would otherwise be very subjective. Cost/benefit analysis is considered to be outside the scope of the tool and hence is not included. The project manager or engineer may wish to perform cost/benefit analysis before deciding to use a given method. Budgetary constraints may dictate use of some methods, especially those that involve contract incentives. The tool includes a number of TxDOT special provisions that have been used at the state or district level, or one time project use. Caution is urged when using these special provisions. Again, these may serve as guides to write project-specific provisions and should not supplant thorough analysis of the method and special provision. Also note that not all special provisions or contractual clauses needed to institute a method are given in the Reference pages. The tool does not consider change orders as an efficient way to institute a method.

In the tool, all circumstances are weighted equally within each method and circumstance coefficients within that method do not change. Limitations exist in the use of coefficients to score the sixteen methods in that the tool does not contain logic such that one circumstance coefficient may modify or nullify the value of another. In the EMST, the scoring of methods is not mutually exclusive in that one method does not influence another. In other words, certain circumstances and methods that in the real world would influence each other or should be linked by logic to each other are not considered as such in the tool. This situation is illustrated in the example of project phase. The project phase circumstance has equal standing with other circumstances and is not used as a qualifier to direct the user to specific circumstances such as occur in categories 7-14. Due to research restraints, the EMST does not account for the variables and complexities of a comprehensive set of real-world interactions.

The application of road user costs in the tool is also somewhat difficult because of problems with assessing a dollar value based on output from varied computer software such as CORFLO, HEEM-II, HEEM-III, PASSER I, PASSER II, QUEZW, and TRANSYT-7F. Some of these computer programs are geared only toward freeway-type projects and hence have limited scope in terms of the diversity of project types considered. One may conclude that perhaps because road user costs are key for all methods, they should be an output from the tool or at least calculated internally by the tool based on user inputs. The design of such a tool was considered beyond the scope of this research; however future research efforts may pursue these tool refinements.

The final chapter of this report presents a restatement of the project objectives and conclusions and recommendations.

7. Conclusions and Recommendations

7.1 Review of Objectives

This chapter reviews the project objectives for this project and provides conclusions on the second-year portion of the research. Lastly recommendations are made for further method research, tool refinement and tool use.

The second-year objectives of this two-year study for TxDOT were to develop and validate a user-friendly tool with which area engineers and assistants may easily determine practical yet innovative expediting methods that are most appropriate in expediting methods given different project conditions. This research was motivated by TxDOT's need to deliver highway projects faster, to make the most efficient use of funds for these projects, and to minimize total road life-cycle cost. This report covers the effort to develop and validate the Expediting Method Selection Tool. For information on the first-year objectives, conclusions, and recommendation, review the interim report by Simon et al. (2002).

7.2 Conclusions

This section presents a review of how the research objectives were met and findings from the demonstration seminars. The research objectives were successfully met in the following ways:

- Identified needs and requirements of circumstances and their relationship with each expediting method.
- Delivered additional information about selected expediting methods.
- Developed structure of tool to create prototype.
- Conducted three demonstration seminars to obtain feedback from TxDOT and industry personnel.
- Updated and validated prototype tool in several iterations, based on projects from the demonstration seminars and others.
- Obtained suggestions and developed guidelines to help implement the tool within TxDOT.
- Delivered the final (final product) on CDROM to TxDOT

From the demonstration seminar comments, as well as the completion of thorough research on each of the expediting methods, the following findings are presented:

- Just as the first-year workshops were an effective and efficient way of sharing information, the demonstration seminars provided an important setting to discuss expediting methods included in the tool and exchange knowledge among participants.
- The demonstration seminar participants provided suggestions for improvements to the tool and also provided excellent guidance for implementation.
- The evaluation form, completed at the demonstration seminars, shows that nearly 97% of the seminar attendees agree that the tool is useful, with the same percent agreeing that the tool appears easy to use. A similar percentage of the participants answered that they would use the tool or recommend it to others on future projects.
- The ballot completion, analysis of data, and the demonstration seminars identified and confirmed areas where further research is needed.
- Determining the road user cost of a given highway project is the most restrictive factor in implementing A+B contracting and probably other incentive/disincentive-based methods such as milestone incentives/disincentives, road user cost liquidated damages, "no excuse" incentives, and to a lesser extent lane rental. The magnitude of the road user cost determines whether the strategy will benefit from application of the method.
- There is considerable confusion among TxDOT personnel on how to calculate road user costs. One problem is that there is no single program to calculate RUC; multiple different programs must be used depending on the project and post-project circumstances such as location, ADT, type of roadway, number of lanes, percentages of trucks, accident rates, etc.
- Project participants in the three demonstration seminars who volunteered projects, hesitated the most during consideration of this question.

The tool may also have great value as an alignment and organizational mechanism. In fact, the tool may have more value in the planning area than the actual scoring and selection of methods. The value of the tool as promoter of alignment was evidenced during the scoring of the three projects in the demonstration seminars. In all of the seminars, scoring was done by more than one individual. At times many others within the group volunteered some information to which others in the group had no previous exposure. The process of scoring these projects seemed to foster open and frank discussion between the area engineers, assistants, supervisors, construction personnel, and many others within the district and seminar as a whole.

7.3 Recommendations for Methods

Of the sixteen expediting methods studied several lacked quantitative research. In general, some quantitative and much qualitative information was found for methods in the late design phase which involve contract management. Not as much information was found for methods in the construction and early design phases. From the information gathered during the researching of each the expediting methods, the following recommendations may be made to TxDOT. Many of these recommendations are derived from the review of TxDOT specifications conducted in Chapter 3.

- Study the implications of mandating use of CPM on all projects, not just those that involve contractual incentives such as lane rental, milestone incentives/disincentives, "no excuse" incentives, and A+B bidding. Other DOTs require the submission of an up-to-date CPM for all projects to receive monthly progress payments.
- Study effects of decreasing excessive time contingency from TxDOT-generated CPM schedules, especially for projects that involve contract incentives such as A+B bidding.
- Gather detailed metrics from other DOTs and private industry on specific contract-based methods such as A+B contracting, lane rental, and especially "no excuse" incentives. Many of these methods were studied in-depth when experimental under SEP-14, but little performance data has been gathered since that time (FHWA 1998b).
- Conduct meticulous studies on the schedule and cost implications of these incentive-based methods used over the last decade. For a sample of possible data to collect on these methods see Herbsman et al (1995).
- Provide a new software program to calculate road user cost for all thirteen DCIS project types and roadway configurations. The researchers found many personnel confused about the calculation of road user costs. In most instances the calculation of road user costs drives the use of methods such as lane rental, milestone incentives/disincentives, "no excuse" incentives, and A+B bidding. In the interim, existing software produced for TxDOT for this purpose in past research projects should be used (Memmott 1982, TxDOT 1999a, TxDOT 1999b).

- Advocate production and evaluation of multiple traffic control plans and partnering with contractors on TCPs, especially in busy congested urban project settings.
- Develop methods for expediting utility relocation work; KPCs and the first-year research both found this circumstance to be a significant barrier to expediting project delivery.
- Develop methods for expediting right-of-way (ROW) acquisition and accurate pricing of properties. This circumstance was found to be a significant barrier to project delivery by KPCs who completed ballots.
- Utility relocations and ROW relocations should be completed, or have a firm completion date, before construction letting. Feed back from the Districts was that these two items were the greatest obstacles for completing construction on schedule, and in many cases impacted the driving public (user costs) by creating longer construction durations (while time was not charged, due to delays with ROW or utilities.)
- Based on the overlap of expediting methods in this report and the GAO study (Chapter 2), DOTs should focus on use of project milestones (in design and construction), partnering and coordination, and training of personnel.
- Develop a standardized pre-project planning approach and project definition rating index.
- Conduct additional TCP studies, examining the number of initial TCPs developed, work-zone limits, and effect on drivers and workers. Some of this information may be obtained from traffic management centers or field observations.
- Emphasize use of maturity testing on all applicable TxDOT projects.
- This research did not provide tools for users to evaluate the project specific LCCA for use in developing specific contract provisions that may increase the bid price while reducing life cycle user costs. However, tools produced in earlier TxDOT research can and should be used for this purpose. They are RPLCC1 (Rigid Pavement Life-Cycle Cost Analysis) and TxPTS (Texas Pavement Type Selections.) (Walls 1998, Waalkes 2000, and Wilde 2001).

7.4 Recommendations for Tool Refinement

Recommendations for future verification and update of the tool were gathered from the participants near the close of the demonstration seminars and from the research team. These recommendations included:

- Collect additional data on projects to perform refinement on the tool using a database program (i.e., Microsoft® Access). Other components of this refinement would include:
  - Gather more expert input regarding the link between circumstances and methods and refine the tool
  - Calibrate tool based on these previous projects and other historical information
  - Perform sensitivity or regression analysis on tool and update based on results
- Verify and tune tool over a few years and many projects
- Customize tool with different versions based on location and phase (i.e. rural, urban, planning and construction, etc.).
- Make the tool even more transparent to display promoter and barrier circumstances where associated values combine to reach the method score.

When the tool refinements are made, the tool results will be more valid and consistent with the user's knowledge, training, experience, and perhaps greater frequency of tool use will result.

7.5 Recommendations for Tool Use

At one of the demonstration seminars an area engineer indicated that engineers within that district "all consider this stuff [expediting methods] anyway." In other words, there is probably no method or few methods recommended by the tool that senior practitioners do not already have some knowledge, expertise, or experience using. However, the tool is useful for those with less experience. The tool attempts to organize categories and circumstances in a manner that provides a useable framework for selection and implementation of applicable methods to expedite major highway projects. Specific suggestions for implementation of the tool by TxDOT are contained in Chapter 6.

The Expediting Method Selection Tool provides method advice and references. The tool provides information about specific expediting methods in a structured environment. The tool is not a decision-making tool; it is only a decision-assisting or support tool. The tool does not make decisions on whether or not to utilize a given expediting method – that is left to the individual user. The research team recommends use of the tool during the feasibility study, design summary report, and PS&E phases. Moreover, during the demonstration seminars, an area engineer suggested that the tool be used at the 10%, 30%, 60%, 90% review stages during PS&E. Planning is the optimum phase for initiating use of the EMST. The tool permits area engineers and assistants to easily determine the methods that are most appropriate given different project conditions. With frequent use of the EMST, project delivery time may be expedited, which could lead to reduced project life cycle cost.

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Appendix A

Comparison of Methods with GAO Approaches

Summary of Top 30 Methods and Associated Approaches			
0-4386 TxDOT Research		**GAO Report**	
	Rank		**Rank**
Use a calendar day schedule	1		
Precast/modular components	2		
Use of contractor milestone incentives	3	Establish project milestones and performance monitoring systems, Incentive/Disincentive construction	5, 37
Pavement type selection decisions	4		
Standardize planning approach	5	Single agency point of contact	27
Generate & evaluate multiple approaches to traffic control plans	6		
Maturity testing	7		
Partnering	8	Early partnership and coordination	1
A+B contracting	9	A + B bidding for construction contracts	40
Expediting utility relocation	10	Utility relocation contracts and (SUE)	45, 35
Implementing multiple work shifts and/or night work	11		
Incentivize contractor work with a lane-rental approach	12	Lane rental construction contracts	43
Expediting ROW acquisition	13	Allow early right-of-way acquisition	18
Set liquidated damages to the appropriate level and enforce	14		
Improving environmental assessment during planning	15	Various environmental approaches; Unify NEPA processes, Est. time frame for NEPA process, Pre. environ. assessment reports, context sensitive design, GIS, Wetlands banking, Environ. Information Center, etc.	4, 6, 8, 10, 13, 21
Full closure instead of partial closure of roadway	16		
"No Excuse" incentives	17	Incentive/Disincentive construction contracting	37
Seek to maximize work-zone size	18		
Develop traffic control plans (TCP's) through partnering between TxDOT design and field organizations	19	Early partnership and coordination	1
Windowed milestones	20	Establish project milestones and performance monitoring systems	5, 37

Summary of Top 30 Methods and Associated Approaches (Continued)			
0-4386 TxDOT Research		**GAO Report**	
	Rank		**Rank**
Increasing levels of design component standardization	21		
ITS & work-zone traffic control	22		
Pilot demonstration projects	23	Acculturation	15
Programmatic (corridor) approach	24		
Train selected field personnel in scheduling methods and schedule claims prevention	25	Training	9
Alternative funding methods	26	Interagency funding agreements	7
Design-build approach	27	Design build contracting	39
Public input on construction methods	28	Public information meetings	12
Exploit web-based team collaboration system	29	Internet	17
Create a lessons-learned database	30		

Appendix B

Method Synopses

IV.5) Use a Calendar Day Schedule:

Faculty Lead: Dr. O'Connor

Description of Method

Scheduling the projects according to calendar days instead of working days enables better weather management and may lead to faster project completion.

Project Characteristics that would Leverage Benefits

- Applicable to emergency situations
- Applicable where a large volume of traffic is affected
- End date of project is better defined
- Will challenge the better contractors who will succeed with this approach
- Applicable to projects with multiple work sites where weather may effect one site and not others

Constraints/Limitations in Implementation

- Lack of TxDOT personnel that are willing to work more than 5-days a week
- Working in bad weather may cause poor quality
- Need to be sensitive to the public, i.e. near church, hospital, residential units, etc.
- Must allow at least one day per week for rest/catch-up, otherwise fatigue hurt productivity
- Complication / How to deal with force-majeure?

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
James Hunt	Director of Cons.	Dallas
Noelle Ibrahim	Chief Eng., Cons.	N. Texas Tollway Authority
Karl J Bednarz	Director of Construction	San Angelo

II.2) Precast/Modular Components:

Faculty Lead: Dr. Haas

Description of Method

Construction zones can maximize concurrent work activity with the use of modular, prefabricated components. Precast modular components such as bridge sections or road slabs are common examples.

Project Characteristics that would Leverage Benefits

- Especially applicable to elevated projects involving girders, bridge decks, retaining walls, piping, etc.
- Bad weather has less effect on schedule and quality
- Where local skilled labor shortage is an issue, lower requirements for on-site personnel due to implementing a modular approach is an advantage.
- Where construction phase schedule compression is critical, modularization is one of the best expediting approaches
- Often used for small local bridges, culverts, etc.

Constraints/Limitations in Implementation

- Limited dimensional flexibility
- Increased design requirements
- Connection between precast pieces can be problematic; in terms of fit and waterproofing
- Transportation difficulties in terms of dimensions of modular components
- Need for heavy cranes and critical lift planning
- Requires designer to have construction knowledge / consultant designers (RPE) requires evergreen contracts over long period of time

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Brian Merrill	Mgr.-Bridge Constr /Maint	Bridge Division
James Koch	Design Director	Houston
Lowell Choate	Area Engineer	Austin District

III.2) Use of Contractor Milestone Incentives:

Faculty Lead: Dr. Gibson

Description of Method

Contractors are financially rewarded for on-time delivery of specific work tasks.

Project Characteristics that would Leverage Benefits

- Applicable where the milestones generate big benefits for public
- Applicable when succeeding projects or tasks depend on on-time completion

Constraints/Limitations in Implementation

- Funding restraints, TxDOT is reluctant to pay too much in incentives
- There should be few utility issues, ROW issues and good plans
- Must have well defined milestones and method for determining incentives
- Disagreements, disputes with contractor likely to increase
- Must ensure project quality

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Daniel Richardson	Asst. Director of TP&D	Abilene
James Koch	Design Director	Houston
Mike Lehman	District Construction Engr.	San Antonio

II.3) Generate & Evaluate Multiple Approaches to Traffic Control Plans:

Faculty Lead: Dr. O'Connor

Description of Method

TCPs, in large part, both drive project schedule and the impact of construction in traffic operations, but too often the first workable TCP solution is pursued during construction. TCPs deserve very vigorous analysis during design.

Project Characteristics that would Leverage Benefits

- Applicable to large projects with complex traffic control (i.e. involving bridges, ramps, frontage roads, elevation differentials, etc.)

Constraints/Limitations in Implementation

- More consultant or TxDOT design resources needed
- Consultants need to get contractor input/feedback
- Limited capital funds to generate multiple TCPs

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
David Gan	Eng. Spec.	Dallas - Design
James Koch	Design Director	Houston

III.1) A + B Contracting

Faculty Lead: Dr. Gibson

Description of Method

A+B contracting (also called cost plus time) is a procedure that incorporates the lowest initial cost, but also factors into the selection process the time to complete the project. This strategy may or may not include incentives and/or disincentives.

Project Characteristics that Would Leverage Benefits:

- Large, complex projects
- Projects in urban areas
- Projects with time constraints
- High priority, high trafficked roadway
- Major freeway interchanges

Constraints / Limitations in Implementation:

- Balance between benefits of early completion (benefits to the public) and any increased cost of construction
- Requires incentives and disincentives that need to be carefully managed to be effective
- The need for clear ROW and utilities before letting is important
- Project with large uncertainties are not good for this method
- Demands on inspection personnel may be higher
- Must have complete and accurate PS&E, minimal change orders
- No unresolved environmental issues
- Nighttime work and accelerated work may raise safety or quality concerns

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
David C. Kopp	Director of Construction	San Antonio
Charles E. Gaskin	Director of Construction	Houston
James Klotz	Director of Construction	Austin

III.6) Incentivize Contractor Work Progress with a Lane Rental Approach:

Faculty Lead: Dr. O'Connor

Description of Method

Lane rental provisions assess the contractor daily or hourly rental fees for each lane, shoulder, or combination taken out-of-service during a project to minimize the time that roadway restrictions impact traffic flow.

Project Characteristics that would Leverage Benefits

- Applicable to major roadway, bridge, or interchange projects with high ADT and traffic restrictions of lane closures
- Applicable to projects or portions of projects involving temporary lane, ramp, or bridge closures, and emergency repair work
- Minimizes impact to traffic
- Applicable to projects with night or multi-shifts and/or dominant traffic periods
- Enhances work zone mobility and may help schedule subcontractor work items

Constraints/Limitations in Implementation

- Need good estimating of lanes, rates, time, etc (Resource intensive).
- The project should be relatively free of third party conflicts, design uncertainties, or right-of-way issues that may impact the project schedule.
- Use to require work during off-peak hours (night)
- Safety of overall roadway
- Sufficient personnel needed to track lane closures and duration

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Tracey Friggle	Asst. Director of Cons.	Dallas
Charles E. Gaskin	Director of Construction	Houston
David C. Kopp	Director of Construction	San Antonio

III.11) "No Excuse" Incentives

Faculty Lead: Dr. Gibson

Description of Method

In this method the constructor is given a "firm delivery date" with no excuses for missing this date. Incentives are provided for early completion; however there are no disincentives other than normal liquidated damages.

Project Characteristics that Would Leverage Benefits:

- High profile, extremely time critical projects
- Clear ROW and Utilities help
- Accurate and realistic schedule is required

Constraints / Limitations in Implementation:

- Incentive can be moot when the contractor bids incentive time in the contract.
- Claims resulting from ROW and utility relocation may occur
- Possible disputes over incentives, therefore incentives must be well documented
- How to deal with change orders?
- Higher cost (Contractors bid higher to offset increased risk)
- Need experienced oversight by TxDOT

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Noelle Ibrahim	Chief Eng., Cons.	N. Texas Tollway Auth.
Randy Hopmann	Director of TP&D	Tyler
Pat Williams	Director of Construction	Bryan

II.10) Maturity Testing

Faculty Lead: Dr. Haas

Description of Method

Maturity testing allows an engineer or manager to make appropriate decisions about the concrete placement options by considering the speed at which each option can achieve a certain strength and about the concrete placement cost by considering aspects such as the penalty or lost opportunity costs for slow concrete development. For example, by stripping forms more rapidly, the forms can be reused more frequently and time savings can ensue. By attaining the specified strength more rapidly, the project can proceed more quickly.

Project Characteristics that Would Leverage Benefits:

- Project dominated by concrete structures
- Concrete Intersection Work
- Concrete placement activities are on the critical path
- Sophisticated contractor is available

Constraints / Limitations in Implementation:

- Special software requirements for contractors
- Reluctance of contractors to implement
- Requires specialty knowledge by inspectors
- Does not reflect other properties of concrete such as permeability
- Requires calibration to specific mix designs and strict quality control at plants
- Physical testing still required

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Brian Merrill	Mgr. - Bridge Constr/Maint	Bridge Division
Tom Hunter	Director of Construction	Lufkin

I.6) Formal Partnering

Faculty Lead: Dr. Haas

Description of Method

Partnering is a formal management process in which all parties to a project voluntarily agree at the outset to adopt a cooperative, team-based approach to project development and problem resolution. Many mechanisms (meetings) can be used to promote partnering concepts including project concept conferences, design concept conferences, and post construction meetings.

Project Challenges that Would Leverage Benefits:

- Previously antagonistic, adversarial or combative relationships may be converted with this approach

Constraints / Limitations in Implementation:

- Little training and much skepticism
- Negative perception of partnering by some participants
- Creates strong dependency on some partners
- Mindset change required. Them vs. us attitude

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Mike Lehman	District Construction Engr.	San Antonio
Randy Hopmann	Director of TP&D	Tyler
Enrique Guillen	Cons. Eng.	Dallas

III.9) Set Liquidated Damages to the Appropriate Level and Enforce:

Faculty Lead: Dr. Gibson

Description of Method

Liquidated damages provisions allow a contracting agency to reduce payment to the contractor of a certain amount of money for each delayed time unit. Use of liquidated damages perhaps in conjunction with incentives may improve project speed.

Project Characteristics that Would Leverage Benefits:

- Critical projects with high potential for traffic inconvenience and delay
- Well-known costs of project delay with good basis
- Realistic schedule known
- ROW and utility relocation efforts are well established

Constraints / Limitations in Implementation:

- Requires rigorous documentation and quick request for information (RFI) to enforce
- Higher construction costs (contractor add any perceived delays to his cost)
- Enforcement problems (collection of damages)
- No authority at field/local level
- Calculation of liquidated damages (based on road user cost)
- Should be off-set with incentives if possible

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Duane A. Schwarz	Director of Construction	Waco
David Hearnsberger	Director of Operations	Beaumont
Mike Lehman	District Construction Engr.	San Antonio

II.1) Pavement Type Selection Decisions:

Faculty Lead: Dr. Haas

Description of Method

The two types of pavement generally considered are rigid and flexible pavements as typified by Portland cement concrete pavement (PCCP) and asphalt concrete pavement (ACP), respectively. Quick curing concrete and flexible pavements, as well as in-place recycling are additional options at this stage.

Project Characteristics that would Leverage Benefits

- Applicable to all types of projects
- For small projects with intense pressure to return to service quickly, ACP may be preferable
- Where future maintenance and rehabilitation will incur extremely high user costs, pavements with more durability and longer design life may be worth the investment

Constraints/Limitations in Implementation

- Initial costs
- Limited ability to predict performance
- Lack of reliable productivity data to indicate whether overall project schedule would benefit more from ACP or PCCP

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Juan D. Villarreal	Engineering Manager	KBR

IV.3) Seek to Maximize Work-Zone Size:

Faculty Lead: Dr. O'Connor

Description of Method

Larger work zones can be developed in the TCP and generally results in lower unit costs as well as schedule compression because relative impacts of mobilization and demobilization are reduced. Safety of the driver and construction worker is of chief concern.

Project Characteristics that Would Leverage Benefits:

- Applicable when multiple TCP options exist
- Urban construction with many adjacent streets, driveways, etc.
- Road geometry permit
- Weigh benefits against impacts on the public
- Weekend and night scheduling may make this possible
- More input for underground, earthwork, and pavement activities

Constraints / Limitations in Implementation:

- Possible traffic congestion and higher user cost
- ROW constraints and access limitations
- Impacts to adjacent businesses and property owners need to be studied
- May require compensation to local businesses

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
John A. Terry	Central Design Eng.	Fort Worth
Charles E. Gaskin	Director of Construction	Houston
Noelle Ibrahim	Chief Eng., Cons.	N. Texas Tollway Authority

IV.7) Full Closure Instead of Partial Closure of Roadway

Faculty Lead: Dr. Haas

Description of Method

Closing the roadway completely instead of partial closure can increase efficiency and decrease project duration significantly by freeing up space and reducing interferences.

Project Characteristics that Would Leverage Benefits:

- Availability and capacity of alternative routes
- Low volume of traffic during closure
- Can be closure 24/7 or during off-peak hours
- Time critical
- Type of highway (more challenging on arterial highways)
- Type of project (may only be possible on low volume roads with a good close detour route acceptable to the public)

Constraints / Limitations in Implementation:

- Need public buy-in
- Night work is more costly, less productive and more dangerous if used to provide full closure during off-peak hours
- Balance of risks with gains
- Possible traffic congestion on alternative routes
- Significant public relations effort

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Noelle Ibrahim	Chief Eng., Cons.	N. Texas Tollway Authority
Charles E. Gaskin	Director of Construction	Houston
Gary Humes	Director of Construction	Brownwood

III.8) Implement Multiple Work Shifts and/or Night Work

Faculty Lead: Dr. Haas

Description of Method

In developing the tools and best practices attention should be paid to safety and implementing night TCPs. The traffic control used for night work is usually the same as that used for typical daytime work zones, despite the potential adverse conditions that may be encountered. For these reasons, there is a need to examine methods to improve traffic control and safety for night work zones. Multiple work shifts can lead to improved project speed.

Project Characteristics that Would Leverage Benefits:

- Large and/or complex projects
- Urban projects
- Availability of new technologies (such as intrusion alarms and new methods to monitor traffic) that can improve night time productivity
- Day time / rush hour traffic flow absolutely necessary

Constraints / Limitations in Implementation:

- Manpower requirements (TxDOT inspectors)
- Night work safety issues
- Night work more costly and less productive and more dangerous (worker circadian rhythms)
- Cost to implement and maintain site
- Noise issues (ordinances)

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Dennis Satre	Vice-president / Consultant	Halff Asso./N Texas Toll. Auth.
James Koch	Design Director	Houston
Lowell Choate	Area Engineer	Austin District

II.6) Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations

Faculty Lead: Dr. O'Connor

Description of Method

Partnering between TxDOT & contractors for the purpose of developing traffic control plans could lead to a more schedule-efficient approach and lead to efficient design and construction.

Project Characteristics that Would Leverage Benefits:

- Timing of construction involvement
- Larger and complex projects
- Clear ROW and utilities

Constraints / Limitations in Implementation:

- Communication and cooperation between design and field (face to face meetings)
- Time and capital involved
- ROW and utility relocations can limit
- Timing of construction involvement

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Wayne Ramert	Director of Construction	Yoakum
Charles E. Gaskin	Director of Construction	Houston
Duane A. Schwarz	Director of Construction	Waco

V.6) Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention

Faculty Lead: Dr. O'Connor

Description of Method

Expeditious schedule adjustments and good short interval planning can minimize schedule delays due to missing materials or information. Having trained personnel who can assess schedule impacts and make good decisions can help to expedite schedule performance and enhance more effective and realistic time estimates.

Project Characteristics that Would Leverage Benefits:

- Very large and complex Projects
- Complex traffic control plans
- Known problems in project (3rd party involvement, unchartered utilities, late ROW acquisition, etc.)
- Contractor with a history of claims
- Use of incentive contract methods requires CPM
- Must use for accurate contract time determination

Constraints / Limitations in Implementation:

- Scheduling methods takes some time to become proficient at
- Schedule based on unreliable assumptions
- Must continue to use to remain proficient
- Only a few need to learn

Knowledgeable points of contact:

Name	**Title**	**District / Organization**
Lowell Choate	Area Engineer	Austin District
James Hunt	Director of Cons.	Dallas
Tracey Friggle	Asst. Director of Cons.	Dallas

Appendix C

Request Letter to Complete Internet Ballot

REQUEST LETTER TO COMPLETE INTERNET BALLOT
Re. PROJECT NO. 0-4386
EXPEDITING HIGHWAY CONSTRUCTION WHILE RETAINING QUALITY

March 11, 2003

Dear Prospective Ballot Participant,

On behalf of our research team, I would like to thank you once again for your participation in the expediting workshops. Feedback gathered during these workshops has been used to select 16 high potential impact expediting methods each of which have been extensively researched. Later, comments on the benefits/drawbacks and constraints/limitations of each method were gathered from some workshop participants.

To review the basis of this research investigation, TxDOT desires a system for selecting the most appropriate "state of the practice" methods to expedite planning, design and construction of capital projects. Concurrently, value and quality must be maintained. The objective of this research is to provide such a system in the form of a Microsoft® Excel based Expediting Tool. Upon completion, the Expediting Tool will be delivered to all TxDOT districts. A questionnaire (ballot) has been prepared to evaluate different methods used in expediting construction and will provide critical information for developing the tool. The project team believes that the information and presentation of the ballot is as clear and concise as possible. Note that this ballot has been reviewed and endorsed by William Goodell from the Dallas District and James Travis from FHWA.

To help with completion of this research, we request that you first read the ballot instructions and then complete the ballot(s). Included with this cover letter you will find at least three other documents: ballot instructions, brief description of each method, and at least one expediting method ballot. The project team anticipates that each ballot will take about 30 minutes or less to complete. Note that individual experience with the particular expediting method may dictate the time needed to complete the ballot. If you have additional comments or concerns, that are not addressed in the ballot, simply emphasize them in the 'Others' category at the end of the ballot.

We have created an internet website that better displays the information included in the fax. We would prefer that you complete the ballot via the internet, as data compilation and tool building facilitation will be easier and quicker. Please access the site on the World Wide Web at http://www.utresearch.150m.com/. On the website main page is an alphabetical list of selected methods with a brief sentence about each. As indicated by the fax, you have been pre-selected to complete specific method ballots, but you can complete additional ballots if you choose. Please click on the individual method name, which is highlighted in blue, to open a window with the respective ballot. For each ballot complete the personal information section, fill-out the ballot (see the instruction link at the top of the page), and click on the submit button at the bottom of the page. The ballots are each two pages long, so after submitting the first page click on continue and the second half of the ballot will open. Once you have completed this page click on the submit button at the bottom of the ballot and then return to the main page. If you do not prefer internet usage or do not have internet access, you may respond by fax or mail.

We realize that you have an extremely busy schedule. If you could however, complete the ballot(s) in two weeks from receipt of this fax we would appreciate it tremendously. Due to the project schedule of this research we are at a critical juncture and need this information quickly. Please complete the ballot(s) by March 26, 2003.

Your feedback is invaluable and essential for the success of this project. Please call or email me if you have any questions. You may also direct questions to the two graduate research assistants working on this project, Berkay Somali and Christopher Anderson (471-1620 or 471-8417). Thank you for your assistance.

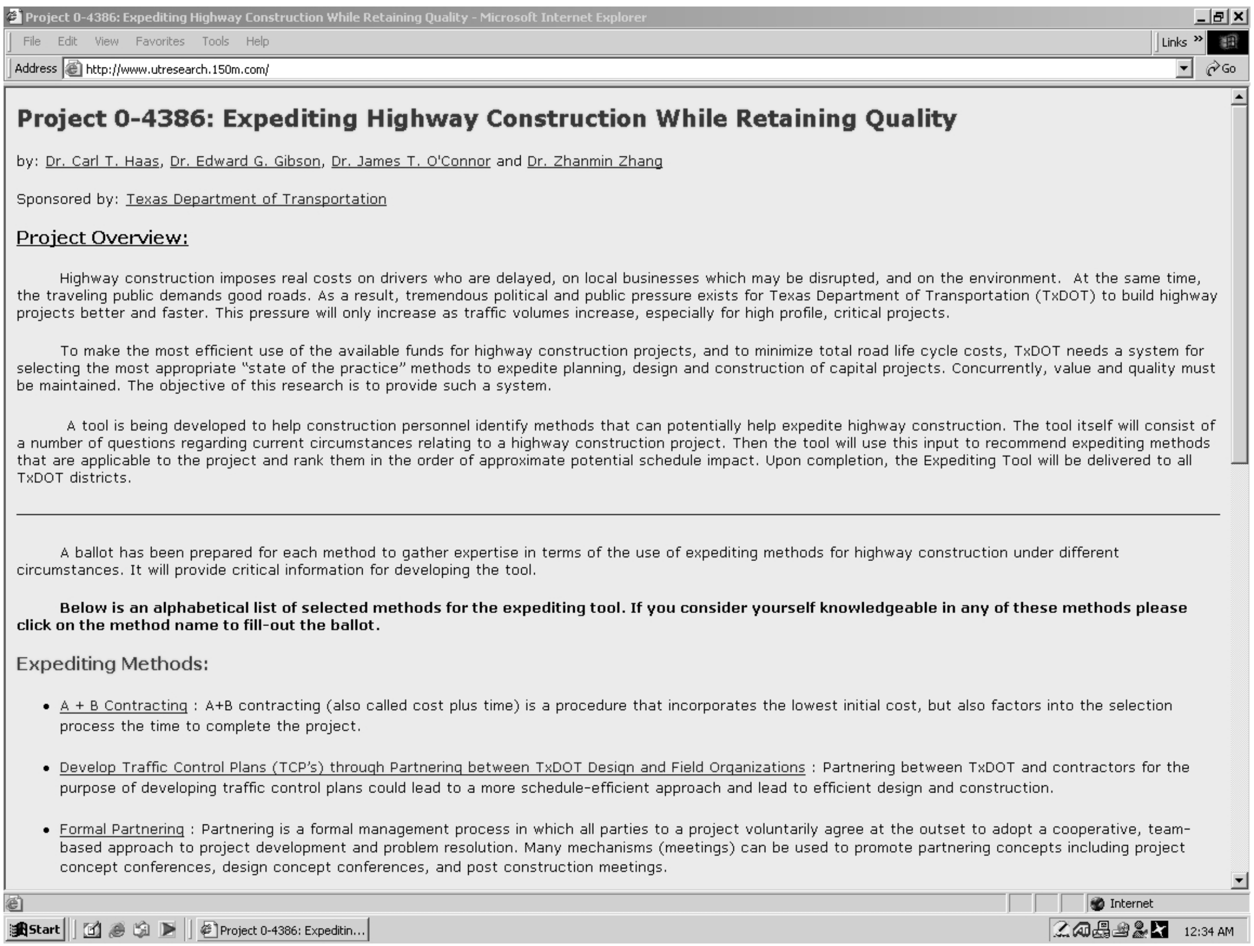
Sincerely,

Carl T. Haas, P.E., PhD
Professor in Civil Engineering
University of Texas at Austin
Phone: (512) 471-4601
Fax: (512) 471-3191
haas@mail.utexas.edu

Cc: G. E. Gibson, P.E., PhD, Professor in Civil Engineering at UT Austin
J. T. O'Connor, P.E., PhD, Professor in Civil Engineering at UT Austin
Z. Zhang, P.E., PhD, Asst. Professor in Civil Engineering at UT Austin

Appendix D

Screenshots from Website Used to Gather Data for Ballots



Project 0-4386: Expediting Highway Construction While Retaining Quality

by: Dr. Carl T. Haas, Dr. Edward G. Gibson, Dr. James T. O'Connor and Dr. Zhanmin Zhang

Sponsored by: Texas Department of Transportation

Project Overview:

Highway construction imposes real costs on drivers who are delayed, on local businesses which may be disrupted, and on the environment. At the same time, the traveling public demands good roads. As a result, tremendous political and public pressure exists for Texas Department of Transportation (TxDOT) to build highway projects better and faster. This pressure will only increase as traffic volumes increase, especially for high profile, critical projects.

To make the most efficient use of the available funds for highway construction projects, and to minimize total road life cycle costs, TxDOT needs a system for selecting the most appropriate "state of the practice" methods to expedite planning, design and construction of capital projects. Concurrently, value and quality must be maintained. The objective of this research is to provide such a system.

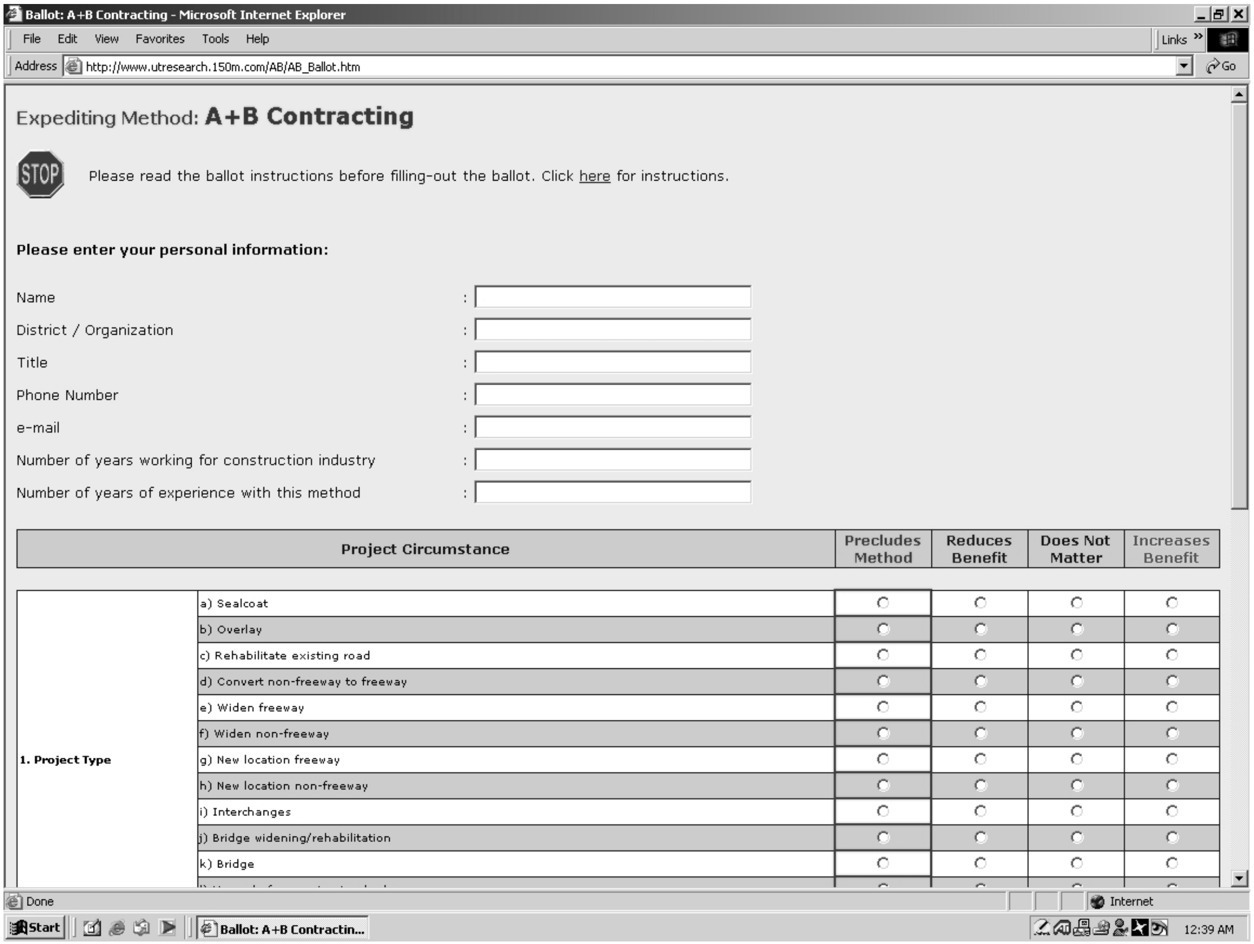
A tool is being developed to help construction personnel identify methods that can potentially help expedite highway construction. The tool itself will consist of a number of questions regarding current circumstances relating to a highway construction project. Then the tool will use this input to recommend expediting methods that are applicable to the project and rank them in the order of approximate potential schedule impact. Upon completion, the Expediting Tool will be delivered to all TxDOT districts.

A ballot has been prepared for each method to gather expertise in terms of the use of expediting methods for highway construction under different circumstances. It will provide critical information for developing the tool.

Below is an alphabetical list of selected methods for the expediting tool. If you consider yourself knowledgeable in any of these methods please click on the method name to fill-out the ballot.

Expediting Methods:

- A + B Contracting : A+B contracting (also called cost plus time) is a procedure that incorporates the lowest initial cost, but also factors into the selection process the time to complete the project.
- Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations : Partnering between TxDOT and contractors for the purpose of developing traffic control plans could lead to a more schedule-efficient approach and lead to efficient design and construction.
- Formal Partnering : Partnering is a formal management process in which all parties to a project voluntarily agree at the outset to adopt a cooperative, team-based approach to project development and problem resolution. Many mechanisms (meetings) can be used to promote partnering concepts including project concept conferences, design concept conferences, and post construction meetings.



Ballot: A+B Contracting - Microsoft Internet Explorer

Address http://www.utresearch.150m.com/AB/AB_Ballot.htm

Expediting Method: **A+B Contracting**

STOP Please read the ballot instructions before filling-out the ballot. Click here for instructions.

Please enter your personal information:

Name :

District / Organization :

Title :

Phone Number :

e-mail :

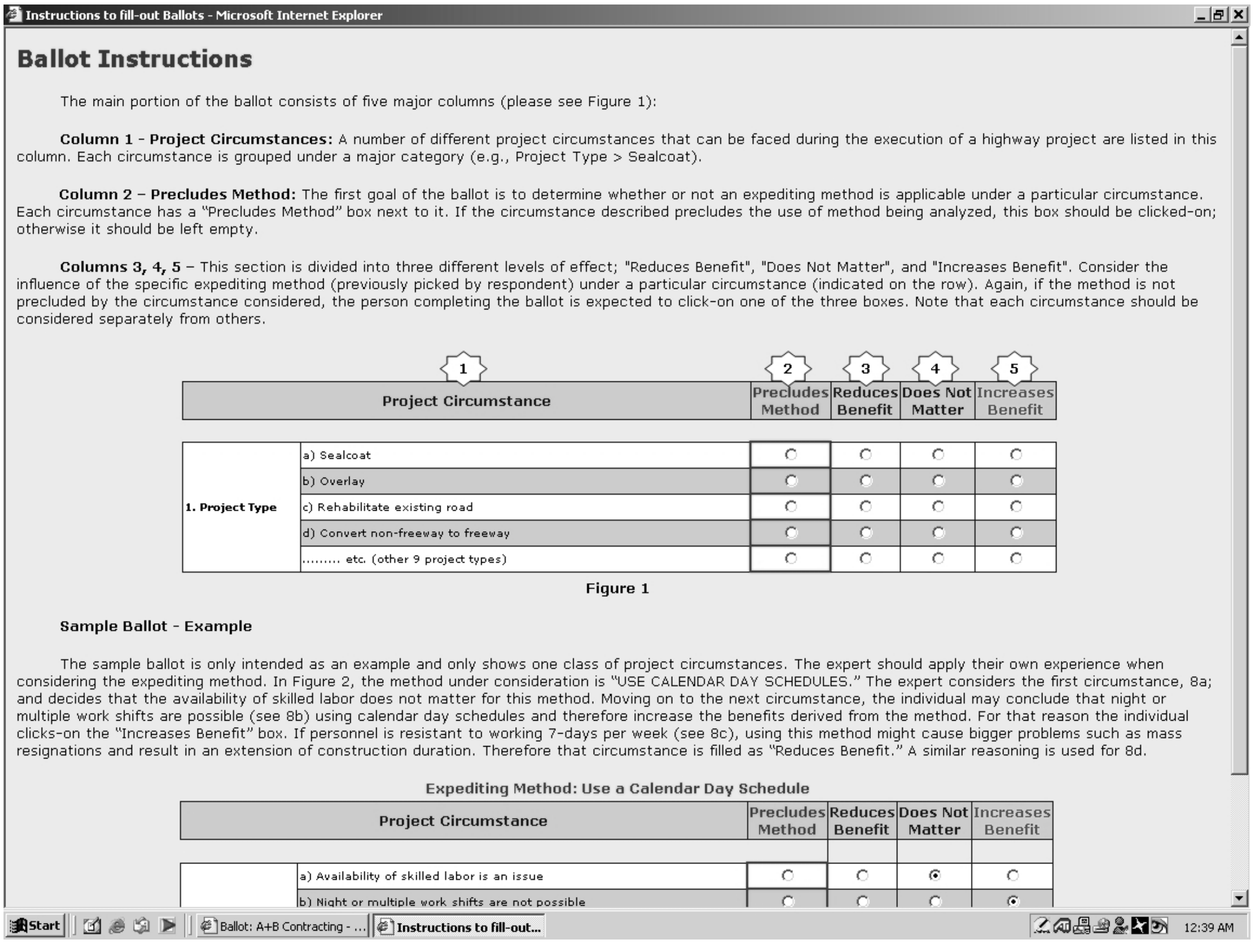
Number of years working for construction industry :

Number of years of experience with this method :

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	○	○	○	○
	b) Overlay	○	○	○	○
	c) Rehabilitate existing road	○	○	○	○
	d) Convert non-freeway to freeway	○	○	○	○
	e) Widen freeway	○	○	○	○
	f) Widen non-freeway	○	○	○	○
	g) New location freeway	○	○	○	○
	h) New location non-freeway	○	○	○	○
	i) Interchanges	○	○	○	○
	j) Bridge widening/rehabilitation	○	○	○	○
	k) Bridge	○	○	○	○

Done Internet

Start Ballot: A+B Contractin... 12:39 AM



Instructions to fill-out Ballots - Microsoft Internet Explorer

Ballot Instructions

The main portion of the ballot consists of five major columns (please see Figure 1):

Column 1 - Project Circumstances: A number of different project circumstances that can be faced during the execution of a highway project are listed in this column. Each circumstance is grouped under a major category (e.g., Project Type > Sealcoat).

Column 2 – Precludes Method: The first goal of the ballot is to determine whether or not an expediting method is applicable under a particular circumstance. Each circumstance has a "Precludes Method" box next to it. If the circumstance described precludes the use of method being analyzed, this box should be clicked-on; otherwise it should be left empty.

Columns 3, 4, 5 – This section is divided into three different levels of effect; "Reduces Benefit", "Does Not Matter", and "Increases Benefit". Consider the influence of the specific expediting method (previously picked by respondent) under a particular circumstance (indicated on the row). Again, if the method is not precluded by the circumstance considered, the person completing the ballot is expected to click-on one of the three boxes. Note that each circumstance should be considered separately from others.

1		2	3	4	5
Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	○	○	○	○
	b) Overlay	○	○	○	○
	c) Rehabilitate existing road	○	○	○	○
	d) Convert non-freeway to freeway	○	○	○	○
	.... etc. (other 9 project types)	○	○	○	○

Figure 1

Sample Ballot - Example

The sample ballot is only intended as an example and only shows one class of project circumstances. The expert should apply their own experience when considering the expediting method. In Figure 2, the method under consideration is "USE CALENDAR DAY SCHEDULES." The expert considers the first circumstance, 8a; and decides that the availability of skilled labor does not matter for this method. Moving on to the next circumstance, the individual may conclude that night or multiple work shifts are possible (see 8b) using calendar day schedules and therefore increase the benefits derived from the method. For that reason the individual clicks-on the "Increases Benefit" box. If personnel is resistant to working 7-days per week (see 8c), using this method might cause bigger problems such as mass resignations and result in an extension of construction duration. Therefore that circumstance is filled as "Reduces Benefit." A similar reasoning is used for 8d.

Expediting Method: Use a Calendar Day Schedule

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
	a) Availability of skilled labor is an issue	○	○	◉	○
	b) Night or multiple work shifts are not possible	○	○	○	◉

Start | Ballot: A+B Contracting - ... | Instructions to fill-out... | 12:39 AM

Appendix E

Completed Ballots by Method

Note: The values in each column represent the frequency of response by the knowledgeable points of contact (KPCs) or method experts.

Expediting Method: USE CALENDAR DAY SCHEDULES

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	1	2	2	1
	b) Overlay	0	2	3	1
	c) Rehabilitate existing road	0	1	1	4
	d) Convert non-freeway to freeway	0	1	1	4
	e) Widen freeway	0	0	1	5
	f) Widen non-freeway	0	1	1	4
	g) New location freeway	0	1	1	4
	h) New location non-freeway	0	1	1	4
	i) Interchanges	0	0	1	5
	j) Bridge widening/rehabilitation	0	0	1	5
	k) Bridge	0	0	1	5
	l) Upgrade freeway to standard	0	0	2	4
	m) Upgrade non-freeway to standard	0	0	2	4
2. Construction Duration	a) Short construction duration (<6 months)	1	1	2	2
	b) Medium construction duration (6 months - 2 years)	0	1	2	3
	c) Long construction duration (>2 years)	0	0	2	4
3. Total Project Cost	a) Significant cost uncertainties exist	0	2	4	0
	b) Additional funding is not readily available for method implementation	0	2	4	0
	c) Other funding problems are anticipated	1	1	4	0
4. Construction Schedule	a) Construction completion date is critical	0	0	1	5
	b) Intermediate milestones are critical	0	0	1	5
	c) End date of project is not clearly defined	1	3	1	1
	d) Project is an emergency situation	0	0	1	5
	e) Subsequent project(s) exist	0	0	2	4
	f) Schedule is not realistic	1	3	2	0
5. Materials & Equipment	a) Material & Equipment logistics are difficult	0	4	2	0
	b) Equipment (cranes, bulldozers, etc.) are not readily available	0	3	3	0

Precludes : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from David Head, Jim Hunt, Karl Bednarz, Juan F. Urrutia, Robert J. Hundley, and Jim Travis

Expediting Method: USE CALENDAR DAY SCHEDULES

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	1	1	4
	b) Conflicts between consultant and contractor are likely	0	0	3	3
	c) Conflicts between contractor and subcontractors are likely	0	1	2	3
	d) Many change orders are anticipated	0	1	4	1
	e) Contractor's quality performance on past projects was not to the desired level	0	0	3	3
	f) Contractor is not familiar enough with the method for implementation	0	1	4	1
	g) Systems are not in place to ensure good communication	0	1	3	2
	h) Contractor resistance (on method or other matters) is anticipated	0	1	3	1
7. Construction Site	a) Significant ROW acquisition issues exist	0	3	2	1
	b) Significant utility relocation issues exist	0	3	2	1
	c) The project consists of multiple work faces	0	0	3	3
	d) Adverse weather conditions are anticipated	1	3	0	2
	e) Lane closures are unavoidable	0	0	3	3
	f) Safety hazards are frequent and/or severe	0	1	3	2
	g) Project involves many lateral streets, driveways, etc.	0	0	3	3
	h) Project involves many adjacent business owners	0	0	0	6
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	1	5
	j) There is only one apparent Traffic Control Plan option	0	1	4	1
8. Personnel	a) Availability of skilled labor is an issue	1	2	1	2
	b) Night or multiple work shifts are not possible	0	1	3	2
	c) Personnel resistance to the method is anticipated	0	1	3	2
	d) Project based TxDOT resources are inadequate (number and/or capability)	0	3	0	3
9. Complexity	a) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	1	5
	b) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	1	5
	c) Project involves underground, earthwork, and pavement activities	0	0	1	5
10. Others	a) Public resistance to the method is anticipated	0	2	1	2

Feedback from David Head, Jim Hunt, Karl Bednarz, Juan F. Urrutia, Robert J. Hundley, and Jim Travis

Expediting Method: PRECAST/MODULAR COMPONENTS

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Rehabilitate existing road	0	1	1	2
	b) Convert non-freeway to freeway	0	0	2	2
	c) Widen freeway	0	0	2	2
	d) Widen non-freeway	0	0	2	2
	e) New location freeway	0	1	1	2
	f) New location non-freeway	0	1	2	1
	g) Interchanges	0	0	0	4
	h) Bridge widening/rehabilitation	0	1	0	3
	i) Bridge	0	0	0	4
	j) Upgrade freeway to standard	0	0	2	2
	k) Upgrade non-freeway to standard	0	0	2	2
2. Project Location	a) Rural	0	1	2	1
	b) Suburban	0	0	1	3
	c) Urban	0	0	1	3
3. Total Project Cost	a) Significant cost uncertainties exist	1	0	3	0
	b) Additional funding is not readily available for method implementation	0	2	1	1
	c) Other funding problems are anticipated	0	1	3	0
4. Construction Schedule	a) Construction completion date is critical	0	0	1	3
	b) Intermediate milestones are critical	0	0	1	3
	c) End date of project is not clearly defined	0	0	3	1
	d) Project is an emergency situation	1	0	1	2
	e) Subsequent project(s) exist	0	0	3	1
	f) Schedule is not realistic	0	0	3	1
5. Materials & Equipment	a) Project has few concrete structures	1	3	0	0
	b) There is not enough data to predict material performance	2	2	0	0
	c) Material & Equipment logistics are difficult	0	2	0	2
	d) Equipment (cranes, bulldozers, etc.) are not readily available	1	2	1	0
	e) Dimensional flexibility for concrete structures is needed	3	1	0	0
	f) Costly future maintenance and rehabilitation is anticipated	0	2	1	1

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Lowell Choate, Brian Merrill, Tracy Friggle, and Jim Travis

Expediting Method: PRECAST/MODULAR COMPONENTS

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	0	3	1
	b) Conflicts between consultant and contractor are likely	0	1	3	0
	c) Conflicts between contractor and subcontractors are likely	0	1	3	0
	d) Many change orders are anticipated	1	0	3	0
	e) Contractor's quality performance on past projects was not to the desired level	0	2	0	2
	f) Contractor is not familiar enough with the method for implementation	1	3	0	0
	g) Systems are not in place to ensure good communication	1	3	0	0
7. Construction Site	a) Significant ROW acquisition issues exist	0	1	3	0
	b) Significant utility relocation issues exist	0	1	3	0
	c) Adverse weather conditions are anticipated	0	0	2	2
	d) Lane closures are unavoidable	0	0	1	3
	e) Safety hazards are frequent and/or severe	0	1	1	2
	f) Project involves many lateral streets, driveways, etc.	0	0	1	3
	g) Project involves many adjacent business owners	0	0	2	2
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	2	2
	i) Extreme environmental issues exist or are anticipated	0	0	1	3
8. Personnel	a) Availability of skilled labor is an issue	0	1	1	2
	b) Night or multiple work shifts are not possible	0	0	2	2
	c) Designers' construction knowledge is not to the desired level	0	3	0	1
	d) Consultants are not available to help implement method	0	0	4	0
	e) Project based TxDOT resources are inadequate (number and/or capability)	0	1	0	3
	f) Additional training is needed to implement method	0	2	2	0
9. Complexity	a) Roadway geometry is complex	0	2	1	1
	b) Geotechnical conditions vary significantly across the site	1	0	3	0
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	1	3
	d) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	1	3
	e) Project involves underground, earthwork, and pavement activities	0	1	3	0
10. Others	a) Lack of technology available to implement method	1	2	0	0

Feedback from Lowell Choate, Brian Merrill, Tracy Friggle, and Jim Travis

Expediting Method:USE OF CONTRACTOR MILESTONE INCENTIVES

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	2	1	0	1
	b) Overlay	1	1	1	1
	c) Rehabilitate existing road	0	1	0	3
	d) Convert non-freeway to freeway	0	0	0	4
	e) Widen freeway	0	0	0	4
	f) Widen non-freeway	0	0	1	3
	g) New location freeway	1	1	0	2
	h) New location non-freeway	1	1	0	2
	i) Interchanges	0	0	0	4
	j) Bridge widening/rehabilitation	0	0	0	4
	k) Bridge	0	0	1	3
	l) Upgrade freeway to standard	0	0	1	3
	m) Upgrade non-freeway to standard	0	0	1	3
2. Project Location	a) Rural	0	2	2	0
	b) Suburban	0	0	0	4
	c) Urban	0	0	0	4
3. Construction Duration	a) Short construction duration (<6 months)	0	1	1	2
	b) Medium construction duration (6 months - 2 years)	0	0	0	4
	c) Long construction duration (>2 years)	0	0	0	4
4. Total Project Cost	a) Low contract amount (<$5M)	1	0	3	0
	b) Medium contract amount ($5M-$40M)	0	0	3	1
	c) High contract amount (>$40M)	0	0	2	2
	d) Significant cost uncertainties exist	1	1	2	0
	e) Additional funding is not readily available for method implementation	2	0	2	0
	f) Other funding problems are anticipated	1	1	2	0
5. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	0	3	1	0
	d) Project is an emergency situation	0	0	0	4
	e) Subsequent project(s) exist	0	1	0	3
	f) Schedule is not realistic	1	2	1	0

Precludes Method : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from David Head, Tracy Friggle, Juan Urrutia, and Jim Travis

Expediting Method:USE OF CONTRACTOR MILESTONE INCENTIVES

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	3	1	0
	b) Conflicts between consultant and contractor are likely	0	2	2	0
	c) Conflicts between contractor and subcontractors are likely	0	2	2	0
	d) Many change orders are anticipated	1	2	1	0
	e) Systems are not in place to ensure good communication	0	0	4	0
	f) Incentives/disincentives are not well defined	1	3	0	0
	g) Systems are not in place to manage incentives/disincentives	2	2	0	0
	h) Contractor resistance (on method or other matters) is anticipated	0	0	4	0
7. Construction Site	a) Significant ROW acquisition issues exist	2	2	0	0
	b) Significant utility relocation issues exist	2	2	0	0
	c) The project consists of multiple work faces	0	1	1	2
	d) Adverse weather conditions are anticipated	0	1	3	0
	e) Lane closures are unavoidable	0	0	3	1
	f) Project involves many lateral streets, driveways, etc.	0	0	1	3
	g) Project involves many adjacent business owners	0	0	1	3
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	2	2
8. Personnel	a) Availability of skilled labor is an issue	0	2	2	0
	b) Night or multiple work shifts are not possible	0	2	1	1
	c) Consultants are not available to help implement method	0	0	4	0
	d) Project based TxDOT resources are inadequate (number and/or capability)	0	3	0	1
	e) Additional training is needed to implement method	0	2	2	0
9. Complexity	a) Roadway geometry is complex	0	0	3	1
	b) Geotechnical conditions vary significantly across the site	0	0	3	1
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	2	2
	d) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	2	2
	e) Project involves underground, earthwork, and pavement activities	0	0	2	2
10. Others					

Feedback from David Head, Tracy Friggle, Juan Urrutia, and Jim Travis

Expediting Method: GENERATE AND EVALUATE MULTIPLE APPROACHES TO TCPs

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	1	0	3	0
	b) Overlay	1	0	3	0
	c) Rehabilitate existing road	0	0	2	2
	d) Convert non-freeway to freeway	0	0	1	3
	e) Widen freeway	0	0	1	3
	f) Widen non-freeway	0	0	1	3
	g) Interchanges	0	0	1	3
	h) Bridge widening/rehabilitation	0	0	2	2
	i) Bridge	0	0	2	2
	j) Upgrade freeway to standard	0	0	1	3
	k) Upgrade non-freeway to standard	0	0	1	3
2. Project Location	a) Rural	0	0	3	1
	b) Suburban	0	0	0	4
	c) Urban	0	0	0	4
3. Total Project Cost	a) Low contract amount (<$5M)	0	0	3	1
	b) Medium contract amount ($5M-$40M)	0	0	1	3
	c) High contract amount (>$40M)	0	0	1	3
	d) Significant cost uncertainties exist	0	0	4	0
	e) Additional funding is not readily available for method implementation	0	2	2	0
	f) Other funding problems are anticipated	0	1	3	0
4. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	1	1	2	0
	d) Project is an emergency situation	0	0	0	4
	e) Subsequent project(s) exist	0	0	3	1
	f) Schedule is not realistic	0	1	1	2

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Enrique Guillen, Edd Gibson, Jim O'Connor, and Carl Haas

Expediting Method: GENERATE AND EVALUATE MULTIPLE APPROACHES TO TCPs

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Contractor	a) Contractor is not familiar enough with the method for implementation	0	1	2	0
	b) Contractor resistance (on method or other matters) is anticipated	0	2	1	0
6. Construction Site	a) Significant ROW acquisition issues exist	0	0	2	2
	b) Significant utility relocation issues exist	0	0	0	4
	c) The project consists of multiple work faces	0	0	0	4
	d) Lane closures are unavoidable	0	0	2	2
	e) Safety hazards are frequent and/or severe	0	0	0	4
	f) Project involves many lateral streets, driveways, etc.	0	0	0	4
	g) Project involves many adjacent business owners	0	0	0	4
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	0	4
	i) Extreme environmental issues exist or are anticipated	0	0	3	1
7. Personnel	a) Night or multiple work shifts are not possible	0	0	2	2
	b) Designers' construction knowledge is not to the desired level	0	3	1	0
	c) Consultants are not available to help implement method	0	2	2	0
	d) Project based TxDOT resources are inadequate (number and/or capability)	0	4	0	0
8. Complexity	a) Roadway geometry is complex	0	0	1	3
	b) Traffic Control Plans are or will be overly complex	0	0	0	4
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	0	4
9. Others					

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Enrique Guillen, Edd Gibson, Jim O'Connor, and Carl Haas

Expediting Method: A+B CONTRACTING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	5	1	1	
	b) Overlay	3		3	1
	c) Rehabilitate existing road	2		1	4
	d) Convert non-freeway to freeway				7
	e) Widen freeway				7
	f) Widen non-freeway	1		2	4
	g) New location freeway			1	6
	h) New location non-freeway	2			5
	i) Interchanges				7
	j) Bridge widening/rehabilitation			1	6
	k) Bridge			1	6
	l) Upgrade freeway to standard			4	3
	m) Upgrade non-freeway to standard	1		2	4
2. Project Location	a) Rural	2	2	2	1
	b) Suburban			2	5
	c) Urban				7
3. Construction Duration	a) Short construction duration (<6 months)	4	1	1	1
	b) Medium construction duration (6 months - 2 years)		1	2	4
	c) Long construction duration (>2 years)				7
4. Total Project Cost	a) Low contract amount (<$5M)	3	3		1
	b) Medium contract amount ($5M-$40M)		1	1	5
	c) High contract amount (>$40M)				7
	d) Significant cost uncertainties exist	1	4	1	1
	e) Additional funding is not readily available for method implementation	1	3	2	1
	f) Other funding problems are anticipated	2	2	2	1
5. Construction Schedule	a) Construction completion date is critical		1	1	5
	b) Intermediate milestones are critical		1	1	5
	c) End date of project is not clearly defined		3	1	3
	d) Project is an emergency situation	1		1	5
	e) Subsequent project(s) exist		1	2	4
	f) Schedule is not realistic	2	2	1	2

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Tom Hunter, Charles E. Gaskin, James D. Klotz, David C. Kopp, Larry Tegtmeyer, Bob Hundley, and Jim Travis

Expediting Method: A+B CONTRACTING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	1	3	3	0
	b) Conflicts between consultant and contractor are likely	0	4	3	0
	c) Conflicts between contractor and subcontractors are likely	0	1	6	0
	d) Many change orders are anticipated	0	6	1	0
	e) Contractor's quality performance on past projects was not to the desired level	0	4	3	0
	f) Contractor is not familiar enough with the method for implementation	0	3	4	0
	g) Systems are not in place to ensure good communication	0	5	2	0
	h) Incentives/disincentives are not well defined	1	6	0	0
	i) Systems are not in place to manage incentives/disincentives	1	5	1	0
	j) Contractor resistance (on method or other matters) is anticipated	0	3	4	0
7. Construction Site	a) Significant ROW acquisition issues exist	4	3	0	0
	b) Significant utility relocation issues exist	4	3	0	0
	c) The project consists of multiple work faces	0	0	2	5
	d) Adverse weather conditions are anticipated	1	3	2	1
	e) Lane closures are unavoidable	0	1	3	3
	f) Project involves many lateral streets, driveways, etc.	0	1	3	3
	g) Project involves many adjacent business owners	0	1	2	4
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	1	4	2
	i) Extreme environmental issues exist or are anticipated	3	3	1	0
8. Personnel	a) Consultants are not available to help implement method	0	1	6	0
	b) Project based TxDOT resources are inadequate (number and/or capability)	2	4	1	0
	c) Additional training is needed to implement method	0	3	4	0
9. Complexity	a) Roadway geometry is complex	0	0	5	2
	b) Geotechnical conditions vary significantly across the site	0	2	5	0
	c) Traffic Control Plans are or will be overly complex	0	1	5	1
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	4	3
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	4	3
	f) Project involves underground, earthwork, and pavement activities	0	0	4	3

Feedback from Tom Hunter, Charles E. Gaskin, James D. Klotz, David C. Kopp, Larry Tegtmeyer, Bob Hundley, and Jim Travis

Expediting Method: INCENTIVIZE CONTRACTOR WORK PROGRESS WITH LANE RENTAL

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	2	0	2	0
	b) Overlay	1	0	2	1
	c) Rehabilitate existing road	0	1	1	2
	d) Convert non-freeway to freeway	0	0	2	2
	e) Widen freeway	0	0	1	3
	f) Widen non-freeway	0	0	2	2
	g) Interchanges	0	0	1	3
	h) Bridge widening/rehabilitation	0	1	1	2
	i) Bridge	0	0	2	2
	j) Upgrade freeway to standard	0	0	2	2
	k) Upgrade non-freeway to standard	0	1	1	2
2. Project Location	a) Rural	0	2	2	0
	b) Suburban	0	1	0	3
	c) Urban	0	0	0	4
3. Construction Duration	a) Short construction duration (<6 months)	1	0	2	1
	b) Medium construction duration (6 months - 2 years)	0	1	2	1
	c) Long construction duration (>2 years)	0	0	2	2
4. Total Project Cost	a) Low contract amount (<$5M)	0	1	2	1
	b) Medium contract amount ($5M-$40M)	0	0	3	1
	c) High contract amount (>$40M)	0	0	2	2
	d) Significant cost uncertainties exist	0	2	2	0
	e) Other funding problems are anticipated	1	1	2	0
5. Construction Schedule	a) Construction completion date is critical	0	0	2	2
	b) Intermediate milestones are critical	0	0	2	2
	c) Project is an emergency situation	1	0	1	2
6. Materials & Equipment	a) Material & Equipment logistics are difficult	0	1	2	1
	b) Equipment (cranes, bulldozers, etc.) are not readily available	0	0	3	1

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Charles Gaskin, Tracy Friggle, Ed Gibson, and Jim O'Connor

Expediting Method: INCENTIVIZE CONTRACTOR WORK PROGRESS WITH LANE RENTAL

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
7. Contractor	a) Conflicts between TxDOT and contractor are likely	1	1	1	1
	b) Conflicts between consultant and contractor are likely	0	2	2	0
	c) Conflicts between contractor and subcontractors are likely	0	1	3	0
	d) Many change orders are anticipated	0	3	1	0
	e) Contractor's quality performance on past projects was not to the desired level	0	1	2	1
	f) Contractor is not familiar enough with the method for implementation	0	0	4	0
	g) Systems are not in place to ensure good communication	0	3	1	0
	h) Incentives/disincentives are not well defined	2	1	1	0
	i) Systems are not in place to manage incentives/disincentives	1	3	0	0
	j) Contractor resistance (on method or other matters) is anticipated	0	3	1	0
8. Construction Site	a) Significant ROW acquisition issues exist	0	1	3	0
	b) Significant utility relocation issues exist	0	2	2	0
	c) Adverse weather conditions are anticipated	0	1	3	0
	d) Lane closures are unavoidable	0	0	0	4
	e) Safety hazards are frequent and/or severe	0	1	2	1
	f) Project involves many lateral streets, driveways, etc.	0	0	0	4
	g) Project involves many adjacent business owners	0	0	0	4
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	0	4
	i) Extreme environmental issues exist or are anticipated	0	0	4	0
	j) There is only one apparent Traffic Control Plan option	0	2	1	1
9. Personnel	a) Night or multiple work shifts are not possible	0	3	1	0
	b) Consultants are not available to help implement method	0	0	4	0
	c) Additional training is needed to implement method	0	1	3	0
10. Complexity	a) Roadway geometry is complex	0	0	3	1
	b) Traffic Control Plans are or will be overly complex	0	0	2	2
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	2	2
	d) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	2	2
	e) Project involves underground, earthwork, and pavement activities	0	0	2	2
11. Others					

Feedback from Charles Gaskin, Tracy Friggle, Ed Gibson, and Jim O'Connor

Expediting Method: "NO EXCUSE" INCENTIVES

Project Circumstance		Precludes Method	Reduce Benefit	Does Not Matter	Increase Benefit
1. Project Type	a) Sealcoat	0	1	3	0
	b) Overlay	0	0	4	0
	c) Rehabilitate existing road	0	0	2	2
	d) Convert non-freeway to freeway	0	0	1	3
	e) Widen freeway	0	0	1	3
	f) Widen non-freeway	0	0	2	2
	g) New location freeway	0	0	1	3
	h) New location non-freeway	0	0	1	3
	i) Interchanges	0	0	1	3
	j) Bridge widening/rehabilitation	0	0	2	2
	k) Bridge	0	0	2	2
	l) Upgrade freeway to standard	0	0	1	3
	m) Upgrade non-freeway to standard	0	0	2	2
2. Construction Duration	a) Short construction duration (<6 months)	0	3	1	0
	b) Medium construction duration (6 months - 2 years)	0	0	4	0
	c) Long construction duration (>2 years)	0	0	1	3
3. Total Project Cost	a) Low contract amount (<$5M)	0	1	3	0
	b) Medium contract amount ($5M-$40M)	0	0	2	2
	c) High contract amount (>$40M)	0	0	1	3
	d) Significant cost uncertainties exist	1	2	0	1
	e) Additional funding is not readily available for method implementation	2	1	1	0
	f) Other funding problems are anticipated	1	2	1	0
4. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	1	2	0	1
	d) Project is an emergency situation	1	1	0	2
	e) Subsequent project(s) exist	0	0	1	3
	f) Schedule is not realistic	0	3	0	1
5. Materials & Equipment	a) Material & Equipment logistics are difficult	0	2	1	1
	b) Equipment (cranes, bulldozers, etc.) are not readily available	0	2	1	1

Precludes Method : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Pat Williams, Curtis Opperman, Jim Travis and Ed Gibson

Expediting Method: "NO EXCUSE" INCENTIVES

Project Circumstance		Precludes Method	Reduce Benefit	Does Not Matter	Increase Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	3	1	0
	b) Conflicts between consultant and contractor are likely	1	2	1	0
	c) Conflicts between contractor and subcontractors are likely	0	1	3	0
	d) Many change orders are anticipated	1	2	0	1
	e) Contractor's quality performance on past projects was not to the desired level	0	3	1	0
	f) Contractor is not familiar enough with the method for implementation	0	2	2	0
	g) Systems are not in place to ensure good communication	0	3	1	0
	h) Incentives/disincentives are not well defined	1	3	0	0
	i) Systems are not in place to manage incentives/disincentives	2	2	0	0
	j) Contractor resistance (on method or other matters) is anticipated	0	3	1	0
7. Construction Site	a) Significant ROW acquisition issues exist	2	2	0	0
	b) Significant utility relocation issues exist	2	2	0	0
	c) Adverse weather conditions are anticipated	0	3	1	0
	d) Safety hazards are frequent and/or severe	0	2	2	0
	e) Project involves many adjacent business owners	0	1	1	2
	f) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	0	4
	g) Extreme environmental issues exist or are anticipated	0	1	1	2
	h) There is only one apparent Traffic Control Plan option	0	0	3	1
8. Personnel	a) Night or multiple work shifts are not possible	0	1	2	1
	b) Personnel resistance to the method is anticipated	0	2	1	1
	c) Project based TxDOT resources are inadequate (number and/or capability)	0	2	0	2
9. Complexity	a) Roadway geometry is complex	0	0	3	1
	b) Geotechnical conditions vary significantly across the site	0	1	2	1
	c) Traffic Control Plans are or will be overly complex	0	0	3	1
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	4	0
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	4	0
	f) Project involves underground, earthwork, and pavement activities	0	0	3	1
10. Others					

Feedback from Pat Williams, Curtis Opperman, Jim Travis and Ed Gibson

Expediting Method: MATURITY TESTING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Rehabilitate existing road	0	0	1	3
	b) Convert non-freeway to freeway	0	0	1	3
	c) Widen freeway	0	0	1	4
	d) Widen non-freeway	0	0	1	4
	e) New location freeway	0	0	1	4
	f) New location non-freeway	0	0	1	4
	g) Interchanges	0	0	1	4
	h) Bridge widening/rehabilitation	0	0	1	4
	i) Bridge	0	0	1	4
	j) Upgrade freeway to standard	0	0	1	4
	k) Upgrade non-freeway to standard	0	0	1	4
2. Total Project Cost	a) Significant cost uncertainties exist	0	0	5	0
	b) Additional funding is not readily available for method implementation	0	4	1	0
	c) Other funding problems are anticipated	0	0	5	0
3. Construction Schedule	a) Construction completion date is critical	0	0	1	4
	b) Intermediate milestones are critical	0	0	1	4
	c) Project is an emergency situation	0	0	1	4
	d) Subsequent project(s) exist	0	0	2	3
4. Materials & Equipment	a) Project has few concrete structures	0	5	0	0
	b) There is not enough data to predict material performance	1	2	2	0
	c) Dimensional flexibility for concrete structures is needed	0	0	5	0
	d) Costly future maintenance and rehabilitation is anticipated	0	0	3	2

Precludes Method : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Brian D. Merrill, Jim Hunt, Tracey Friggle, Ed Gibson, and Jim O'Connor

Expediting Method: MATURITY TESTING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Contractor	a) Contractor's quality performance on past projects was not to the desired level	0	2	3	0
	b) Contractor is not familiar enough with the method for implementation	0	2	3	0
	c) Contractor resistance (on method or other matters) is anticipated	0	3	2	0
6. Construction Site	a) Adverse weather conditions are anticipated	0	1	2	2
	b) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	1	4
	c) Extreme environmental issues exist or are anticipated	0	0	5	0
7. Personnel	a) Availability of skilled labor is an issue	0	2	3	0
	b) Personnel resistance to the method is anticipated	0	5	0	0
	c) Designers' construction knowledge is not to the desired level	0	1	4	0
	d) Consultants are not available to help implement method	0	2	3	0
	e) Project based TxDOT resources are inadequate (number and/or capability)	0	5	0	0
	f) Additional training is needed to implement method	0	3	1	1
8. Complexity	a) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	1	4
	b) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	1	4
	c) Project involves underground, earthwork, and pavement activities	0	0	3	2
9. Others	a) Lack of technology available to implement method	1	2	2	0

Feedback from Brian D. Merrill, Jim Hunt, Tracey Friggle, Ed Gibson, and Jim O'Connor

Expediting Method: PARTNERING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	0	1	3	0
	b) Overlay	0	1	3	0
	c) Rehabilitate existing road	0	0	2	2
	d) Convert non-freeway to freeway	0	0	1	3
	e) Widen freeway	0	0	2	2
	f) Widen non-freeway	0	0	2	2
	g) New location freeway	0	0	1	3
	h) New location non-freeway	0	0	1	3
	i) Interchanges	0	0	0	4
	j) Bridge widening/rehabilitation	0	0	0	4
	k) Bridge	0	0	1	3
	l) Upgrade freeway to standard	0	0	2	2
	m) Upgrade non-freeway to standard	0	0	2	2
2. Construction Duration	a) Short construction duration (<6 months)	0	0	4	0
	b) Medium construction duration (6 months - 2 years)	0	0	1	3
	c) Long construction duration (>2 years)	0	0	1	3
3. Total Project Cost	a) Low contract amount (<$5M)	0	0	3	1
	b) Medium contract amount ($5M-$40M)	0	0	1	3
	c) High contract amount (>$40M)	0	0	0	4
	d) Significant cost uncertainties exist	0	0	0	4
	e) Additional funding is not readily available for method implementation	0	0	3	1
	f) Other funding problems are anticipated	0	1	1	2
4. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	0	0	1	3
	d) Schedule is not realistic	0	2	0	2

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from David Kopp, Enrique Guillen, Ed Gibson, and Carl Haas

Expediting Method: PARTNERING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Contractor	a) Conflicts between TxDOT and contractor are likely	1	0	0	3
	b) Conflicts between consultant and contractor are likely	1	0	0	3
	c) Conflicts between contractor and subcontractors are likely	0	0	1	3
	d) Many change orders are anticipated	0	0	1	3
	e) Contractor's quality performance on past projects was not to the desired level	0	2	0	2
	f) Systems are not in place to ensure good communication	0	2	0	2
	g) Contractor resistance (on method or other matters) is anticipated	1	3	0	0
6. Construction Site	a) Significant ROW acquisiton issues exist	0	0	2	2
	b) Significant utility relocation issues exist	0	0	1	3
	c) The project consists of multiple work faces	0	0	1	3
	d) Adverse weather conditions are anticipated	0	0	1	3
	e) Lane closures are unavoidable	0	0	1	3
	f) Safety hazards are frequent and/or severe	0	0	1	3
	g) Project involves many lateral streets, driveways, etc.	0	0	1	3
	h) Project involves many adjacent business owners	0	0	1	3
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	1	3
	j) Extreme environmental issues exist or are anticipated	0	0	0	4
	k) There is only one apparent Traffic Control Plan option	0	0	3	1
7. Personnel	a) Personnel resistance to the method is anticipated	0	3	0	1
	b) Consultants are not available to help implement method	0	0	4	0
	c) Additional training is needed to implement method	0	1	3	0
8. Complexity	a) Roadway geometry is complex	0	0	1	3
	b) Geotechnical conditions vary significantly across the site	0	0	1	3
	c) Traffic Control Plans are or will be overly complex	0	0	0	4
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	2	2
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	2	2
	f) Project involves underground, earthwork, and pavement activities	0	0	3	1
9. Others					

Feedback from David Kopp, Enrique Guillen, Ed Gibson, and Carl Haas

Expediting Method: SET LIQUIDATED DAMAGES TO APPROPRIATE LEVEL AND ENFORCE

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	1	0	0	3
	b) Overlay	1	0	0	3
	c) Rehabilitate existing road	0	1	0	3
	d) Convert non-freeway to freeway	0	1	0	3
	e) Widen freeway	0	0	0	4
	f) Widen non-freeway	0	1	0	3
	g) New location freeway	1	0	0	3
	h) New location non-freeway	1	0	0	3
	i) Interchanges	0	0	0	4
	j) Bridge widening/rehabilitation	0	0	0	4
	k) Bridge	0	0	0	4
	l) Upgrade freeway to standard	0	0	0	4
	m) Upgrade non-freeway to standard	0	0	0	4
2. Construction Duration	a) Short construction duration (<6 months)	0	0	1	3
	b) Medium construction duration (6 months - 2 years)	0	0	0	4
	c) Long construction duration (>2 years)	0	0	1	3
3. Total Project Cost	a) Low contract amount (<$5M)	0	1	1	2
	b) Medium contract amount ($5M-$40M)	0	0	1	3
	c) High contract amount (>$40M)	0	0	0	4
	d) Significant cost uncertainties exist	0	1	2	1
	e) Other funding problems are anticipated	1	2	0	1
4. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	1	2	0	1
	d) Project is an emergency situation	0	0	1	3
	e) Subsequent project(s) exist	0	0	2	2
	f) Schedule is not realistic	1	2	0	1

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Tracy Friggle, Karl Bednarz, Juan Urritia, and David Hearnsberger

Expediting Method: SET LIQUIDATED DAMAGES TO APPROPRIATE LEVEL AND ENFORCE

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Contractor	a) Conflicts between TxDOT and contractor are likely	0	2	1	1
	b) Conflicts between consultant and contractor are likely	0	1	2	1
	c) Conflicts between contractor and subcontractors are likely	0	1	3	0
	d) Many change orders are anticipated	0	2	2	0
	e) Contractor's quality performance on past projects was not to the desired level	0	0	1	3
6. Construction Site	a) Significant ROW acquisition issues exist	2	1	1	0
	b) Significant utility relocation issues exist	2	1	1	0
	c) The project consists of multiple work faces	0	1	3	0
	d) Project involves many lateral streets, driveways, etc.	0	1	3	0
	e) Project involves many adjacent business owners	0	0	1	3
	f) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	2	2
	g) Extreme environmental issues exist or are anticipated	0	2	2	0
7. Personnel	a) Night or multiple work shifts are not possible	0	0	3	1
	b) Consultants are not available to help implement method	0	1	3	0
	c) Project based TxDOT resources are inadequate (number and/or capability)	0	2	1	1
8. Complexity	a) Roadway geometry is complex	0	0	1	2
	b) Geotechnical conditions vary significantly across the site	0	2	1	1
	c) Traffic Control Plans are or will be overly complex	0	2	0	2
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	0	4
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	1	3
	f) Project involves underground, earthwork, and pavement activities	0	1	0	3
9. Others					

Feedback from Tracy Friggle, Karl Bednarz, Juan Urritia, and David Hearnsberger

Expediting Method: PAVEMENT TYPE SELECTION DECISIONS

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Rehabilitate existing road	0	1	0	3
	b) Convert non-freeway to freeway	0	0	1	3
	c) Widen freeway	0	1	0	3
	d) Widen non-freeway	0	1	0	3
	e) New location freeway	0	0	1	3
	f) New location non-freeway	0	0	1	3
	g) Interchanges	0	1	1	2
	h) Bridge widening/rehabilitation	1	1	0	2
	i) Bridge	1	1	0	2
	j) Upgrade freeway to standard	0	1	1	2
	k) Upgrade non-freeway to standard	0	1	1	2
2. Project Location	a) Rural	0	0	1	3
	b) Suburban	0	0	0	4
	c) Urban	0	0	0	4
3. Total Project Cost	a) Low contract amount (<$5M)	0	0	2	2
	b) Medium contract amount ($5M-$40M)	0	0	3	1
	c) High contract amount (>$40M)	0	0	3	1
	d) Significant cost uncertainties exist	0	1	2	1
	e) Additional funding is not readily available for method implementation	0	2	0	2
	f) Other funding problems are anticipated	0	2	1	1
4. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) End date of project is not clearly defined	0	0	3	1
	d) Project is an emergency situation	0	0	0	4
	e) Subsequent project(s) exist	0	0	0	4
	f) Schedule is not realistic	0	0	4	0

Precludes Method : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Mon Won, Jim Travis, Ed Gibson, and Zhanmin Zhang

Expediting Method: PAVEMENT TYPE SELECTION DECISIONS

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Materials & Equipment	a) Project has few concrete structures	0	0	4	0
	b) Optimum pavement type is not determined	0	0	0	4
	c) There is not enough data to predict material performance	0	3	0	1
	d) Material & Equipment logistics are difficult	0	1	2	1
	e) Equipment (cranes, bulldozers, etc.) are not readily available	1	0	3	0
	f) Dimensional flexibility for concrete structures is needed	0	0	3	1
	g) Costly future maintenance and rehabilitation is anticipated	0	0	0	4
6. Contractor	a) Many change orders are anticipated	0	0	4	0
	b) Contractor's quality performance on past projects was not to the desired level	0	1	2	1
	c) Contractor resistance (on method or other matters) is anticipated	0	2	2	0
7. Construction Site	a) Significant ROW acquisition issues exist	0	0	4	0
	b) Significant utility relocation issues exist	0	0	4	0
	c) Adverse weather conditions are anticipated	0	0	2	2
	d) Project involves many lateral streets, driveways, etc.	0	1	1	2
	e) Project involves many adjacent business owners	0	1	1	2
	f) Extreme environmental issues exist or are anticipated	0	0	2	2
8. Personnel	a) Designers' construction knowledge is not to the desired level	0	3	1	0
	b) Consultants are not available to help implement method	0	2	2	0
	c) Project based TxDOT resources are inadequate (number and/or capability)	0	3	1	0
	d) Additional training is needed to implement method	0	2	2	0
9. Complexity	a) Geotechnical conditions vary significantly across the site	0	1	0	3
	b) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	2	2
	c) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	4	0
	d) Project involves underground, earthwork, and pavement activities	0	0	2	2
10. Others	a) Lack of technology available to implement method	1	1	0	2

Precludes Method : This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Mon Won, Jim Travis, Ed Gibson, and Zhanmin Zhang

Expediting Method:SEEK TO MAXIMIZE WORK-ZONE SIZE

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	0	0	0	5
	b) Overlay	0	0	0	5
	c) Rehabilitate existing road	0	0	0	5
	d) Convert non-freeway to freeway	0	0	0	5
	e) Widen freeway	0	0	0	5
	f) Widen non-freeway	0	0	0	5
	g) Interchanges	0	0	2	3
	h) Bridge widening/rehabilitation	0	0	2	3
	i) Bridge	0	0	2	3
	j) Upgrade freeway to standard	0	0	0	5
	k) Upgrade non-freeway to standard	0	0	0	5
2. Project Location	a) Rural	0	1	1	3
	b) Suburban	0	0	0	5
	c) Urban	0	0	0	5
3. Construction Duration	a) Short construction duration (<6 months)	0	0	3	2
	b) Medium construction duration (6 months - 2 years)	0	0	2	3
	c) Long construction duration (>2 years)	0	0	2	3
4. Total Project Cost	a) Significant cost uncertainties exist	0	0	4	1
	b) Additional funding is not readily available for method implementation	0	0	4	1
	c) Other funding problems are anticipated	0	0	4	1
5. Construction Schedule	a) Construction completion date is critical	0	0	0	5
	b) Intermediate milestones are critical	0	0	0	5
	c) Project is an emergency situation	0	0	0	5
	d) Subsequent project(s) exist	0	0	2	3

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Charles Gaskin, Edd Gibson, Jim O'Connor, Carl Haas, and Zhanmin Zhang

Expediting Method:SEEK TO MAXIMIZE WORK-ZONE SIZE

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Materials & Equipment	a) Material & Equipment logistics are difficult	0	1	0	4
	b) Equipment (cranes, bulldozers, etc.) are not readily available	1	1	3	0
7. Construction Site	a) Significant ROW acquisition issues exist	0	4	1	0
	b) Significant utility relocation issues exist	0	4	1	0
	c) The project consists of multiple work faces	0	0	3	2
	d) Lane closures are unavoidable	0	0	2	3
	e) Safety hazards are frequent and/or severe	0	1	0	4
	f) Project involves many lateral streets, driveways, etc.	0	3	0	2
	g) Project involves many adjacent business owners	0	4	0	1
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	1	2	2
	i) There is only one apparent Traffic Control Plan option	0	2	2	1
8. Complexity	a) Roadway geometry is complex	0	1	1	3
	b) Geotechnical conditions vary significantly across the site	0	1	4	0
	c) Traffic Control Plans are or will be overly complex	0	1	2	2
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	3	2
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	3	2
	f) Project involves underground, earthwork, and pavement activities	0	0	2	3
9. Others	a) Public resistance to the method is anticipated	0	4	1	0

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Charles Gaskin, Edd Gibson, Jim O'Connor, Carl Haas, and Zhanmin Zhang

Expediting Method: FULL CLOSURE INSTEAD OF PARTIAL CLOSURE OF ROADWAY

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	2	0	0	2
	b) Overlay	2	1	0	1
	c) Rehabilitate existing road	1	0	1	2
	d) Convert non-freeway to freeway	1	1	0	2
	e) Widen freeway	1	0	0	3
	f) Widen non-freeway	1	0	0	3
	g) Interchanges	0	0	1	3
	h) Bridge widening/rehabilitation	0	1	0	3
	i) Bridge	0	0	0	4
	j) Upgrade freeway to standard	1	0	0	3
	k) Upgrade non-freeway to standard	1	0	0	3
2. Project Location	a) Rural	0	0	1	3
	b) Suburban	1	0	0	3
	c) Urban	1	0	0	3
3. Construction Duration	a) Short construction duration (<6 months)	0	0	0	4
	b) Medium construction duration (6 months - 2 years)	0	2	2	0
	c) Long construction duration (>2 years)	1	3	0	0
4. Total Project Cost	a) Low contract amount (<$5M)	0	1	2	1
	b) Medium contract amount ($5M-$40M)	0	1	1	2
	c) High contract amount (>$40M)	1	0	1	2

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Charles Gaskin, James Klotz, Jim Travis, and Edd Gibson

Expediting Method: FULL CLOSURE INSTEAD OF PARTIAL CLOSURE OF ROADWAY

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
5. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	1	0	3
	c) Project is an emergency situation	0	0	0	4
	d) Subsequent project(s) exist	0	1	1	2
6. Materials & Equipment	a) Material & Equipment logistics are difficult	1	1	0	2
	b) Equipment (cranes, bulldozers, etc.) are not readily available	1	2	1	0
7. Construction Site	a) Significant ROW acquisition issues exist	2	1	0	1
	b) Significant utility relocation issues exist	2	1	0	1
	c) The project consists of multiple work faces	0	1	0	3
	d) Lane closures are unavoidable	0	0	2	2
	e) Safety hazards are frequent and/or severe	0	1	1	2
	f) Project involves many lateral streets, driveways, etc.	2	1	1	0
	g) Project involves many adjacent business owners	2	2	0	0
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	1	0	1	2
	i) There is only one apparent Traffic Control Plan option	0	1	1	2
8. Complexity	a) Roadway geometry is complex	0	0	2	2
	b) Traffic Control Plans are or will be overly complex	0	1	0	3
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	1	0	2	1
	d) Project involves girders, bridge decks, retaining walls, piping, etc.	1	0	2	1
	e) Project involves underground, earthwork, and pavement activities	0	0	2	2
9. Others	a) Public resistance to the method is anticipated	1	2	0	0

Feedback from Charles Gaskin, James Klotz, Jim Travis, and Edd Gibson

Expediting Method: IMPLEMENT MULTIPLE WORKSHIFTS AND/OR NIGHT WORK

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	0	0	2	2
	b) Overlay	0	0	2	2
	c) Rehabilitate existing road	0	0	1	3
	d) Convert non-freeway to freeway	0	0	1	3
	e) Widen freeway	0	0	0	4
	f) Widen non-freeway	0	0	0	4
	g) New location freeway	0	0	1	3
	h) New location non-freeway	0	0	2	2
	i) Interchanges	0	0	0	4
	j) Bridge widening/rehabilitation	0	0	2	2
	k) Bridge	0	0	2	2
	l) Upgrade freeway to standard	0	0	0	4
	m) Upgrade non-freeway to standard	0	0	1	3
2. Project Location	a) Rural	0	1	2	1
	b) Suburban	0	0	1	3
	c) Urban	0	0	0	4
3. Construction Duration	a) Short construction duration (<6 months)	0	0	2	2
	b) Medium construction duration (6 months - 2 years)	0	0	2	2
	c) Long construction duration (>2 years)	0	0	1	3
4. Total Project Cost	a) Low contract amount (<$5M)	0	0	2	2
	b) Medium contract amount ($5M-$40M)	0	0	1	3
	c) High contract amount (>$40M)	0	0	1	3
	d) Significant cost uncertainties exist	1	3	0	0
	e) Additional funding is not readily available for method implementation	1	2	0	1
	f) Other funding problems are anticipated	1	3	0	0
5. Construction Schedule	a) Construction completion date is critical	0	0	0	4
	b) Intermediate milestones are critical	0	0	0	4
	c) Project is an emergency situation	0	0	0	4
	d) Subsequent project(s) exist	0	0	1	3

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Lowell Choate, Larry Tegtmeyer, Curtis Opperman, and Ed Gibson

Expediting Method: IMPLEMENT MULTIPLE WORKSHIFTS AND/OR NIGHT WORK

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	3	1	0
	b) Conflicts between consultant and contractor are likely	0	2	2	0
	c) Conflicts between contractor and subcontractors are likely	0	2	2	0
	d) Contractor's quality performance on past projects was not to the desired level	0	4	0	0
	e) Contractor is not familiar enough with the method for implementation	0	4	0	0
	f) Systems are not in place to ensure good communication	1	3	0	0
	g) Contractor resistance (on method or other matters) is anticipated	1	3	0	0
7. Construction Site	a) Significant ROW acquisition issues exist	1	1	1	1
	b) Significant utility relocation issues exist	1	2	0	1
	c) The project consists of multiple work faces	0	0	1	3
	d) Adverse weather conditions are anticipated	0	2	1	1
	e) Lane closures are unavoidable	0	0	0	4
	f) Safety hazards are frequent and/or severe	0	1	0	3
	g) Project involves many lateral streets, driveways, etc.	0	0	1	3
	h) Project involves many adjacent business owners	0	0	1	3
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	0	4
8. Personnel	a) Availability of skilled labor is an issue	0	3	0	1
	b) Night or multiple work shifts are not possible	3	0	1	0
	c) Personnel resistance to the method is anticipated	0	3	0	1
	d) Project based TxDOT resources are inadequate (number and/or capability)	2	2	0	0
	e) Additional training is needed to implement method	0	3	1	0
9. Complexity	a) Roadway geometry is complex	0	0	3	1
	b) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	3	1
	c) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	3	1
	d) Project involves underground, earthwork, and pavement activities	0	0	2	2
10. Others	a) Public resistance to the method is anticipated	1	2	0	1
	b) Lack of technology available to implement method	2	1	0	1

Feedback from Lowell Choate, Larry Tegtmeyer, Curtis Opperman, and Ed Gibson

Expediting Method: DEVELOP TRAFFIC CONTROL PLANS THROUGH PARTNERING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Sealcoat	2	0	2	0
	b) Overlay	1	0	2	1
	c) Rehabilitate existing road	0	0	1	3
	d) Convert non-freeway to freeway	0	0	1	3
	e) Widen freeway	0	0	2	2
	f) Widen non-freeway	0	0	2	2
	g) Interchanges	0	0	2	2
	h) Bridge widening/rehabilitation	0	0	1	3
	i) Bridge	0	0	2	2
	j) Upgrade freeway to standard	0	0	1	3
	k) Upgrade non-freeway to standard	0	0	1	3
2. Project Location	a) Rural	1	1	2	0
	b) Suburban	0	0	1	3
	c) Urban	0	0	1	3
3. Construction Duration	a) Short construction duration (<6 months)	0	1	3	0
	b) Medium construction duration (6 months - 2 years)	0	0	3	1
	c) Long construction duration (>2 years)	0	0	3	1
4. Total Construction Cost	a) Low contract amount (<$5M)	0	1	3	0
	b) Medium contract amount ($5M-$40M)	0	0	2	2
	c) High contract amount (>$40M)	0	0	2	2
	d) Additional funding is not readily available for method implementation	0	2	2	0
5. Construction Schedule	a) Project is an emergency situation	0	0	0	4

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from David Head, Charles Gaskin, Ed Gibson, and Jim O'Connor

Expediting Method: DEVELOP TRAFFIC CONTROL PLANS THROUGH PARTNERING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	1	1	2
	b) Conflicts between consultant and contractor are likely	0	1	1	2
	c) Conflicts between contractor and subcontractors are likely	0	1	1	2
	d) Contractor's quality performance on past projects was not to the desired level	0	0	3	1
	e) Contractor is not familiar enough with the method for implementation	0	1	2	1
	f) Systems are not in place to ensure good communication	0	2	0	2
	g) Contractor resistance (on method or other matters) is anticipated	0	1	2	1
7. Construction Site	a) Significant ROW acquisition issues exist	0	1	1	2
	b) Significant utility relocation issues exist	0	1	0	3
	c) Lane closures are unavoidable	0	0	1	3
	d) Safety hazards are frequent and/or severe	0	0	0	4
	e) Project involves many lateral streets, driveways, etc.	0	0	0	4
	f) Project involves many adjacent business owners	0	0	0	4
	g) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	0	4
	h) Extreme environmental issues exist or are anticipated	0	0	2	2
	i) There is only one apparent Traffic Control Plan option	1	0	1	2
8. Personnel	a) Night or multiple work shifts are not possible	0	1	2	1
	b) Personnel resistance to the method is anticipated	0	2	1	1
	c) Designers' construction knowledge is not to the desired level	0	0	1	3
	d) Consultants are not available to help implement method	0	0	3	1
9. Complexity	a) Roadway geometry is complex	0	0	1	3
	b) Traffic Control Plans are or will be overly complex	0	0	0	4
	c) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	1	3
	d) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	1	3
	e) Project involves underground, earthwork, and pavement activities	0	0	1	3

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from David Head, Charles Gaskin, Ed Gibson, and Jim O'Connor

Expediting Method: TRAIN SELECTED FIELD PERSONNEL IN SCHEDULING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
1. Project Type	a) Rehabilitate existing road	0	0	3	3
	b) Convert non-freeway to freeway	0	0	2	4
	c) Widen freeway	0	0	1	5
	d) Widen non-freeway	0	0	1	5
	e) New location freeway	0	0	1	5
	f) New location non-freeway	0	0	0	6
	g) Interchanges	0	0	0	6
	h) Bridge widening/rehabilitation	0	0	1	5
	i) Bridge	0	0	1	5
	j) Upgrade freeway to standard	0	0	1	5
	k) Upgrade non-freeway to standard	0	0	2	4
2. Project Location	a) Rural	0	1	2	3
	b) Suburban	0	0	2	4
	c) Urban	0	0	0	5
3. Construction Duration	a) Short construction duration (<6 months)	0	2	2	2
	b) Medium construction duration (6 months - 2 years)	0	1	2	3
	c) Long construction duration (>2 years)	0	0	0	6
4. Total Project Cost	a) Low contract amount (<$5M)	1	2	0	3
	b) Medium contract amount ($5M-$40M)	0	0	0	6
	c) High contract amount (>$40M)	0	0	0	6
	d) Significant cost uncertainties exist	1	0	1	4
	e) Additional funding is not readily available for method implementation	1	0	3	2
	f) Other funding problems are anticipated	1	0	3	2
5. Construction Schedule	a) Construction completion date is critical	0	0	0	6
	b) Intermediate milestones are critical	0	0	0	6
	c) End date of project is not clearly defined	1	1	1	3
	d) Subsequent project(s) exist	0	0	2	4
	e) Schedule is not realistic	2	0	1	2

Precludes Method: This circumstance precludes the use of this method

Reduces Benefit : This circumstance can reduce the benefits derived from this method

Does Not Matter : This circumstance does not matter regarding the use of this method

Increases Benefit : This circumstance can increase the benefits derived from this method

Feedback from Jim Hunt, Tracey Friggle, Karl Bednarz, Juan F. Urrutia, Robert J. Hundley, & Lowell Choate

Expediting Method: TRAIN SELECTED FIELD PERSONNEL IN SCHEDULING

Project Circumstance		Precludes Method	Reduces Benefit	Does Not Matter	Increases Benefit
6. Contractor	a) Conflicts between TxDOT and contractor are likely	0	0	0	6
	b) Conflicts between consultant and contractor are likely	0	0	0	6
	c) Conflicts between contractor and subcontractors are likely	0	0	1	5
	d) Contractor's quality performance on past projects was not to the desired level	0	0	1	5
	e) Contractor is not familiar enough with the method for implementation	0	1	2	3
	f) Systems are not in place to ensure good communication	1	2	1	2
	g) Contractor resistance (on method or other matters) is anticipated	0	1	0	5
7. Construction Site	a) Significant ROW acquisition issues exist	1	0	0	5
	b) Significant utility relocation issues exist	1	0	0	5
	c) The project consists of multiple work faces	0	0	0	6
	d) Adverse weather conditions are anticipated	1	0	0	5
	e) Lane closures are unavoidable	0	0	3	3
	f) Project involves many lateral streets, driveways, etc.	0	0	2	4
	g) Project involves many adjacent business owners	0	0	1	5
	h) Traffic patterns involve dominant traffic periods, rush hours, etc.	0	0	1	5
8. Personnel	a) Availability of skilled labor is an issue	0	0	3	3
	b) Night or multiple work shifts are not possible	0	1	4	1
	c) Personnel resistance to the method is anticipated	0	2	4	0
	d) Designers' construction knowledge is not to the desired level	0	2	3	1
	e) Field/local level has difficulty in enforcing liquidated damages	0	2	2	2
	f) Consultants are not available to help implement method	0	1	5	0
9. Complexity	a) Roadway geometry is complex	0	0	1	5
	b) Geotechnical conditions vary significantly across the site	0	0	2	4
	c) Traffic Control Plans are or will be overly complex	0	0	0	6
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	0	0	6
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	0	6
	f) Project involves underground, earthwork, and pavement activities	0	0	0	6

Feedback from Jim Hunt, Tracey Friggle, Karl Bednarz, Juan F. Urrutia, Robert J. Hundley, & Lowell Choate

Appendix F

Analysis of Individual Ballots: Promoters and Barriers

Analysis of Individual Method Ballots: Promoters and Barriers

"Use the Calendar Day Schedule" table is contained in Chapter 3.

Precast/ Modular Components	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Interchanges • Bridge
Project Location	Increases Benefit • Suburban • Urban
Construction Schedule Materials & Equipment	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical
	Reduces Benefit • Project has few concrete structures
	Precludes Method • Dimensional flexibility for concrete structures is needed
Contractor	Reduces Benefit • Contractor is not familiar enough with the method for implementation • Systems are not in place to ensure good communication
Construction Site	Increases Benefit • Extreme environmental issues exist or are anticipated
Complexity	Increases Benefit • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc.

Use of Contractor Milestone Incentives	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • Interchanges • Bridge widening/rehabilitation • Bridge • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Construction Duration	Increases Benefit • Medium construction duration • Long construction duration
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation Reduces Benefit • End date of project is not clearly defined
Contractor	Reduces Benefit • Significant conflicts between TxDOT and contractor are likely • Incentives/disincentives are not well defined
Construction Site	Increase Benefit • Project involves many lateral streets, driveways, etc. • Project involves many adjacent business owners

Generate and Evaluate Multiple Approaches to Traffic Control Plans	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • Interchanges • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount
Construction Schedule	Increase Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation
Construction Site	Increases Benefit • Significant utility relocation issues exist • The project consists of multiple work locations • Safety hazards are frequent and/or severe • Project involves many lateral streets, driveways, etc. • Project involves many adjacent businesses owners • Traffic patterns involve dominant traffic periods, rush hour, etc.
Personnel	Reduces Benefit • Designers' construction knowledge is not to the desired level • Project based TxDOT resources are inadequate (number and/or capability)
Complexity	Increases Benefit • Roadway geometry is complex • Traffic Control Plans are or will be overly complex • Project involves bridges, ramps, frontage roads, elevation differentials, etc.

A+B Contracting	
Category	**Level of Effect/Circumstances**
Project Type	Precludes • Sealcoat
	Increases Benefit • Convert non-freeway to freeway • Widen freeway • New location freeway • Interchanges • Bridge widening/rehabilitation • Bridge
Project Location	Increases Benefit • Suburban • Urban
Construction Duration	Increases Benefit • Long construction duration
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical
Contractor	Reduces Benefit • Many change orders are anticipated • Systems are not in place to ensure good communication • Incentives/disincentives are not well defined • Systems are not in place to manage incentives disincentives
Construction Site	Reduces Benefit • Significant ROW acquisition issues exist • Significant utility relocation issues exist Increases Benefit • The project consists of multiple work locations

Incentivize Contractor Work Progress with a Lane Rental Approach	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Widen freeway • Interchanges
Project Location	Increases Benefit • Urban
Contractor	Reduces Benefit • Many change orders are anticipated • Systems not in place to ensure good communication • Systems are not in place to manage incentives/disincentives • Contractor resistance (on method or other matters) is anticipated
Construction Site	Increases Benefit • Lane closures are unavoidable • Project involves many lateral streets, driveways, etc. • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hour etc.
Personnel	Reduces Benefit • Night or multiple work shifts are not possible

“No Excuse” Incentives	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • Widen freeway • New location freeway • New location non-freeway • Interchanges • Upgrade freeway to standard
Construction Duration	Increases Benefit • Long construction duration Reduces Benefit • Short construction duration
Total Project Cost	Increases Benefit • High contract amount
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Subsequent project(s) exist
Contractor	Reduces Benefit • Significant conflicts between TxDOT and contractor are likely • Contractor’s quality performance on past projects was not to the desired level • Systems are not in place to ensure good communication • Incentives/disincentives are not well defined • Contractor resistance (on method or other matters) is anticipated
Construction Site	Increases Benefit • Traffic patterns involve dominant traffic periods, rush hours, etc. Reduces Benefit • Adverse weather conditions are anticipated

Maturity Testing	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Rehabilitate existing road • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • New location freeway • New location non-freeway • Interchanges • Bridge widening/rehabilitation • Bridge • Upgrade freeway to standard • Upgrade non-freeway to standard
Total Project Cost	Reduces Benefit • Additional funding is not readily available for method implementation
Construction schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation
Materials & Equipment	Reduces Benefit • Project has few concrete structures
Construction Site	Increases Benefit • Traffic patterns involve dominant traffic periods, rush hours, etc.
Personnel	Reduces Benefit • Personnel resistance to the method is anticipated • Project based TxDOT resources are inadequate (number and/or capability)
Complexity	Increases Benefit • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc.

Partnering	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • New location freeway • New location non-freeway • Interchanges • Bridge widening/rehabilitation • Bridge
Construction Duration	Increases Benefit • Medium construction duration • Long construction duration
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount • Significant cost uncertainties exist
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • End date of project is not clearly defined
Contractor	Increases Benefit • Significant conflicts between contractor and subcontractors are likely • Many change orders are anticipated Reduces Benefit • Contractor resistance (on method or other matters) is anticipated
Construction Site	Increases Benefit • Significant utility relocation issues exist • The project consists of multiple work locations • Adverse weather conditions are anticipated • Lane closures are unavoidable • Safety hazards are frequent and/or severe • Project involves many lateral streets, driveways, etc. • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hours, etc. • Extreme environmental issues exist or are anticipated
Complexity	Increases Benefit • Roadway geometry is complex • Geotechnical conditions vary significantly across the site • Traffic Control Plans are or will be overly complex

Set Liquidated Damages to Appropriate Level and Enforce	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Widen freeway • Interchanges • Bridge widening/rehabilitation • Bridge • Upgrade freeway to standard • Upgrade non-freeway to standard
Construction Duration	Increases Benefit • Short construction duration • Medium construction duration • Long construction duration
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation
Contractor	Increases Benefit • Contractor's quality performance on past projects was not to the desired level
Construction Site	Increases Benefit • Project involves many adjacent business owners
Complexity	Increases Benefit • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc.

Pavement Type Selection Decisions	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • New location freeway • New location non-freeway
Project Location	Increases Benefit • Rural • Suburban • Urban
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation • Subsequent project(s) exist
Materials & Equipment	Increase Benefit • Optimum pavement type is not determined • Costly future maintenance and rehabilitation is anticipated
Personnel	Reduces Benefit • Designers' construction knowledge is not to the desired level • Project based TxDOT resources are inadequate (number and/or capability)

Seek to Maximize Work-Zone Sizes	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Sealcoat • Overlay • Rehabilitate existing road • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation
Construction Site	Reduces Benefit • Significant ROW acquisition issues exist • Significant utility relocation issues exist
Others	Reduces Benefit • Public support may be lacking

Full Closure Instead of Partial Closure of Roadway	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Interchanges • Bridge
Project Location	Increases Benefit • Rural
Construction Duration	Increases Benefit • Short construction duration Reduces Benefit • Long construction duration
Construction Schedule	Increases Benefit • Construction completion date is critical • Project is an emergency situation
Construction Site	Increases Benefit • The project consists of multiple work locations

Implement Multiple Workshifts and/or Night Work	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Rehabilitate existing road • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • New location freeway • Interchanges • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Construction Duration	Increases Benefit • Long construction duration
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount Reduces Benefit • Significant cost uncertainties • Other funding problems are anticipated
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Project is an emergency situation • Subsequent project(s) exist
Contractor	Reduces Benefit • Significant conflicts between TxDOT and contractor are likely • Contractor's quality performance on past projects was not to the desired level • Contractor is not familiar enough with the method for implementation • Systems are not in place to ensure good communication • Contractor resistance (on method or other matters) is anticipated

Implement Multiple Workshifts and/or Night Work (continued)	
Category	**Level of Effect/Circumstances**
Construction Site	Increases Benefit • The project consists of multiple work locations • Lane closures are unavoidable • Project involves many lateral streets, driveways, etc. • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hours, etc.
Personnel	Reduces Benefit • Additional training is needed to implement method Precludes Method • Night or multiple work shifts are not possible

Develop Traffic Control Plans (TCPs) through Partnering between TxDOT Design and Field Organizations	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Rehabilitate existing road • Convert non-freeway to freeway • Bridge widening/rehabilitation • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Construction Schedule	Increases Benefit • Project is an emergency situation
Construction Site	Increases Benefit • Lane closures are unavoidable • Safety hazards are frequent and/or severe • Project involves many lateral streets, driveways, etc. • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hour, etc.
Personnel	Increases Benefit • Designers' construction knowledge is not to the desired level
Complexity	Increases Benefit • Roadway geometry is complex • Traffic Control Plans are or will be overly complex • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc. • Project involves underground, earthwork, and pavement activities

Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	
Category	**Level of Effect/Circumstances**
Project Type	Increases Benefit • Convert non-freeway to freeway • Widen freeway • Widen non-freeway • New location freeway • New location non-freeway • Interchanges • Bridge widening/rehabilitation • Bridge • Upgrade freeway to standard • Upgrade non-freeway to standard
Project Location	Increases Benefit • Suburban • Urban
Construction Duration	Increases Benefit • Long construction duration
Total Project Cost	Increases Benefit • Medium contract amount • High contract amount
Construction Schedule	Increases Benefit • Construction completion date is critical • Intermediate milestones are critical • Subsequent project(s) exist
Contractor	Increases Benefit • Significant conflicts between TxDOT and contractor are likely • Significant conflicts between consultant and contractor are likely • Significant conflicts between contractor and subcontractors are likely • Contractor's quality performance on past projects was not to the desired level
Construction Site	Increases Benefit • The project consists of multiple work locations • Project involves many adjacent business owners • Traffic patterns involve dominant traffic periods, rush hours, etc.

Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention (continued)	
Category	**Level of Effect/Circumstances**
Complexity	Increases Benefit • Roadway geometry is complex • Geotechnical conditions vary significantly across the site • Traffic Control Plans are or will be overly complex • Project involves bridges, ramps, frontage roads, elevation differentials, etc. • Project involves girders, bridge decks, retaining walls, piping, etc. • Project involves underground, earthwork, and pavement activities

Appendix G

Collective Tool Coefficients by Circumstance

An analysis of the tool coefficients ranked the circumstances and compared them to each other. This analysis was used to validate the collective ballot results. The coefficients are a numerical value assigned to each circumstance which correlates with ballot results and represents relative effectiveness of use. The circumstances were ranked by the summing the coefficients horizontally (see Appendix H) and then sorting from highest to lowest values. An additional qualifier catalogued the circumstances into two groups. One group was organized with categories that exist for all projects (categories 1-6); the second group contains categories unique to projects (categories 7-14).

Collective Tool Coefficients (Categories 1-6)			
Sum of Coefficients	**Number of Methods Precluded**	**Circumstances**	
118.0	0	1. Project Phase	a) Planning
118.0	0	2. Road User Cost (RUC)	c) High RUC
104.9	1	1. Project Phase	b) Design
95.0	0	3. Types of Work	i) Interchanges
87.3	0	3. Types of Work	e) Widen freeway
76.9	0	3. Types of Work	l) Upgrade freeway to standard
76.9	0	3. Types of Work	d) Convert non-freeway to freeway
75.2	0	3. Types of Work	k) Bridge
69.1	0	3. Types of Work	j) Bridge widening/rehabilitation
68.0	0	3. Types of Work	m) Upgrade non-freeway to standard
68.0	1	1. Project Phase	c) Contracting & Procurement
67.9	0	3. Types of Work	f) Widen non-freeway
66.5	0	4. Project Location	c) Urban
56.9	0	4. Project Location	b) Suburban

Collective Tool Coefficients (Categories 1-6) continued			
Sum of Coefficients	**Number of Methods Precluded**	**Circumstances**	
54.1	0	3. Types of Work	c) Rehabilitate existing road
53.2	0	6. Total Project Cost I	c) High contract amount (>$40M)
46.3	0	5. Construction Duration	c) Long construction duration (>2 years)
45.5	4	3. Types of Work	g) New location freeway
43.2	0	6. Total Project Cost I	b) Medium contract amount ($5M-$40M)
35.1	4	3. Types of Work	h) New location non-freeway
31.1	0	5. Construction Duration	b) Medium construction duration (6 months - 2 years)
28.0	9	1. Project Phase	d) Construction
1.9	0	5. Construction Duration	a) Short construction duration (<6 months)
0.0	0	2. Road User Cost (RUC)	b) Medium RUC
-11.2	0	4. Project Location	a) Rural
-12.3	0	6. Total Project Cost I	a) Low contract amount (<$5M)
-35.1	4	3. Types of Work	b) Overlay
-63.1	5	3. Types of Work	a) Sealcoat
-209.4	0	2. Road User Cost (RUC)	a) Low RUC

Collective Tool Coefficients (Categories 7-14)			
Sum of Coefficients	**Number of Methods Precluded**	**Circumstances**	
99.2	0	8. Construction Schedule	a) Construction completion date is critical
94.5	0	8. Construction Schedule	b) Intermediate milestones are critical
70.6	0	11. Construction Site	i) Traffic patterns involve dominant traffic periods, rush hours, etc.
68.8	1	8. Construction Schedule	d) Project is an emergency situation
60.6	0	13. Complexity	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.
55.1	0	8. Construction Schedule	e) Subsequent project(s) exist
51.8	0	13. Complexity	f) Project involves underground, earthwork, and pavement activities
49.8	0	11. Construction Site	e) Lane closures are unavoidable
49.7	0	13. Complexity	e) Project involves girders, bridge decks, retaining walls, piping, etc.
36.8	0	13. Complexity	a) Roadway geometry is complex
36.5	0	11. Construction Site	h) Project involves many adjacent business owners
34.2	0	11. Construction Site	c) The project consists of multiple work faces
32.6	0	13. Complexity	c) Traffic Control Plans are or will be overly complex
31.7	0	11. Construction Site	g) Project involves many lateral streets, driveways, etc.
25.5	0	11. Construction Site	f) Safety hazards are frequent and/or severe
9.9	0	9. Materials & Equipment	g) Costly future maintenance and rehabilitation is anticipated
9.0	0	11. Construction Site	j) Extreme environmental issues exist or are anticipated
7.3	0	9. Materials & Equipment	b) Optimum pavement type is not determined
2.7	1	12. Personnel	b) Night or multiple work shifts are not possible
1.8	1	9. Materials & Equipment	f) Dimensional flexibility for concrete structures is needed
0.0	0	12. Personnel	e) Field/local level has difficulty in enforcing liquidated damages
-0.3	0	13. Complexity	b) Geotechnical conditions vary significantly across the site
-1.8	0	10. Contractor	e) Contractor's quality performance on past projects was not to the desired level
-2.3	0	11. Construction Site	k) There is only one apparent Traffic Control Plan option
-2.8	0	10. Contractor	c) Conflicts between contractor and subcontractors are likely
-3.6	0	11. Construction Site	d) Adverse weather conditions are anticipated

Collective Tool Coefficients (Categories 7-14) continued			
Sum of Coefficients	**Number of Methods Precluded**	**Circumstances**	
-8.2	0	9. Materials & Equipment	d) Material & Equipment logistics are difficult
-8.9	0	10. Contractor	b) Conflicts between consultant and contractor are likely
-10.7	0	10. Contractor	a) Conflicts between TxDOT and contractor are likely
-11.0	0	12. Personnel	a) Availability of skilled labor is an issue
-20.0	0	9. Materials & Equipment	a) Project has few concrete structures
-24.6	0	7. Total Project Cost II	a) Significant cost uncertainties exist
-25.2	0	10. Contractor	d) Many change orders are anticipated
-26.9	0	10. Contractor	f) Contractor is not familiar enough with new methods for expediting highway construction
-27.2	0	12. Personnel	f) Consultants are not available to help implement method
-29.6	0	9. Materials & Equipment	c) There is not enough data to predict material performance
-29.7	0	10. Contractor	h) Incentives/disincentives are not well defined
-30.2	0	12. Personnel	d) Designers' construction knowledge is not to the desired level
-31.0	0	14. Others	a) Weak public buy-in might be problematic
-31.7	0	10. Contractor	i) Systems are not in place to manage incentives/disincentives
-32.6	0	14. Others	b) The use of new construction technology is limited
-33.5	0	12. Personnel	h) Additional training is needed to implement method
-36.0	0	8. Construction Schedule	c) End date of project is not clearly defined
-40.8	0	10. Contractor	g) Systems are not in place to ensure good communication
-44.2	0	12. Personnel	c) Personnel might be resistant to try new expediting methods
-45.1	0	9. Materials & Equipment	e) Equipment (cranes, bulldozers, etc.) are not readily available
-48.0	0	8. Construction Schedule	f) Schedule is not realistic
-53.8	0	7. Total Project Cost II	c) Other funding problems are anticipated
-54.1	0	7. Total Project Cost II	b) Additional funding is not readily available for expediting methods which may need it
-54.6	0	12. Personnel	g) Project based TxDOT resources are inadequate (number and/or capability)
-66.4	0	11. Construction Site	b) Significant utility relocation issues exist
-68.5	0	11. Construction Site	a) Significant ROW acquisition issues exist

Appendix H

Paper Version of Tool and Instruction

The paper version of the tool is provided for those individuals wishing to use this medium (17 total pages) and for investigation of the tool coefficients. The user may examine the reasoning behind the associated methods and coefficients. For each method, the user is instructed to following these steps:

1. For circumstances 1-6 circle the single most applicable coefficient.
2. For the other circumstances (7-14) circle all applicable coefficients.
3. Add the coefficients vertically to obtain a score for the category and then add these to obtain the page total.
4. Transfer and add the four page totals to reach a final score for the method.
5. Transfer the final score to the table on the last page of the this appendix
6. Repeat for each method and rank based on total score.

For a more efficient evaluation, the user is encouraged to use the computerized EMST. For method references, refer to those within this report or the "References" worksheet within the EMST.

Circumstances		Circumstance Coefficients for Each Method: A + B Contracting	Develop Traffic Control Plans (TCP's) through Partnering	Formal Partnering	Full Closure Instead of Partial Closure of Roadway
1. Project Phase	a) Planning	9	6	4	7
	b) Early Design	6	6	4	7
	c) Late Design	3	6	2	3
	d) Construction	Precludes	6	2	-5
	Category Score - Project Phase				
2. Road User Cost (RUC)	a) Low RUC	-4	-22	-30	7
	b) Medium RUC	5	0	0	3
	c) High RUC	6	3	2	-3
	c) Very High RUC	9	6	4	-5
	Category Score - Road User Cost				
3. Project Type	a) Sealcoat	Precludes	-28	-7	-6
	b) Overlay	-4	-8	-7	-10
	c) Rehabilitate existing road	-1	4	2	-1
	d) Convert non-freeway to freeway	9	4	3	-3
	e) Widen freeway	9	3	2	1
	f) Widen non-freeway	2	3	2	1
	g) New location freeway	8	Precludes	3	Precludes
	h) New location non-freeway	0	Precludes	3	Precludes
	i) Interchanges	9	3	4	7
	j) Bridge widening/rehabilitation	8	4	4	5
	k) Bridge	8	3	3	10
	l) Upgrade freeway to standard	4	4	2	1
	m) Upgrade non-freeway to standard	2	4	2	1
	Category Score - Project Type				
4. Project Location	a) Rural	-4	-19		7
	b) Suburban	6	4		1
	c) Urban	9	4		1
	Category Score - Project Location				
5. Construction Duration	a) Short construction duration (<6 months)	-6	-6	0	10
	b) Medium construction duration (6 months - 1 year)	-1	1	3	-4
	c) Long construction duration (1 year - 2 years)	6	1	3	-6
	d) Very long constructino duration (>2years)	9	1	3	-11
	Category Score - Construction Duration				
	Score Totals for this Page				

Circumstances		Circumstance Coefficients for Each Method			
		A + B Contracting	Develop Traffic Control Plans (TCP's) through Partnering	Formal Partnering	Full Closure Instead of Partial Closure of Roadway
6. Total Project Cost	a) Low contract amount (< $5 Million)	-6	-6	1	0
	b) Medium contract amount ($5 Million -$15 Million)	4	3	3	2
	c) High contract amount ($15 Million - $50 Million)	6	3	4	2
	d) Very high contract amount (>$50 Million)	9	3	4	-1
	Category Score - Total Project Cost				
7. Other Project Costs	a) Significant cost uncertainties exist	-3		4	
	b) Additional funding is not readily available for method implementation	-3	-11	1	
	c) Other funding problems are anticipated	-4		1	
	Category Score - Other Project Costs				
8. Construction Schedule	a) Construction completion date is critical	5		4	10
	b) Intermediate milestones are critical	5		4	5
	c) End date of project is not clearly defined	0		3	
	d) Project is an emergency situation	3	6		10
	e) Subsequent project(s) exist	4			2
	f) Schedule is not realistic	-3		0	
	Category Score - Construction Schedule				
9. Materials & Equipment	a) Project has few concrete structures				
	b) Optimum pavement type is not determined				
	c) There is not enough data to predict material performance				
	d) Material & Equipment logistics are difficult				-3
	e) Equipment (cranes, bulldozers, etc.) are not readily available				-9
	f) Dimensional flexibility for concrete structures is needed				
	g) Costly future maintenance and rehabilitation is anticipated				
	Category Score - Materials & Equipment				
	Score Totals for this Page				

Circumstances		Circumstance Coefficients for Each Method: A + B Contracting	Develop Traffic Control Plans (TCP's) through Partnering	Formal Partnering	Full Closure Instead of Partial Closure of Roadway
10. Contractor	a) Significant conflicts between TxDOT and contractor are likely	-3	1	1	
	b) Significant conflicts between consultant and contractor are likely	-2	1	1	
	c) Significant conflicts between contractor and subcontractors are likely	-1	1	3	
	d) Many change orders are anticipated	-4		3	
	e) Contractor's quality performance on past projects was not to the desired level	-2	1	0	
	f) Contractor is not familiar enough with the method for implementation	-2	0		
	g) Systems are not in place to ensure good communication	-3	0	0	
	h) Incentives/disincentives are not well defined	-5			
	i) Systems are not in place to manage incentives/disincentives	-5			
	j) Contractor resistance (on method or other matters) is anticipated	-2	0	-41	
	Category Score - Contractor				
11. Construction Site	a) Significant ROW acquisition issues exist	-8	1	2	-10
	b) Significant utility relocation issues exist	-8	3	3	-10
	c) The project consists of multiple work locations	6		3	5
	d) Adverse weather conditions are anticipated	-3		3	
	e) Lane closures are unavoidable	3	4	3	5
	f) Safety hazards are frequent and/or severe		6	3	2
	g) Project involves many lateral streets, driveways, etc.	3	6	3	-12
	h) Project involves many adjacent business owners	4	6	3	-14
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	1	6	3	-1
	j) Extreme environmental issues exist or are anticipated	-6	3	4	
	k) There is only one apparent Traffic Control Plan option		-3	1	2
	Category Score - Construction Site				
	Score Totals for this Page				

Circumstances		A + B Contracting	Develop Traffic Control Plans (TCP's) through Partnering	Formal Partnering	Full Closure Instead of Partial Closure of Roadway
		Circumstance Coefficients for Each Method			
12. Personnel	a) Availability of skilled labor is an issue		0		
	b) Night or multiple work shifts are not possible				
	c) Personnel resistance to the method is anticipated		-6	-15	
	d) Designers' construction knowledge is not to the desired level		4		
	e) Field/local level has difficulty in enforcing liquidated damages				
	f) Consultants are not available to help implement method	-1	1	0	
	g) Project based TxDOT resources are inadequate (number and/or capability)	-6			
	h) Additional training is needed to implement method	-2		-7	
	Category Score - Personnel				
13. Complexity	a) Roadway geometry is complex	3	4	3	5
	b) Geotechnical conditions vary significantly across the site	-1		3	
	c) Traffic Control Plans are or will be overly complex	0	6	4	5
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	4	4	2	-3
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	4	4	2	-3
	f) Project involves underground, earthwork, and pavement activities	4	4	1	5
	Category Score - Complexity				
14. Others	a) Public resistance to the method is anticipated				-12
	b) Lack of technology available to implement method				
	Category Score - Others				
	Score Totals for this Page				
	FINAL SCORES				

Circumstances		Generate & Evaluate Multiple Approaches to TCP's	Implement Multiple Work Shifts and/or Night Work	Incentivize Contractor with a Lane Rental Approach	Maturity Testing
		Circumstance Coefficients for Each Method			
1. Project Phase	a) Planning	6	7	9	11
	b) Early Design	6	7	9	11
	c) Late Design	6	3	4	11
	d) Construction	6	3	Precludes	5
	Category Score - Project Phase				
2. Road User Cost (RUC)	a) Low RUC	-21	-5	-7	-11
	b) Medium RUC	-5	-2	4	0
	c) High RUC	2	4	9	11
	c) Very High RUC	4	7	9	11
	Category Score - Road User Cost				
3. Project Type	a) Sealcoat	-9	3	-9	Precludes
	b) Overlay	-9	3	-3	Precludes
	c) Rehabilitate existing road	3	5	2	8
	d) Convert non-freeway to freeway	4	5	4	8
	e) Widen freeway	4	7	6	9
	f) Widen non-freeway	4	7	4	9
	g) New location freeway	Precludes	5	Precludes	9
	h) New location non-freeway	Precludes	3	Precludes	9
	i) Interchanges	4	7	6	9
	j) Bridge widening/rehabilitation	3	3	2	9
	k) Bridge	3	3	4	9
	l) Upgrade freeway to standard	4	7	4	9
	m) Upgrade non-freeway to standard	4	5	2	9
	Category Score - Project Type				
4. Project Location	a) Rural	1	0	-4	
	b) Suburban	6	5	4	
	c) Urban	6	7	9	
	Category Score - Project Location				
5. Construction Duration	a) Short construction duration (<6 months)		3	-3	
	b) Medium construction duration (6 months - 1 year)		3	0	
	c) Long construction duration (1 year - 2 years)		3	2	
	d) Very long constructino duration (>2years)		5	4	
	Category Score - Construction Duration				
	Score Totals for this Page				

Circumstances		Circumstance Coefficients for Each Method			
		Generate & Evaluate Multiple Approaches to TCP's	Implement Multiple Work Shifts and/or Night Work	Incentivize Contractor with a Lane Rental Approach	Maturity Testing
6. Total Project Cost	a) Low contract amount (< $5 Million)	1	3	0	
	b) Medium contract amount ($5 Million -$15 Million)	4	5	2	
	c) High contract amount ($15 Million - $50 Million)	4	5	2	
	d) Very high contract amount (>$50 Million)	4	5	4	
	Category Score - Total Project Cost				
7. Other Project Costs	a) Significant cost uncertainties exist	0	-7	-4	0
	b) Additional funding is not readily available for method implementation	-7	-5		-9
	c) Other funding problems are anticipated	-4	-7	-7	0
	Category Score - Other Project Costs				
8. Construction Schedule	a) Construction completion date is critical	6	7	4	9
	b) Intermediate milestones are critical	6	7	4	9
	c) End date of project is not clearly defined	-13			
	d) Project is an emergency situation	6	7	-1	9
	e) Subsequent project(s) exist	1	5		7
	f) Schedule is not realistic	1			
	Category Score - Construction Schedule				
9. Materials & Equipment	a) Project has few concrete structures				-11
	b) Optimum pavement type is not determined				0
	c) There is not enough data to predict material performance				-10
	d) Material & Equipment logistics are difficult			0	
	e) Equipment (cranes, bulldozers, etc.) are not readily available			2	
	f) Dimensional flexibility for concrete structures is needed				0
	g) Costly future maintenance and rehabilitation is anticipated				4
	Category Score - Materials & Equipment				
	Score Totals for this Page				

Circumstances		Generate & Evaluate Multiple Approaches to TCP's	Implement Multiple Work Shifts and/or Night Work	Incentivize Contractor with a Lane Rental Approach	Maturity Testing
		Circumstance Coefficients for Each Method			
10. Contractor	a) Significant conflicts between TxDOT and contractor are likely		-4	-5	
	b) Significant conflicts between consultant and contractor are likely		-3	-4	
	c) Significant conflicts between contractor and subcontractors are likely		-3	-2	
	d) Many change orders are anticipated			-6	
	e) Contractor's quality performance on past projects was not to the desired level		-5	0	-4
	f) Contractor is not familiar enough with the method for implementation	-5	-5	0	-4
	g) Systems are not in place to ensure good communication		-7	-6	
	h) Incentives/disincentives are not well defined			-11	
	i) Systems are not in place to manage incentives/disincentives			-10	
	j) Contractor resistance (on method or other matters) is anticipated	-10	-7	-6	-6
	Category Score - Contractor				

Circumstances		Generate & Evaluate Multiple Approaches to TCP's	Implement Multiple Work Shifts and/or Night Work	Incentivize Contractor with a Lane Rental Approach	Maturity Testing
11. Construction Site	a) Significant ROW acquisition issues exist	3	-3	-2	
	b) Significant utility relocation issues exist	6	-5	-4	
	c) The project consists of multiple work locations	6	5		
	d) Adverse weather conditions are anticipated		-1	-2	2
	e) Lane closures are unavoidable	3	7	9	
	f) Safety hazards are frequent and/or severe	6	3	0	
	g) Project involves many lateral streets, driveways, etc.	6	5	9	
	h) Project involves many adjacent business owners	6	5	9	
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	6	7	9	9
	j) Extreme environmental issues exist or are anticipated	1		0	
	k) There is only one apparent Traffic Control Plan option			-2	
	Category Score - Construction Site				
	Score Totals for this Page				

Circumstances		Generate & Evaluate Multiple Approaches to TCP's	Implement Multiple Work Shifts and/or Night Work	Incentivize Contractor with a Lane Rental Approach	Maturity Testing
		Circumstance Coefficients for Each Method			
12. Personnel	a) Availability of skilled labor is an issue		-3		-4
	b) Night or multiple work shifts are not possible	3	Precludes	-6	
	c) Personnel resistance to the method is anticipated		-3		-11
	d) Designers' construction knowledge is not to the desired level	-11	0		-2
	e) Field/local level has difficulty in enforcing liquidated damages		0		
	f) Consultants are not available to help implement method	-7	0	0	-4
	g) Project based TxDOT resources are inadequate (number and/or capability)	-14	-9		-11
	h) Additional training is needed to implement method		-4	-2	-4
	Category Score - Personnel				
13. Complexity	a) Roadway geometry is complex	4	2	2	
	b) Geotechnical conditions vary significantly across the site		0		
	c) Traffic Control Plans are or will be overly complex	6	0	4	
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	6	2	4	9
	e) Project involves girders, bridge decks, retaining walls, piping, etc.		2	4	9
	f) Project involves underground, earthwork, and pavement activities		3	4	4
	Category Score - Complexity				
14. Others	a) Public resistance to the method is anticipated		-5		
	b) Lack of technology available to implement method		-7		-10
	Category Score - Others				
	Score Totals for this Page				
	FINAL SCORES				

Circumstances		Circumstance Coefficients for Each Method			
		"No Excuse" Incentives	Pavement Type Selection Decisions	Precast/Modular Components	Seek to Maximize Work-zone Size
1. Project Phase	a) Planning	12	7	8	8
	b) Early Design	8	7	4	8
	c) Late Design	4	-9	0	4
	d) Construction	Precludes	Precludes	Precludes	4
	Category Score - Project Phase				
2. Road User Cost (RUC)	a) Low RUC	-5	4	-4	-19
	b) Medium RUC	6	4	4	-9
	c) High RUC	12	7	8	4
	c) Very High RUC	12	7	8	8
	Category Score - Road User Cost				
3. Project Type	a) Sealcoat	-1	Precludes	Precludes	8
	b) Overlay	0	Precludes	Precludes	8
	c) Rehabilitate existing road	6	4	2	8
	d) Convert non-freeway to freeway	9	5	4	8
	e) Widen freeway	9	4	4	8
	f) Widen non-freeway	6	4	4	8
	g) New location freeway	9	5	2	0
	h) New location non-freeway	9	5	0	0
	i) Interchanges	9	2	8	5
	j) Bridge widening/rehabilitation	6	-7	4	5
	k) Bridge	6	-7	8	5
	l) Upgrade freeway to standard	9	2	4	8
	m) Upgrade non-freeway to standard	6	2	4	8
	Category Score - Project Type				
4. Project Location	a) Rural		5	0	3
	b) Suburban		7	6	8
	c) Urban		7	6	8
	Category Score - Project Location				
5. Construction Duration	a) Short construction duration (<6 months)	-3			3
	b) Medium construction duration (6 months - 1 year)	0			5
	c) Long construction duration (1 year - 2 years)	0			5
	d) Very long constructino duration (>2years)	9			5
	Category Score - Construction Duration				
	Score Totals for this Page				

Circumstances		Circumstance Coefficients for Each Method			
		"No Excuse" Incentives	Pavement Type Selection Decisions	Precast/Modular Components	Seek to Maximize Work-zone Size
6. Total Project Cost	a) Low contract amount (< $5 Million)	-1	4		
	b) Medium contract amount ($5 Million -$15 Million)	6	2		
	c) High contract amount ($15 Million - $50 Million)	6	2		
	d) Very high contract amount (>$50 Million)	9	2		
	Category Score - Total Project Cost				
7. Other Project Costs	a) Significant cost uncertainties exist	-4	0	-4	2
	b) Additional funding is not readily available for method implementation	-7	0	-2	2
	c) Other funding problems are anticipated	-5	-4	-2	2
	Category Score - Other Project Costs				
8. Construction Schedule	a) Construction completion date is critical	12	7	6	8
	b) Intermediate milestones are critical	12	7	6	8
	c) End date of project is not clearly defined	-4	2	2	
	d) Project is an emergency situation	-2	7	-1	8
	e) Subsequent project(s) exist	9	7	2	5
	f) Schedule is not realistic	-2	0	2	
	Category Score - Construction Schedule				
9. Materials & Equipment	a) Project has few concrete structures		0	-10	
	b) Optimum pavement type is not determined		7		
	c) There is not enough data to predict material performance		-9	-12	
	d) Material & Equipment logistics are difficult	-1	0	0	5
	e) Equipment (cranes, bulldozers, etc.) are not readily available	-1	-11	-8	-13
	f) Dimensional flexibility for concrete structures is needed		2	Precludes	
	g) Costly future maintenance and rehabilitation is anticipated		7	-2	
	Category Score - Materials & Equipment				
	Score Totals for this Page				

Circumstances		"No Excuse" Incentives	Pavement Type Selection Decisions	Precast/Modular Components	Seek to Maximize Work-zone Size
		Circumstance Coefficients for Each Method			
10. Contractor	a) Significant conflicts between TxDOT and contractor are likely	-3		2	
	b) Significant conflicts between consultant and contractor are likely	-5		-2	
	c) Significant conflicts between contractor and subcontractors are likely	-1		-2	
	d) Many change orders are anticipated	-4	0	-4	
	e) Contractor's quality performance on past projects was not to the desired level	-3	0	0	
	f) Contractor is not familiar enough with the method for implementation	-2		-10	
	g) Systems are not in place to ensure good communication	-3		-10	
	h) Incentives/disincentives are not well defined	-6			
	i) Systems are not in place to manage incentives/disincentives	-8			
	j) Contractor resistance (on method or other matters) is anticipated	-3	-9		
	Category Score - Contractor				
11. Construction Site	a) Significant ROW acquisition issues exist	-8	0	-2	-15
	b) Significant utility relocation issues exist	-8	0	-2	-15
	c) The project consists of multiple work locations				3
	d) Adverse weather conditions are anticipated	-3	4	4	
	e) Lane closures are unavoidable			6	5
	f) Safety hazards are frequent and/or severe	-2		2	5
	g) Project involves many lateral streets, driveways, etc.		2	6	-4
	h) Project involves many adjacent business owners	3	2	4	-11
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	12		4	2
	j) Extreme environmental issues exist or are anticipated	3	4	6	
	k) There is only one apparent Traffic Control Plan option	3		0	-4
	Category Score - Construction Site				
	Score Totals for this Page				

Circumstances		Circumstance Coefficients for Each Method			
		"No Excuse" Incentives	Pavement Type Selection Decisions	Precast/Modular Components	Seek to Maximize Work-zone Size
12. Personnel	a) Availability of skilled labor is an issue			2	
	b) Night or multiple work shifts are not possible	0		4	
	c) Personnel resistance to the method is anticipated	-1			
	d) Designers' construction knowledge is not to the desired level		-13	-4	
	e) Field/local level has difficulty in enforcing liquidated damages				
	f) Consultants are not available to help implement method		-9	0	
	g) Project based TxDOT resources are inadequate (number and/or capability)	0	-13	4	
	h) Additional training is needed to implement method		-9	-4	
	Category Score - Personnel				
13. Complexity	a) Roadway geometry is complex	3		-2	3
	b) Geotechnical conditions vary significantly across the site	0	4	-4	-4
	c) Traffic Control Plans are or will be overly complex	3			2
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	0	4	6	3
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	0	0	6	3
	f) Project involves underground, earthwork, and pavement activities	3	4	-2	5
	Category Score - Complexity				
14. Others	a) Public resistance to the method is anticipated				-15
	b) Lack of technology available to implement method		-7	-11	
	Category Score - Others				
	Score Totals for this Page				
	FINAL SCORES				

Circumstances		Set Liquidated Damages to the Appropriate Level and Enforce	Use a Calendar Day Schedule	Use of Contractor Milestone Incentives	Train Selected Field Personnel in Scheduling Methods
		Circumstance Coefficients for Each Method			
1. Project Phase	a) Planning	8	7	8	4
	b) Early Design	8	7	5	4
	c) Late Design	4	3	3	4
	d) Construction	Precludes	Precludes	Precludes	2
	Category Score - Project Phase				
2. Road User Cost (RUC)	a) Low RUC	8	-5	-5	-13
	b) Medium RUC	8	2	4	1
	c) High RUC	8	4	8	3
	c) Very High RUC	8	7	8	4
	Category Score - Road User Cost				
3. Project Type	a) Sealcoat	1	-8	-6	Precludes
	b) Overlay	1	-2	-3	Precludes
	c) Rehabilitate existing road	4	3	4	2
	d) Convert non-freeway to freeway	4	3	8	3
	e) Widen freeway	8	6	8	3
	f) Widen non-freeway	4	3	6	3
	g) New location freeway	1	3	-2	3
	h) New location non-freeway	1	3	-2	4
	i) Interchanges	8	6	8	4
	j) Bridge widening/rehabilitation	8	6	8	3
	k) Bridge	8	6	6	3
	l) Upgrade freeway to standard	8	4	6	3
	m) Upgrade non-freeway to standard	8	4	6	3
	Category Score - Project Type				
4. Project Location	a) Rural			-3	1
	b) Suburban			8	3
	c) Urban			8	4
	Category Score - Project Location				
5. Construction Duration	a) Short construction duration (<6 months)	6	-4	2	0
	b) Medium construction duration (6 months - 1 year)	8	2	8	1
	c) Long construction duration (1 year - 2 years)	8	3	8	3
	d) Very long constructino duration (>2years)	6	4	8	4
	Category Score - Construction Duration				
	Score Totals for this Page				

Circumstances		Set Liquidated Damages to the Appropriate Level and Enforce	Use a Calendar Day Schedule	Use of Contractor Milestone Incentives	Train Selected Field Personnel in Scheduling Methods
		Circumstance Coefficients for Each Method			
6. Total Project Cost	a) Low contract amount (< $5 Million)	2		-3	-10
	b) Medium contract amount ($5 Million -$15 Million)	6		2	4
	c) High contract amount ($15 Million - $50 Million)	6		2	4
	d) Very high contract amount (>$50 Million)	8		4	4
	Category Score - Total Project Cost				
7. Other Project Costs	a) Significant cost uncertainties exist	0	-5	-4	1
	b) Additional funding is not readily available for method implementation		-5	-6	-3
	c) Other funding problems are anticipated	-10	-8	-4	-3
	Category Score - Other Project Costs				
8. Construction Schedule	a) Construction completion date is critical	8	6	8	4
	b) Intermediate milestones are critical	8	6	8	4
	c) End date of project is not clearly defined	-10	-11	-4	-3
	d) Project is an emergency situation	6	6	8	Precludes
	e) Subsequent project(s) exist	4	4	4	3
	f) Schedule is not realistic	-10	-13	-6	-24
	Category Score - Construction Schedule				
9. Materials & Equipment	a) Project has few concrete structures				
	b) Optimum pavement type is not determined				
	c) There is not enough data to predict material performance				
	d) Material & Equipment logistics are difficult		-10		
	e) Equipment (cranes, bulldozers, etc.) are not readily available		-7		
	f) Dimensional flexibility for concrete structures is needed				
	g) Costly future maintenance and rehabilitation is anticipated				
	Category Score - Materials & Equipment				
	Score Totals for this Page				

Circumstances		Set Liquidated Damages to the Appropriate Level and Enforce	Use a Calendar Day Schedule	Use of Contractor Milestone Incentives	Train Selected Field Personnel in Scheduling Methods
		Circumstance Coefficients for Each Method			
10. Contractor	a) Significant conflicts between TxDOT and contractor are likely	-3	3	-4	4
	b) Significant conflicts between consultant and contractor are likely	0	3	-3	4
	c) Significant conflicts between contractor and subcontractors are likely	-3	2	-3	3
	d) Many change orders are anticipated	-6	0	-6	
	e) Contractor's quality performance on past projects was not to the desired level	6	3		3
	f) Contractor is not familiar enough with the method for implementation		0		1
	g) Systems are not in place to ensure good communication		1	0	-17
	h) Incentives/disincentives are not well defined			-7	
	i) Systems are not in place to manage incentives/disincentives			-9	
	j) Contractor resistance (on method or other matters) is anticipated		0	0	3
	Category Score - Contractor				
11. Construction Site	a) Significant ROW acquisition issues exist	-18	-5	-9	2
	b) Significant utility relocation issues exist	-18	-5	-9	2
	c) The project consists of multiple work locations	-3	3	2	4
	d) Adverse weather conditions are anticipated		-8	-1	2
	e) Lane closures are unavoidable		3	2	2
	f) Safety hazards are frequent and/or severe		1		
	g) Project involves many lateral streets, driveways, etc.	-3	3	6	3
	h) Project involves many adjacent business owners	6	7	6	3
	i) Traffic patterns involve dominant traffic periods, rush hours, etc.	4	6	4	3
	j) Extreme environmental issues exist or are anticipated	-6			
	k) There is only one apparent Traffic Control Plan option		0		
	Category Score - Construction Site				
	Score Totals for this Page				

Circumstances		Set Liquidated Damages to the Appropriate Level and Enforce	Use a Calendar Day Schedule	Use of Contractor Milestone Incentives	Train Selected Field Personnel in Scheduling Methods
		Circumstance Coefficients for Each Method			
12. Personnel	a) Availability of skilled labor is an issue		-6	-3	2
	b) Night or multiple work shifts are not possible	2	1	-1	0
	c) Personnel resistance to the method is anticipated		1		-13
	d) Designers' construction knowledge is not to the desired level				-7
	e) Field/local level has difficulty in enforcing liquidated damages				0
	f) Consultants are not available to help implement method	-3		0	-7
	g) Project based TxDOT resources are inadequate (number and/or capability)	-3	0	-3	
	h) Additional training is needed to implement method			-3	
	Category Score - Personnel				
13. Complexity	a) Roadway geometry is complex	5		2	3
	b) Geotechnical conditions vary significantly across the site	-3		2	3
	c) Traffic Control Plans are or will be overly complex	0			4
	d) Project involves bridges, ramps, frontage roads, elevation differentials, etc.	8	6	4	4
	e) Project involves girders, bridge decks, retaining walls, piping, etc.	6	6	4	4
	f) Project involves underground, earthwork, and pavement activities	4	6	4	4
	Category Score - Complexity				
14. Others	a) Public resistance to the method is anticipated		0		
	b) Lack of technology available to implement method				
	Category Score - Others				
	Score Totals for this Page				
	FINAL SCORES				

Expediting Methods	Total Score
A+B Contracting	
Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations	
Formal Partnering	
Full Closure Instead of Partial Closure Roadway	
Generate & Evaluate Multiple Approaches to Traffic Control Plans	
Implement Multiple Work Shifts and/or Night Work	
Incentivize Contractor Work Progress with a Lane Rental Approach	
Maturity Testing	
"No Excuse" Incentives	
Pavement type selection decisions	
Precast/Modular Components	
Seek to Maximize Work-zone Size	
Set Liquidated Damages to the Appropriate Level and Enforce	
Use a Calendar Day Schedule	
Use of Contractor Milestone Incentives	
Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	

Instructions: Transfer the total score for each method in the table above.

Appendix I

Questionnaire screenshots from Expediting Method Selection Tool

Expediting Method Selection Tool For Highway Construction

Questionnaire - Page 1 of 4 Home ◄ ►

Please answer the following questions by clicking on the circles next to the options.

1. Project Phase - What is the current phase of this project?

- a) Planning
- b) Early Design
- c) Late Design
- d) Construction

2. Road User Cost (RUC) - What is the estimated level of RUC during construction?

- a) Low
- b) Moderate
- c) High
- d) Very High

3. Project Type - Please select the predominant type of work covered by this project.

- a) Sealcoat
- b) Overlay
- c) Rehabilitate existing road
- d) Convert non-freeway to freeway
- e) Widen freeway
- f) Widen non-freeway
- g) New location freeway
- h) New location non-freeway
- i) Interchanges
- j) Bridge widening/rehabilitation
- k) Bridge
- l) Upgrade freeway to standard
- m) Upgrade non-freeway to standard
- n) Other

4. Project Location - What is or will be the construction site location?

- a) Rural
- b) Suburban
- c) Urban

5. Construction Duration - What is the estimated construction duration?

- a) Shorter than 6 months
- b) 6 months to 1 year
- c) 1 year to 2 years
- d) Longer than 2 years

6. Total Project Cost - What is the estimated project cost?

- a) Lower than $5 Million
- b) $5 Million to $15 Million
- c) $15 Million to $50 Million
- d) Greater than $50 Million

Please click on the right arrow and move to the next page of the questionnaire. Home ◄ ►

Expediting Method Selection Tool For Highway Construction

Please answer 'Yes' or 'No' to the questions concerning the current project circumstances. Use your best judgment, some of the questions may not apply to the current project phase.

7. Other Project Costs

	Yes	No
a) Do significant cost uncertainties exist?	○	○
b) Is additional funding readily available for expediting methods which may need it?	○	○
c) Are other funding problems anticipated?	○	○

8. Construction Schedule

	Yes	No
a) Is construction completion date critical?	○	○
b) Are intermediate milestones critical?	○	○
c) Is the end date of project clearly defined?	○	○
d) Is the project an emergency situation?	○	○
e) Are subsequent project(s) planned or underway?	○	○
f) Is the current schedule too aggressive or lax?	○	○

9. Materials and Equipment

	Yes	No
a) Does the project have many concrete structures?	○	○
b) Has an optimum pavement type been determined?	○	○
c) Does sufficient data exist to predict material performance?	○	○
d) Does the project entail difficult material and equipment logistics?	○	○
e) Is equipment (cranes, bulldozers, etc.) readily available?	○	○
f) Is dimensional flexibility for concrete structures needed?	○	○
g) Is costly maintenance and rehabilitation anticipated after construction?	○	○

Please click on the right arrow and move to the next page of the questionnaire. Home ◄ ►

Expediting Method Selection Tool For Highway Construction

Questionnaire - Page 3 of 4 Home ◄ ►

Please answer 'Yes' or 'No' to the questions concerning the current project circumstances. Use your best judgment, some of the questions may not apply to the current project phase.

10. Contractor

	Yes	No
a) Are significant conflicts between TxDOT and contractor likely?	○	○
b) Are significant conflicts between consultant and contractor likely?	○	○
c) Are significant conflicts between contractor and subcontractors likely?	○	○
d) Are many change orders anticipated?	○	○
e) Has contractor's quality performance on past projects been acceptable?	○	○
f) Is the contractor familiar enough with new methods for expediting highway construction?	○	○
g) Are systems in place to ensure good communication?	○	○
h) Are incentives/disincentives well defined?	○	○
i) Are systems in place to manage incentives/disincentives?	○	○
j) Will contractor be resistant to try new expediting methods?	○	○

11. Construction Site

	Yes	No
a) Do significant ROW acquisition issues exist?	○	○
b) Do significant utility relocation issues exist?	○	○
c) Does the project consist of multiple work locations?	○	○
d) Are adverse weather conditions anticipated?	○	○
e) Are lane closures unavoidable?	○	○
f) Are safety hazards frequent and/or severe?	○	○
g) Does the project involve many crossing or lateral streets, driveways, etc.?	○	○
h) Does the project involve many adjacent business owners?	○	○
i) Do the traffic patterns involve dominant periods, rush hours, etc.?	○	○
j) Do extreme environmental issues exist or are any anticipated?	○	○
k) Is there only one apparent Traffic Control Plan option?	○	○

Please click on the right arrow and move to the next page of the questionnaire. Home ◄ ►

Expediting Method Selection Tool For Highway Construction

Questionnaire - Page 4 of 4 Home ◄ ►

Please answer 'Yes' or 'No' to the questions concerning the current project circumstances. Use your best judgment, some of the questions may not apply to the current project phase.

12. Personnel

	Yes	No
a) Is availability of skilled labor an issue?	○	○
b) Are night or multiple work shifts prohibited?	○	○
c) Are personnel resistant to try new expediting methods?	○	○
d) Is the designers' construction knowledge acceptable?	○	○
e) Does the field/local level have difficulty enforcing liquidated damages?	○	○
f) Are consultants available to help implement new expediting methods?	○	○
g) Are TxDOT project based resources adequate (number and/or capability)?	○	○
h) Is additional training needed to implement expediting method(s)?	○	○

13. Complexity

	Yes	No
a) Is the roadway geometry complex?	○	○
b) Do geotechnical conditions vary significantly across the site?	○	○
c) Will Traffic Control Plans be overly complex?	○	○
d) Does the project involve bridges, ramps, frontage roads, elevation differentials, etc.?	○	○
e) Does the project involve girders, bridge decks, retaining walls, piping, etc.?	○	○
f) Does the project involve underground, earthwork, drainage, and pavement activities?	○	○

14. Others

	Yes	No
a) Is the public supportive of the project?	○	○
b) Will new technology (testing devices, software, etc.) be utilized?	○	○

Please click on the right arrow and the results page will be displayed. Home ◄ ►

Appendix J

VBA Code of the Expediting Method Selection Tools

VBA Module 1

```
Sub GotoWelcome()
   Sheets("Welcome").Select
   Range("b4").Select
End Sub
```

```
Sub GotoInstructions()
   Sheets("Instructions").Select
   Range("b4").Select
End Sub
```

```
Sub GotoQuestions1()
   Sheets("Questions1").Select
   Range("b4").Select
End Sub
```

```
Sub GotoQuestions2from1()
   If Range("H8").Value = 0 Or Range("H14").Value = 0 Or Range("H20").Value = 0 Or _
   Range("H36").Value = 0 Or Range("H42").Value = 0 Or Range("H48").Value = 0 Then
   MsgBox "You have not answered all the questions!" _
   & vbNewLine & "Please review and answer each question.", vbCritical, "Unanswered
Questions"
   Exit Sub
   End If
   Sheets("Questions2").Select
   Range("b4").Select
End Sub
```

```
Sub GotoQuestions2()
   Sheets("Questions2").Select
   Range("b4").Select
End Sub
```

```
Sub GotoQuestions3()
   Sheets("Questions3").Select
   Range("b4").Select
End Sub
```

```
Sub GotoQuestions4()
   Sheets("Questions4").Select
```

```
    Range("b4").Select
End Sub
```

VBA Module 2

```
Sub ChooseMethods()

    Application.ScreenUpdating = False

    Calculate

    Dim cell As Range, NMethods As Integer

'Assign range names to Methods and Scores
    Sheets("Scores").Select
    With Range("A3")
        Range(.Offset(0, 1), .End(xlDown)).Name = "Methods"
    End With

    With Range("C3")
        Range(.Offset(0, 0), .End(xlDown)).Name = "Scores"
    End With

'Rank order the methods according to their scores
    Range("Methods", "Scores").Select
    Range("C3").Activate
    Selection.Sort Key1:=Range("C3"), Order1:=xlDescending

'Clear contents of the target area where the chosen methods will be listed
    With Range("D3")
        Range(.Offset(0, 1), .End(xlDown)).ClearContents
    End With

'Copy the chosen methods to the target area
    For Each cell In Range("Scores")
              If cell > 0 Then
          cell.Offset(0, -1).Copy cell.Offset(0, 2)
         cell.Offset(0, -2).Copy cell.Offset(0, 1)
        End If
    Next

'Assign range name for chosen methods (if there is any)
    If Range("E4") > 0 Then
      With Range("E3")
          Range(.Offset(0, 0), .End(xlDown)).Name = "ChosenMethods"
        End With
```

```
    Else
       If Range("E3") > 0 Then
        Range("E3").Name = "ChosenMethods"
        End If
    End If

'Clear contents of the results page
    Sheets("Results").Select
    Range("D15:H30").Select
    With Selection
        .ClearContents
        .MergeCells = False
    End With

'Copy chosen methods to the results page
       Sheets("Scores").Select
        Range("B3:B18").Select
        Selection.Copy
        Sheets("Results").Select
        Range("D15").Select
        ActiveSheet.Paste
        Application.CutCopyMode = False

Range("D15:H15,D16:H16,D17:H17,D18:H18,D19:H19,D20:H20,D21:H21,D22:H22,D23:H23
,D24:H24,D25:H25,D26:H26,D27:H27,D28:H28,D29:H29,D30:H30").Select
        Selection.Merge
        Range("B4").Select


End Sub
```

VBA Module 3

```
Sub Reference1()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="1"
    Range("B4").Select
End Sub
```

```
Sub Reference2()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="2"
    Range("B4").Select
End Sub
```

```
Sub Reference3()
```

```
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="3"
    Range("B4").Select
End Sub
```

```
Sub Reference4()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="4"
    Range("B4").Select
End Sub
```

```
Sub Reference5()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="5"
    Range("B4").Select
End Sub
```

```
Sub Reference6()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="6"
    Range("B4").Select
End Sub
```

```
Sub Reference7()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="7"
    Range("B4").Select
End Sub
```

```
Sub Reference8()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="8"
    Range("B4").Select
End Sub
```

```
Sub Reference9()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="9"
    Range("B4").Select
End Sub
```

```
Sub Reference10()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="10"
    Range("B4").Select
End Sub
```

```
Sub Reference11()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="11"
    Range("B4").Select
End Sub
```

```
Sub Reference12()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="12"
    Range("B4").Select
End Sub
```

```
Sub Reference13()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="13"
    Range("B4").Select
End Sub
```

```
Sub Reference14()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="14"
    Range("B4").Select
End Sub
```

```
Sub Reference15()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="15"
    Range("B4").Select
End Sub
```

```
Sub Reference16()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="16"
    Range("B4").Select
End Sub
```

```
Sub Reference17()
    Sheets("References").Select
    Selection.AutoFilter Field:=1, Criteria1:="17"
    Range("B4").Select
End Sub
```

VBA Module 4

```
Sub ShowPrintForm()

Application.ScreenUpdating = False

'Prepare the reference sheet which shows all references for selected methods
    Sheets("AllReferences").Select
        Range("A7").Select
        Range("A5:B184").AdvancedFilter Action:=xlFilterInPlace, CriteriaRange:= _
            Range("A190:A206"), Unique:=False
    Sheets("Results").Select

'Show the Print Form
frmPrintPages.Show

End Sub
```

```
Sub SaveAs()

Application.Dialogs(xlDialogSaveAs).Show

End Sub
```

VBA Print Box Form

```
Private Sub CheckBox1_Click()

End Sub
```

```
Private Sub chkMethods_Click()

End Sub
```

```
Private Sub cmdOK_Click()
    Dim PrintPages As New Collection
    Dim PrintPage As New Class1
    Dim i As Integer
    i = 0
    For Each ctrl In frmPrintPages.Controls
        If TypeOf ctrl Is MSForms.CheckBox Then
            i = i + 1
            Set PrintPage.ChkBox = ctrl
            PrintPages.Add PrintPage, CStr(i)
            Set PrintPage = Nothing
        End If
```

```
    Next

    Dim PrintShts() As Variant
    ReDim PrintShts(1 To 6)
    PrintShts = Array("Questions1", "Questions2", "Questions3", "Questions4", _
        "Results", "AllReferences")

    Dim SelectedPrintShts() As Variant
    Dim j, k As Integer
    j = 0
    k = 0
    For Each PrintPage In PrintPages
        j = j + 1
        If PrintPage.ChkBox = True Then
            SelectedPrintPages = SelectedPrintPages & "   -" & PrintPage.ChkBox.Caption &
Chr(13)
            k = k + 1
            ReDim Preserve SelectedPrintShts(1 To k)
            SelectedPrintShts(k) = PrintShts(j)
            Sheets(SelectedPrintShts).Select

        End If
    Next

    If SelectedPrintPages = "" Then
        iResponse = MsgBox("No pages were selected to print." _
        & vbNewLine & vbNewLine & "If you wish to print any pages, click OK and then check
pages to print." _
        & vbNewLine & "Otherwise, click Cancel to close the 'Select Pages to Print' dialog box." _
        , vbOKCancel + vbExclamation, "No pages selected. Do you still wish to print?")
        If iResponse = vbCancel Then
            Unload Me
            Exit Sub
        End If
    Else
        res1 = MsgBox("Please click Yes to print the following pages you have selected." _
            & vbNewLine & "In the next Excel dialog box, you may not change 'print what' option."
_
            & vbNewLine & vbNewLine & SelectedPrintPages & vbNewLine & _
            "Or click No to make whatever changes to the current page selection.", vbYesNo +
vbInformation, _
            "Selected Pages to Print")
        If res1 = vbYes Then
            Unload Me
            Dim Res2 As Variant
            Res2 = Application.Dialogs(xlDialogPrint).Show(, , , , , , , , , , , 2)
```

```
        Else
            Exit Sub
        End If
        Sheets("Results").Activate
    End If
End Sub
Private Sub cmdCancel_Click()
    Unload Me
    Sheets("Results").Select
End Sub
```

```
Private Sub UserForm_Click()

End Sub
```

VBA Class Module

```
Public ChkBox As MSForms.CheckBox
```

VBA Code for the Results Page

```
Private Sub Worksheet_SelectionChange(ByVal Target As Range)

If Not Application.Intersect(Target, Range("K1")) Is Nothing Then _
        Call Reference1
If Not Application.Intersect(Target, Range("K2")) Is Nothing Then _
        Call Reference2
If Not Application.Intersect(Target, Range("K3")) Is Nothing Then _
        Call Reference3
If Not Application.Intersect(Target, Range("K4")) Is Nothing Then _
        Call Reference4
If Not Application.Intersect(Target, Range("K5")) Is Nothing Then _
        Call Reference5
If Not Application.Intersect(Target, Range("K6")) Is Nothing Then _
        Call Reference6
If Not Application.Intersect(Target, Range("K7")) Is Nothing Then _
        Call Reference7
If Not Application.Intersect(Target, Range("K8")) Is Nothing Then _
        Call Reference8
If Not Application.Intersect(Target, Range("K9")) Is Nothing Then _
        Call Reference9
If Not Application.Intersect(Target, Range("K10")) Is Nothing Then _
        Call Reference10
If Not Application.Intersect(Target, Range("A11")) Is Nothing Then _
        Call Reference11
```

```
If Not Application.Intersect(Target, Range("A12")) Is Nothing Then _
    Call Reference12
If Not Application.Intersect(Target, Range("A13")) Is Nothing Then _
    Call Reference13
If Not Application.Intersect(Target, Range("A14")) Is Nothing Then _
    Call Reference14
If Not Application.Intersect(Target, Range("A15")) Is Nothing Then _
    Call Reference15
If Not Application.Intersect(Target, Range("A16")) Is Nothing Then _
    Call Reference16
If Not Application.Intersect(Target, Range("A17")) Is Nothing Then _
    Call Reference17
End Sub
```

Appendix K

Invitation Letter to Attend Demonstration Seminar

TEXAS DEPARTMENT OF TRANSPORTATION
CENTER FOR TRANSPORTATION RESEARCH
PROJECT NO. 0-4386
EXPEDITING HIGHWAY CONSTRUCTION WHILE RETAINING QUALITY

July 14, 2003

Dear Prospective Seminar Attendee,

On behalf of our research team, I invite you to attend a seminar to learn about a tool for selection of methods for expediting highway construction.

Last year, 50 expediting methods were evaluated in three workshops in Dallas and Austin. Feedback gathered during these workshops has been used to select 16 "high potential impact" expediting methods, each of which has been further researched. As a culmination of this work, a prototype tool has been developed to help highway personnel identify which of these 16 methods can potentially help expedite planning, design, and construction of their capital projects. This Microsoft® Excel based tool consists of questions regarding current project circumstances. The tool then uses this input to recommend expediting methods that are applicable to the project and ranks them in rough order of potential schedule impact.

The seminar will not last more than one hour. The agenda is as follows:

- Background and introduction
- Presentation and instructions on tool usage
- Demonstration of software
- Questions and comments concerning software
- Distribution of disks and forms for feedback

Your feedback and comments concerning this tool will be appreciated and used to refine the final version of the tool. For your convenience we are providing three seminars at different locations and times.

Date/Time	Location	Presenter	TxDOT & FHWA personnel
24 July 10:30am	TxDOT Houston Dist. Office Maintenance Conf. Rm. 7721 Washington Ave., Houston, TX 77007	Dr. O'Connor	
18 Aug. 10:30am	TxDOT Dallas Dist. Office Ellis Conference Room 4777 E. Highway 80 Mesquite, TX 75150	Dr. Gibson	Bill Goodell
20 Aug. 10:00am	Ernest Cockrell, Jr. Hall (ECJ) 5.442 University of Texas at Austin	Dr. Haas	Jim Travis

Please indicate which seminar location you plan to attend and reply regarding your attendance by July 17, 2003. If you intend to bring colleagues, we would appreciate it if you would send their names as well.

Please call or email me if you have any questions. Direct replies and other questions to Christopher Anderson, a graduate research assistant working on this project, andersonck@mail.utexas.edu or (512) 471-8417.

Thank you for your assistance.

Sincerely,

Carl T. Haas, Ph.D., P.E.
Liedtke Centennial Fellow and
Professor in Civil Engineering
University of Texas at Austin
Phone: (512) 471-4601
Fax: (512) 471-3191
haas@mail.utexas.edu

Cc: G. E. Gibson, P.E., PhD, Professor in Civil Engineering at UT Austin
J. T. O'Connor, P.E., PhD, Professor in Civil Engineering at UT Austin
Z. Zhang, P.E., PhD, Asst. Professor in Civil Engineering at UT Austin

Appendix L

Evaluation Form Used for Demonstration Seminars

Evaluation Form

Expediting Method Selection Tool

Center for Transportation Research (TxDOT Project No. 0-4386)

Evaluation Date: ________________ **Seminar Location:** ________________________

Please provide the following information:

Name ________________________ Title ________________________

E-mail address ________________________ District/Division/Org. ________________

Phone No. ________________________ Yrs w/ TxDOT/Org. ________________

About the Tool: General

1. Is the tool useful?

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

2. Does the tool appear to be easy to use?

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

3. Would you use this tool or recommend it to others on future projects?

________ Yes ________ No

About the Tool: Specific

4. What do you like about the tool?

____

____

5. What areas of the tool could be improved? Please provide suggestions for refinement or enhancement.

____

____

____

6. Please provide recommendations for implementation.

____

____

____

Thank you for your feedback

Email address: andersonck@mail.utexas.edu
512-471-3191 (fax)
Mailing address: The University of Texas at Austin
Civil Engineering-CEPM
ECJ 5.2, 1 University Station C1752
Austin, TX 78712-0276

Appendix M

Tool Feedback Form for Specific Project from Demonstration Seminar

Feedback Form (for specific project)
Expediting Method Selection Tool
Center for Transportation Research (TxDOT Project No. 0-4386)

Feedback Date: ____________ **Seminar Location:** ____________

Please provide your name, role/title for this project and contact:

Name ____________ Title ____________

E-mail address ____________ District/Division/Org. ____________

Phone No. ____________ Yrs w/ TxDOT/Org. ____________

1. Where is this project located? (Highway, Project Limits, City, County)

   ____

2. When is the project scheduled to be bid or when was the project bid?

   ____

3. What is the CCSJ for the project?

   ____

4. If applicable, who is the contractor?

   ____

5. If applicable, please provide the following cost data ($):
   - Engineers Estimate ____________
   - Contract Amount ____________
   - Final Contact Amount ____________

6. If applicable, please provide the following duration data (in days):
   - Contract Time ____________
   - Additional Days Granted ____________
   - Total Days Used ____________

7. Please provide a description of the time charge (ie, calendar or working day, holidays off, nonworking days)?

   ____

8. Did the project use multiple work shifts and/or night work? Was this usage effective?

   ____

9. Amount of contract administered liquidated damages ($/day)

   ____

10. Did this project use some type of incentive or disincentive (I/D)? (check all that apply)
    - ______ A+B
    - ______ A+B with I/D
    - ______ Milestone I/D
    - ______ Lane Rental
    - ______ "No Excuse"
    - ______ Other, please describe ____________

11. If applicable, amount of I/D ($) and description?

    ____

12. If applicable, maximum number of incentive days allowed?

    ____

13. Did the project use contractually stipulated partnering or partnering plus?
    If so, how effective was the experience?

    ____

    ____

14. Please provide a brief description of the TCP and its effectiveness?

15. If applicable, how were road user costs calculated for the project (QUEWZ, HEEM II, MicroBencost, etc)? What was the amount of calculated RUC for this project?

16. What special provisions and/or special specifications did you use to implement 'expediting methods'?

17. What other sources or references did you consult for information about any 'expediting methods' used?

About the Tool:

1. Did the tool results parallel actual project usage of the 'expediting methods'? Please explain.

2. What areas of the tool could be improved? Please provide suggestions for refinement or enhancement.

3. Please provide recommendations for implementation.

Thank you for your feedback

Please return to: andersonck@mail.utexas.edu (email)
512-471-3191 (fax)
Mailing address: The University of Texas at Austin
Civil Engineering-CEPM
ECJ 5.2, 1 University Station C1752
Austin, TX 78712-0276

Appendix N

List of Demonstration Seminar Participants

Houston Demonstration Seminar Participants, Thursday, July 24, 2003

Name	Title	District/Area Office
Michelle Milliard	Assistant Area Engineer	Houston/Brazoria
John Zimmerman	Director, Acquisition Section	Austin ROW
Quincy Allen	Area Engineer - Design	Houston/E. Harris
Charles E. Gaskin, Jr.	District Construction Engineer	Houston
Les Thompson	District Construction Engineer	Houston
Maureen Wakeland	Area Engineer	Houston/S. Harris
Delvin Dennis		Houston
Karen Baker	Area Engineer	Houston/Montgomery

Dallas Demonstration Seminar Participants, Monday, August 18, 2003

Name	**Title**	**District/Organization**
Jack D. Hedge	Civil Design Manager	Dallas County Public Works
Larry Tegtmeyer	Area Engineer	Dallas
Chris Campbell	Practice Leader-Highway Des.	KBR
Enrique Guillen	Construction Engineer	Dallas
Nabeel Khwaja	Research Associate	CTR
Pat Ellis	Project Manager	HNTB
Robert E. Boykin	Field Construction Engineer	Dallas
Stan Hall	Planning Engineer	Dallas
John Rantz	Director of Operations	Lubbock
Joe Anderson	Director of Construction	Wichitia Falls
Duane A. Schwarz	Director of Construction	Waco
Moosa Saghian	Director of Administration	Dallas
David Neshyba	District Design Engineer	Atlanta
Lance Simmons	District Bridge Engineer	Atlanta
Tom Beckendorf	Design Project Coordinator	Atlanta
Gary Moonshower	Area Engineer	Dallas
Paul Wong	Transportation Engineer	Atlanta
Jerry L. Yates	Design Project Coordinator	Atlanta
Curtis Opperman	Project Manager	KBR
Matt McGregor	LBJ Project Manager	Dallas

Austin Demonstration Seminar Participants, Wednesday, August 20, 2003

Name	**Title**	**District/Organization**
Stephen G. Smith	Director of Construction	Odessa
Daniel Gomez	Transportation Eng.	Laredo
Rogelio Garcia	Central Design Engineer	Laredo
Tom Dahl	Area Engineer	Brownwood
Lonnie Ragsdale	Construction Manager	Brownwood
Catherine Hejl	Area Engineer	Bryan
Juan Urrutia	Transportation Eng.	Construction Division
Mike Lehman	Dist. Construction Eng.	San Antonio
David C. Kopp	Director of Construction	San Antonio

Appendix O

Seminar Demonstration Projects and Pilot Tests

Houston Demonstration Seminar Pilot Projects, July 24, 2003	
Project Category	**Specific Project Characteristic**
Project Name	SH-105E
Project Number	CSJ-
District	Houston
Project Location (description)	SH-105E, through several miles of Montgomery
Project Evaluators	Dr. O'Connor (Professor), Karen Baker (Area Engineer), Charles E. Gaskin (Director of Construction)
Phase	Planning
Road User Cost	Moderate
Project Type	Widen non-freeway
Project Location	Suburban
Construction Duration	Between 1 and 2 years, about 14 months
Total Project Cost	Between $5 and $15 million, $12 million
Description of Work (Scope)	
Range of Scores	49 to -18
Highest Scored Method (two methods)	Incentivize Contractor Work Progress with a Lane Rental Approach Seek to Maximize Work-Zone Size
Lowest Scored Method	Full Closure Instead of Partial Closure of Roadway
Time to Score Project	20 minutes

Expediting Method Selection Tool For Highway Construction

Results

Project Name:	SH-105E	**Name of Evaluator:**	O'Connor/Baker
Project Number:		**Data Date:**	July 24, 2002
District Name:	Houston, Montgomery	**Orginal Evaluation Date:**	September 24, 2003

Scores of Expediting Methods

Please click on the method name for more information and references.

? Save Print

		Scores
1)	Incentivize Contractor Work Progress with a Lane Rental Approach	49
2)	Seek to Maximize Work-zone Size	49
3)	Generate & Evaluate Multiple Approaches to Traffic Control Plans	43
4)	Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations	40
5)	Formal Partnering	40
6)	A+B Contracting	37
7)	Use a Calendar Day Schedule	35
8)	"No Excuse" Incentives	33
9)	Use of Contractor Milestone Incentives	29
10)	Set Liquidated Damages to the Appropriate Level and Enforce	23
11)	Implement Multiple Work Shifts and/or Night Work	13
12)	Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	8
13)	Precast/Modular Components	5
14)	Pavement type selection decisions	-6
15)	Maturity Testing	-11
16)	Full Closure Instead of Partial Closure Roadway	-18

Dallas Demonstration Seminar Pilot Projects, August 18, 2003	
Project Category	**Specific Project Characteristic**
Project Name	LBJ (I-635) Early Frontage Road
Project Number	CSJ 2374-01-130
District	Dallas
Project Location (description)	I-635, Early Frontage Road, from Hillcrest Road to Merit Drive, Dallas County, Dallas
Project Evaluators	Dr. Gibson (Professor), Matt McGregor (Project Manager), Larry Tegtmeyer (Area Engineer)
Phase	Design
Road User Cost	High
Project Type	Bridge/widening rehabilitation
Project Location	Urban
Construction Duration	Between 1 and 2 years, about 20 months
Total Project Cost	Between $15 and $50 million, $25 million
Description of Work (Scope)	The frontage road project is located near the Dallas High Five project and is part of the master transportation plan for that area. The LBJ Early Frontage Road Project calls for reconstruction to raise the frontage roads out of the White Rock Creek flood plain. Construction is scheduled to begin in late 2004 if right-of-way has been acquired with estimated completion in late 2006.
Range of Scores	63 to Precluded
Highest Scored Method	"No Excuse" Incentives
Lowest Scored Method	Full Closure Instead of Partial Closure of Roadway (Precluded)
Time to Score Project	20 minutes

Expediting Method Selection Tool For Highway Construction

Results

Project Name:	Early Frontage Road	**Name of Evaluator:**	Gibson/Matt MacGregor
Project Number:	2374-01-130	**Original Data Date:**	August 18, 2003
District Name:	Dallas	**Today's Date:**	September 24, 2003

Scores of Expediting Methods

Please click on the method name for more information and references.

? Save Print

		Scores
1)	"No Excuse" Incentives	63
2)	Maturity Testing	60
3)	A+B Contracting	56
4)	Incentivize Contractor Work Progress with a Lane Rental Approach	55
5)	Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	53
6)	Use of Contractor Milestone Incentives	50
7)	Use a Calendar Day Schedule	50
8)	Generate & Evaluate Multiple Approaches to Traffic Control Plans	48
9)	Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations	46
10)	Set Liquidated Damages to the Appropriate Level and Enforce	40
11)	Implement Multiple Work Shifts and/or Night Work	40
12)	Partnering	38
13)	Precast/Modular Components	30
14)	Pavement type selection decisions	25
15)	Seek to Maximize Work-zone Size	17
16)	Full Closure Instead of Partial Closure Roadway	Precluded

Austin Demonstration Seminar Pilot Projects, August 20, 2003	
Project Category	**Specific Project Characteristic**
Project Name	US-281, etc.
Project Number	CSJ 0521-06-026
District	Brownwood
Project Location (description)	US-281, etc. through several miles of Lampasas, Lampasas County, Lampasas,
Project Evaluators	Dr. Haas (Professor), Tom Dahl (Area Engineer), Lonnie Ragsdale (Construction Engineer)
Phase	Planning
Road User Cost	Moderate
Project Type	Rehabilitate existing road
Project Location	Urban
Construction Duration	Between 1 and 2 years, about 18 months
Total Project Cost	Between $5 and $15 million, $9 million
Description of Work (Scope)	The project involves utility adjustments, traffic signal upgrades, rehabilitation of some lanes, elimination of parking on side of road, addition of light fixtures, and storm drainage upgrade. The project has an ADT of 18,000. The utility design is being performed by a consultant. The negotiation of the utility contract with the city of Lampasas maybe the most difficult portion of the project. Another problem may occur with subcontractor that will relocate utilities.
Range of Scores	55 to Precluded
Highest Scored Method	Develop Traffic Control Plans through Partnering between TxDOT Design & Field Organizations
Lowest Scored Method	Use of Contractor Milestone Incentives (Precluded)
Time to Score Project	30 Minutes

Expediting Method Selection Tool For Highway Construction

Results

Project Name:	US 281, etc.	**Name of Evaluator:**	Dahl/Haas
Project Number:	0251-06-026	**Data Date:**	August 20, 2003
District Name:	Brownwood	**Orginal Evaluation Date:**	September 24, 2003

Scores of Expediting Methods

Please click on the method name for more information and references.

? Save Print

		Scores
1)	Develop Traffic Control Plans (TCP's) through Partnering between TxDOT Design and Field Organizations	**55**
2)	Train Selected Field Personnel in Scheduling Methods and Schedule Claims Prevention	**54**
3)	A+B Contracting	**42**
4)	Implement Multiple Work Shifts and/or Night Work	**41**
5)	Pavement type selection decisions	**41**
6)	Incentivize Contractor Work Progress with a Lane Rental Approach	**38**
7)	Use a Calendar Day Schedule	**37**
8)	Generate & Evaluate Multiple Approaches to Traffic Control Plans	**35**
9)	"No Excuse" Incentives	**33**
10)	Maturity Testing	**24**
11)	Set Liquidated Damages to the Appropriate Level and Enforce	**23**
12)	Partnering	**23**
13)	Precast/Modular Components	**12**
14)	Seek to Maximize Work-zone Size	**10**
15)	Full Closure Instead of Partial Closure Roadway	**0**
16)	Use of Contractor Milestone Incentives	**Precluded**

Appendix P

Demonstration Seminar Participants' Comments on the Tool

Question	Comments
What do you like about the tool?	• Simple and straightforward to use • Uses Excel and can be used anywhere. Also the references are good. (Engineers like results with numbers) • Analyzing of the project complexities and setting up tools for potential use • Appears to be user friendly • Comprehensive • Ease of use • Reduces need for users' experience in selection of methods and knowing methods • Set up of initial project criteria • Seems easy to use • User friendly • Ability to use at different stages; programming, design, construction • Gives a starting point for choosing methods to expedite construction • Ability to make changes for comparisons • Relative ease of use • Very thorough, very good for younger less experienced personnel • Seems pretty useful for less experienced personnel • Quick listing (links) of tools that can be used. • It is easy to use • I like the reference component • Good tie to DCIS (Design Construction Information System) types • Quick overview of project giving direction for efforts to be done in design and construction • Include a help icon. Explain or define each question in a separate window • The simplicity of it • Easy to use, quick, provides suggestions • The simplicity of it • Its ease in use • Its simplicity and use of links for explaining further things in more detail • Simple and user friendly • User friendly • Simplicity
What areas of the tool could be improved? Please provide suggestions for refinement or enhancement	• Add commentary on final scores • Could all the questions be positive and add a disagree button. (Even if it doesn't do anything) • The saving and opening file doesn't work • Will wait to see how the program works, and turn in feedback • Some questions could be worded differently i.e. "Work Faces?" • Provision of a listing of methods may mislead younger/less experienced employees thus resulting in selection of method less than optimal • Calibrate based on previous projects and historical information • In places, need additional categories or circumstances (i.e. railroad) • Seems to still have a bug or two (Excel 2000 version) • The program questionnaire could be customized for construction • Need to work with it before commenting

Question	Comments
What areas of the tool could be improved? Please provide suggestions for refinement or enhancement (continued)	• Unknown at this time, not sure • The agree box should be changed to "yes" and "no" because the agree answer is a positive response to a question written in a negative form. I have to think too hard. • The questions are inverted. Could you put in disagree or not factor, to help ensure it was answered and not just forgotten • Hard to predict how contractor will impact project • In the construction phase, there is no mention of any railroad issues. Please consider it. • More explanation on how results were obtained. (Reason why they rated the way they did). • Clarify questions to reduce subjectivity and to eliminate ambiguity • Need explanation of some or all of the statements you are asked to agree or not agree with. • More explanation of question and how they effect scoring • It appears that a sole answer to a question strongly triggers a driver. Perhaps more questions may be needed. • Split out for projects in planning and those already under construction • Pop ups for short explanation (intent) of questions • More pull down explanations
Please provide recommendations for implementation	• Mail to Transportation, Planning, and Development and District Construction Engineers • Put in a project, see how it works and provide comments that may or may not be helpful • Distribute to key TxDOT personnel with a short training session • Ideally, could be most useful during formative states of project selection and planning • Keep improving • The sooner the better • Need to try on past projects • Take into account the need to upgrade the tool to accommodate upgrades to computer programs, operating systems, etc. • Need additional time to evaluate • Nice tool for district voluntary use. Unfortunately "tools" develop into mandates for districts to implement • May want to put in more background references on the questions to make sure people understand. Connect to a pdf for the research project. Consider three boxes agree, disagree, not a factor • Give examples of project that used tool in planning showing how project utilized tool upon completion of construction • Provide final version of program to attendees. They can in turn implement at the district level • Distribute through TxDOT construction division to districts with encouragement to use it. • You need an Office of Primary Responsibility (OPR), usually a division, to act a champion of use of the program • Have different versions of the tool depending on the degree of planning, design, and construction • Secure OPR for implementation. Present at TxDOT 2004 Design Conference. Present at TxDOT Transportation conference October 2003 and 2004. Also have poster sessions as well (held at TTI). • Give presentations at design conference, construction conference, and at TxDOT short course. Obtain OPR – probably through construction division. • Come to districts; train appropriate personnel