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16. Abstract TxDOT is faced with a need to expand their maintenance contracted services due to shortage of in-house personnel and expertise. As a result, TxDOT had a need to investigate maintenance contracting strategies to identify those efficient strategies that might be implemented to help them achieve their maintenance goals. This study investigated current maintenance contracting practices in TxDOT and other state DOTs, and produced a selection framework, guide and case studies to assist maintenance personnel in selecting and implementing appropriate contracting strategies for maintenance outsourcing. A prototype selection algorithm was created to help decision makers identify contracting strategy for achieving outsourcing goals and accommodating maintenance circumstances.		
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Synthesis of Innovative Contracting Strategies for Routine and Preventive Maintenance Contracts

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Chapter 1. Introduction and Background

1.1 Background and Significance of Work

In 2000, as the United States entered a new millennium, the Federal Highway Administration (FHWA) challenged state highway agencies (SHAs) to "focus on preserving and maintaining rather than expanding our existing highway system" and to "make the system work better, run more smoothly, and last longer" (Davies and Sorenson 2000). This call for action resulted from a 1997 report to Congress, titled *Status of the Nation's Surface Transportation System: Condition and Performance*, which reported that about 50% of the nation's rural highways and 60% of the nation's urban highways were rated in fair to poor condition. During that same timeframe, the American Society of Civil Engineers (ASCE) published their *1998 Report Card for America's Infrastructure* that assigned our nation's roads a grade of a D-, which was a decline from their previous 1988 grade of a C+. It was evident to the FHWA then, and continues to be evident today, that the condition of our nation's highway infrastructure was deteriorating.

To address the deteriorating highway system, the FHWA encouraged SHAs to establish a pavement-preservation strategy that entailed implementing specific pavement maintenance techniques backed by dedicated funding. They identified the many expected benefits of a comprehensive pavement-preservation program as higher customer satisfaction, increased safety, cost savings/cost-effectiveness, improved pavement condition, and better informed decisions (Davies and Sorenson 2000). They also applauded several states for quickly implementing a pavement-preservation program, including California, Georgia, Michigan, New York, and Texas. These early pavement maintenance programs generally used in-house personnel to perform the work, but over the course of a decade (1998-2008), several states began contracting out maintenance activities to achieve greater efficiency.

In response to poor road conditions, the federal government passed the Transportation Equity Act for the 21st Century (TEA-21), which provided significant funding increases for new road construction and rehabilitation. State DOTs also began investing more money in maintenance, and, as a result, many states turned to more significant outsourcing in order to reduce costs, increase efficiency, and improve the quality of service (Segal et al. 2003).

While cost savings was a significant factor that inspired DOTs to experiment with outsourcing, many other factors provided further motivation. For example, Florida's aggressive maintenance contracting program resulted from a government mandate in which they were directed to increase their outsourcing to 60% while reducing personnel 25% (Ribreau 2004). Ultimately, they reported cost savings of nearly 20%, demonstrating that contracting out maintenance activities was generally cost-beneficial (Segal et al. 2003). Massachusetts initiated a pilot program to investigate whether operational efficiency could be gained and whether cost savings could be achieved by inviting maintenance employees to compete with contractors to perform maintenance activities. Anecdotal evidence suggests that much efficiency have been realized through this technique. Many states have contracted out maintenance activities to achieve better levels of service quality, and some states have outsourced in order to recover expertise that has been lost through employee retirements (Segal et al. 2003). Table 1.1 identifies many of the reasons why highway agencies have turned to maintenance outsourcing.

While many states continue to use traditional in-house personnel to perform maintenance, some states are shifting toward greater outsourcing, and other states are using hybrid methods that bring together in-house and contract staff to maximize cost, quality, expertise, and efficiency. These hybrid programs can provide a comfortable tradeoff between control and efficiency, with many DOTs retaining control over "core" maintenance activities while contractors assume responsibility for specialized activities that can be performed more efficiently by outsourced personnel. However, while many reports suggest that contracting out maintenance services has generally been successful and cost-beneficial, there are some indications that not all efforts have been successful because outsourcing goals have not been aligned with the appropriate contracting strategy. Therefore, it is necessary to understand both the benefits and the pitfalls that have been experienced on past maintenance contracts so that we can begin to identify those factors that contribute to successful achievement of agency goals.

Table 1.1: Reasons DOTs Initiated Maintenance Outsourcing (Source: Segal et al. 2003)

Reasons for Maintenance Outsourcing		
Reduce costs	Increase the level of service	Enhance risk management
Increase efficiency	Speed project delivery	Overcome a lack of expertise
Improve quality	Spur innovation	Legislative mandate

1.2 Problem Statement

Several districts within TxDOT have contracted out a significant portion of their maintenance activities because they do not have sufficient personnel to complete the work in-house. This lack of personnel has created voids in expertise that make outsourcing especially important so that specialty tasks can be completed efficiently. Consequently, TxDOT is faced with a need to expand their maintenance contracted services, and, as a result, they have a need to investigate efficient contracting strategies – beyond their traditional method – that might be implemented now or in the future. Previous studies have presented conflicting results about the effectiveness of innovative maintenance contracting strategies, creating confusion within TxDOT about the factors that contribute to success or how to align maintenance outsourcing goals with an appropriate contracting strategy. Therefore, it is necessary for TxDOT to evaluate the effectiveness of innovative maintenance contracting strategies that are being used nationwide so that they can identify efficient contracting strategies that might be implemented to help them achieve their maintenance goals.

Maintenance directors often decide which maintenance activities should be contracted out and what type of contracting strategy should be implemented. However, previous research has suggested that decision-makers often make choices based on techniques and practices that have been used successfully in the past rather than by examining all possible methods and using a systematic selection process. In fact, there currently is no systematic method for selecting appropriate contracting strategies for the outsourcing of hundreds of maintenance activities.

Accordingly, the purpose of this research was to develop a decision aid that will assist TxDOT districts with the selection and implementation of appropriate innovative maintenance contracting strategies.

1.3 Objectives, Research Scope, and Limitations

The objectives of the research were to:

- Identify the maintenance contracting practices, benefits, costs, and lessons learned internal to TxDOT, including contract strategies, cost effectiveness, quality of maintenance, and responsiveness
- Likewise identify the practices, benefits, costs, and lessons learned from other states that have implemented maintenance contracting
- Compare TxDOT's maintenance contracting strategies to those implemented in other states using various criteria, such as increase in responsiveness, rise in level of service/quality, and participation of local contractors
- Provide a decision method for selecting and implementing those contracting strategies that demonstrate the greatest potential for efficiently reducing maintenance costs and increasing responsiveness while maintaining or increasing the quality of service provided in TxDOT.

This document can be used by Maintenance Division and district personnel at all levels to encourage implementation of innovative methods for outsourcing more extensive maintenance activities within TxDOT. These research objectives were accomplished through the following **research tasks**:

1. Assemble a comprehensive list of innovative road maintenance contract strategies and criteria for evaluating their effectiveness
2. Investigate the effectiveness of TxDOT contract strategies and practices for accomplishing road maintenance
3. Investigate the effectiveness of other DOTs' contract strategies and practices for accomplishing road maintenance
4. Compare TxDOT's maintenance contract strategies to other states and develop a decision aid for selecting and implementing appropriate strategies
5. Summarize the findings and present the results

The scope and limitations of this research are presented here to properly use and apply the results of this project. Through a literature review, the researchers identified 14 delivery methods for maintenance contracting that are being used in North America, South America, Australia, Northern Europe and England. An on-line questionnaire was developed and distributed to state highway agencies in all 50 states and the 25 TxDOT districts. The questionnaire identified the 14 delivery methods and asked respondents to identify all of the methods they use to outsource maintenance activities in their agency. The research Project Monitoring Committee (PMC), in conjunction with the researchers, selected six TxDOT districts and five state DOTs (other than TxDOT) to conduct in-person interviews about specific contracting methods.

A key limitation of the research that might influence the outcome of the study is the limited size of the sample. The questionnaire aimed to investigate which road agencies are currently using part or all of the 14 delivery methods. It was distributed to all 25 TxDOT districts

and state highway agencies within the other 49 states, of which 79 responses were received. Eight of the 79 agencies also responded to a second questionnaire aimed to identify the criteria used respectively to select a *delivery method, type of contract specification* and *pricing strategy*. Six TxDOT districts and five state DOTs (other than TxDOT) were interviewed to investigate their particular maintenance contracting strategies. A larger degree of confidence might have been achieved if more responses had been received and additional state DOT interviews had been conducted. The researchers acknowledge that there might have been inherent differences between state DOTs that were willing to participate and those that were not willing to participate. However, in spite of these limitations, the research resulted in excellent data from which to launch a more comprehensive study of the decision criteria that can be used to select appropriate contracting strategies for maintenance activities. The researchers created a prototype spreadsheet-based contracting strategy selection tool based on the evaluation of experts on the potential influence of each maintenance contracting strategy on the achievement of maintenance outsourcing goals and accommodation of maintenance circumstances (see Chapter 7). The selection aid tool did not work as well as expected because many of TxDOT's experts were not familiar with the innovative contracting strategies. Hence, the data obtained from their evaluation may not accurately represent the most effective contracting strategy.

1.4 Organization of the Research Report

This final report is divided into the following ten chapters:

Chapter 1 presents the project's background, significance of work, problem statement, research objectives, scope, and limitations, and the organization of the report.

Chapter 2 presents the study methodology including an overview of the process, data collection, and study participants.

Chapter 3 presents the review of relevant literature from previous TRB studies on Maintenance Contracting, the innovative maintenance contracting strategies currently used inside and outside the United States, challenges with these innovative maintenance contracting strategies, and summary of contracting strategies investigated in this study.

Chapter 4 summarizes the delivery methods used for maintenance contracting in the United States on the basis of an on-line survey distributed to all 25 TxDOT districts and state highway agencies within the other 49 states.

Chapter 5 summarizes the criteria used respectively to select a *delivery method*, *types of contract specification* and *pricing strategy* of a contracting strategy based on another on-line questionnaire with eight highway agency participants.

Chapter 6 presents the framework for selecting appropriate contracting strategies for various types of maintenance activities.

Chapter 7 presents a selection algorithm that is aimed to help maintenance personnel identify appropriate contracting strategies for maintenance outsourcing.

Chapter 8 presents a contracting strategy selection guide that provides more information about the selection and implementation of each contracting strategy.

Chapter 9 presents case studies describing the implementation of the contracting strategies employed by various road agencies.

Chapter 10 provides conclusions and recommendations.

Chapter 2. Study Methodology

2.1 Overview of Process

Figure 2.1 summarizes the study methodology. Through a comprehensive literature review, the researchers identified delivery methods that are used nationally and internationally for highway maintenance contracting. At the same time, in-person and phone interviews were conducted with TxDOT experts in maintenance districts to identify the delivery methods used within TxDOT. Based on the literature review and the interviews within TxDOT, 14 delivery methods were identified to study in this research project. A list of the 14 delivery methods is included in Chapter 3. The 14 delivery methods were used to develop an on-line questionnaire that was distributed to all 25 TxDOT districts and state highway agencies within the other 49 states. The questionnaire also sought to identify which types of contract specifications were used, which pricing strategies were used, and whether the delivery methods resulted in successful maintenance performance. An example of the questionnaire is included in Appendix A. A picture of maintenance contracting practices throughout the U.S. was obtained based on the analysis of the collected data. Chapter 4 provides the summary of delivery methods used in the United States.

In addition to the original on-line questionnaire above-mentioned, the researchers also developed a follow-up on-line questionnaire that was aimed to identify various criteria used by road agencies for the implementation of maintenance outsourcing, such as criteria for selecting in-house or outsourced performance for various types of maintenance activities, criteria for selecting contracting strategies, and criteria for selecting contractors. An example of the follow-up questionnaire is included in Appendix B. The follow-up questionnaire was distributed to eight agencies that expressly conveyed their willingness to complete the longer questionnaire. Chapter 5 provides the summary of those criteria used for maintenance outsourcing based on the analysis of the collected data from the follow-up questionnaire.

The results of the original questionnaire were also used to identify districts within TxDOT and other state DOTs that should be interviewed face-to-face to learn more about their maintenance contracting strategies. As a result, six districts within TxDOT and five state DOTs were selected for participation in the interview process. An interview protocol was developed to investigate selected maintenance contracting strategies. The typical questions in the protocol included: why they chose a contracting strategy, how they implemented it, whether it was implemented successfully, how they evaluated effectiveness, best practices, and lesson learned. An example of the interview protocol is included in Appendix C.

After implementing the questionnaire and conducting six TxDOT site visits, four visits to other states and one phone interview with another state, the researchers realized that many of the 14 delivery methods were conceptually the same. It became apparent that a single delivery concept was often referred to by more than one name. For example, an Activity-Based Maintenance Contract Method might also be a type of Individual Activity Contract or a Moderately Bundled Activities Contract. To resolve the potential confusion and the overlap of methods, the researchers developed a new framework for defining maintenance contracting methods (see Chapter 3).

A decision tree for selecting appropriate contracting strategies was first proposed at the kick-off meeting. However, in the progress of in-person interviews, the researchers found out that the decision process of selecting contracting strategies for various types of maintenance

activities was more complicated in reality than what the original decision tree demonstrated. Additional decision criteria needed to be identified for establishing a practical decision method. Accordingly, the decision tree was modified in light of the actual needs. The new decision tree was named the *Maintenance Contracting Strategy Selection Framework* and is provided in Chapter 6 as along with the numerous decision criteria involved.

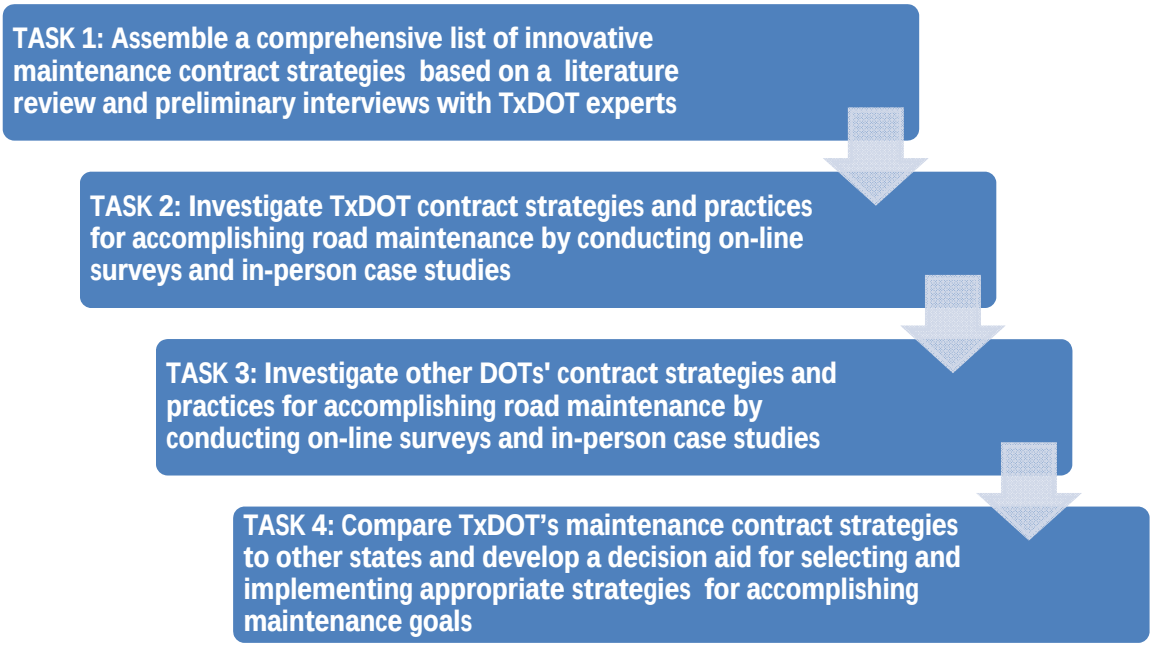


Figure 2.1: Flowchart of Study Methodology

Although the investigation of the criteria used to evaluate the effectiveness of contract strategies was included in the interview protocol, the interviewed road agencies (except for Pharr District in Texas) did not provide quantitative data for the researchers to evaluate the effectiveness of contract strategies. As a result, the comparison of the contract strategies' effectiveness within TxDOT and other state DOTs could not be made. Instead, the researchers recommend that maintenance district personnel select an appropriate contracting strategy for different types or combinations of maintenance activities by using the *Maintenance Contracting Strategy Selection Framework* and following each decision path until potential contracting strategies have been identified. The researchers also developed a selection guide in Chapter 8 to provide more information about contracting strategy selection and implementation, where each delivery method is discussed according to six aspects: description of the delivery method, conditions for appropriate implementation, selecting a type of specification, pricing strategy options, selecting an award strategy, and additional information and references. Furthermore, 11 case studies in Chapter 9 were developed from the interviews that enable maintenance personnel to further investigate the implementation, best practices and lessons learned for innovative contracting strategies. The *Maintenance Contracting Strategy Selection Framework*, *Selection Guide* and *Case Studies* can be used jointly for road agencies to select and implement appropriate contracting strategies for various types of maintenance activities.

The researchers created a spreadsheet-based decision support tool to aid in selecting appropriate contracting strategies for the outsourcing of maintenance activities. The engine of the tool is a selection algorithm that models the selection process. The selection algorithm allows potential decision-makers to evaluate their outsourcing goals and particular maintenance circumstances in order to identify appropriate maintenance contracting strategies that will aid them in achieving their outsourcing goals and accommodating their circumstances. To collect data to support the selection algorithm, a workshop was held and a panel of maintenance experts from the Maintenance Division and 11 TxDOT districts conducted three evaluation exercises: the evaluation of the influence of maintenance delivery methods on the achievement of outsourcing goals, the evaluation of the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing, and the evaluation of relative importance of the outsourcing goals and maintenance circumstances. Data were then processed and used to create a spreadsheet-based selection aid tool (see Chapter 7).

2.2 Data Collection and Study Participants

TxDOT experts in maintenance districts were interviewed in person or by phone to identify the delivery methods used within TxDOT and are listed in Table 2.1.

Table 2.1: List of Interviewed Experts in Maintenance Districts within TxDOT

TxDOT District	In Person vs. By phone	Interviewee	Date
Dallas	By phone	Gary Charlton	1/26/2009
Headquarter	In person	Robert Blackwell	11/19/2008
Headquarter	In person	Tammy Sims	1/15/2009
Headquarter	In person	Joe Graff	4/3/2009
Houston	By phone	Mike Alford	1/28/2009
San Antonio	By phone	Dan Stacks	1/22/2009
Waco	By phone	Mike Heise	3/20/2009

The districts within TxDOT and other state DOTs that responded the original on-line questionnaire are listed in Table 2.2 and Table 2.3 respectively. The districts within TxDOT and other state DOTs that responded the follow-up questionnaire are listed in Table 2.4 and Table 2.5 respectively.

Table 2.2: List of Districts within TxDOT That Responded the Original Questionnaire

Abilene	Atlanta	Austin	Beaumont
Brownwood	Bryan	Childress	Corpus Christi
Fort Worth	Houston	Laredo	Lubbock
Lufkin	Paris	Pharr	San Antonio
Tyler	Waco	Wichita Falls	Yoakum

Table 2.3: List of Other State DOTs That Responded the Original Questionnaire

Alaska	California	District of Columbia	Idaho
Illinois	Indiana	Iowa	Kentucky
Maine	Mississippi	Missouri	Montana
North Carolina	North Dakota	Ohio	Pennsylvania
South Carolina	Utah	Vermont	Virginia
Washington	Wisconsin	Wyoming	

Table 2.4: List of Districts within TxDOT That Responded the Follow-up Questionnaire

Bryan	Houston	Lufkin	Pharr

Table 2.5: List of Other State DOTs That Responded the Follow-up Questionnaire

Montana	North Carolina	Pennsylvania	Washington

The Project Monitoring Committee (PMC) suggested that the six districts within TxDOT should be comprised of two districts located in metropolitan areas, two in urban areas and two in rural areas. The six districts within TxDOT were selected based on their geographic location and the contracting strategies they used. The five state DOTs were selected based on the innovative contracting strategies they used. The Directors of Maintenance or other experts in highway maintenance operation were interviewed. The participants, the delivery methods investigated, and the date of the in-person interviews with the six districts within TxDOT are listed in Table 2.6. The participants, the delivery methods investigated, and the date of the in-person interviews with the four state DOTs and a phone interview with Maine DOT are listed in Table 2.7. A maintenance contracting strategy evaluation workshop was held on November 20, 2009 at TxDOT Riverside Campus. The districts and their representatives who participated in the workshop are listed in Table 2.8.

Table 2.6: List of Interview Participants from TxDOT

TxDOT District	Area	Delivery Method	Interviewee	Date
Dallas	Metropolitan	Total Asset Management Contract Method	Gary Charlton	7/1/2009
Houston	Metropolitan	Significantly Bundled Activities Contract Method	Mike Alford	5/1/2009
Lubbock	Rural	Moderately Bundled Activities Contract Method	Ted Moore	6/9/2009
Lufkin	Rural	Jointly-Performed Maintenance Contract Method	Paul Montgomery	6/4/2009
Pharr	Urban	Moderately Bundled Activities Contract Method	Pedro Alvarez	6/5/2009
Waco	Urban	Total Asset Management Contract Method	Mike Heise	6/18/2009

Table 2.7: List of Interview Participants from other State DOTs

State DOT	Delivery Method	Interviewee	Date
FL	Total Asset Management Contract Method	Tim Lattner	6/1/2009
NC	Total Asset Management Contract Method	Jennifer Brandenburg	6/2/2009
PA	Jointly-Performed Maintenance Contract Method	David J. Mallin	5/21/2009
KY	Integrated Maintenance Contract Method	Nancy Albright	8/14/09
ME	Long-term Separate Maintenance Contract Method	Michael Burns	8/24/2009

Table 2.8: List of Workshop Participants

Districts	Participants	Districts	Participants
Abilene	Brian Crawford	Atlanta	Brad A. Haugh
Beaumont	Jack Moser	Bryan	Terry Paholek
Childress	Darwin Lankford	Dallas	Gary Charlton
Lubbock	Ted Moore	Maintenance Division	Tammy Sims
San Antonio	John Bohuslav	Tyler	Michael Schneider
Wichita Falls	Tim Hertel	Yoakum	Carl O'Neill

Chapter 3. Literature Review

A significant amount of research was conducted in the late 1980s and early 1990s on maintenance outsourcing. However, these studies focused primarily on decision methods for deciding whether to outsource maintenance activities, criteria used to make a decision, and determining whether it is more economical to perform work using in-house or contract personnel. More recently, studies have been completed or are in progress on performance-based maintenance contracting. This research, in contrast, does not focus solely on deciding whether to outsource or solely on a particular maintenance outsourcing strategy. Instead, *the research reported in this research report investigates numerous innovative maintenance contracting strategies that might be implemented to achieve specific maintenance goals.*

3.1 Previous TRB Studies on Maintenance Contracting

Some state departments of transportation (DOTs) began contracting a part of minor maintenance activities in the mid 1970s. In the 1980s contracting continued to increase under the influence of the growing trend in privatization and downsizing. In the 1990s, almost every type of maintenance activities was being, at least in part, contracted out by one or more states. During this period, the Transportation Research Board (TRB) conducted the following four studies:

1. Maintenance Activities Accomplished by Contract, NCHRP Synthesis 125 (McMullen 1986)
2. Maintenance Contracting , NCHRP Report 344 (Newman et al. 1991)
3. Outsourcing of State Highway Facilities and Services, NCHRP Synthesis 246 (Witheford 1997)
4. State DOT Outsourcing and Private-Sector Utilization, NCHRP Synthesis 313 (Warne 2003)

Each study included an investigation of the factors considered in the contracting decision process. The factors listed in these studies included:

limited in-house resources	need for specialized expertise or equipment
to obtain services at lower cost	to cover peak workloads
contractor availability	legislative requirements or agency policies
to obtain better quality	to improve responsiveness

NCHRP Report 344 presented a maintenance contracting decision tree developed by Virginia DOT (Figure 3.1). It also supplied “Guidelines for Contracting Maintenance Services,” which provided detailed help on deciding what activities to contract, selecting contractors, contract administration, and training for inspectors. NCHRP Synthesis 246 included an excerpt from *PENNDOT’s Maintenance Contract-ability Manual* designed to assist in calculating contracting potential for particular maintenance activities.

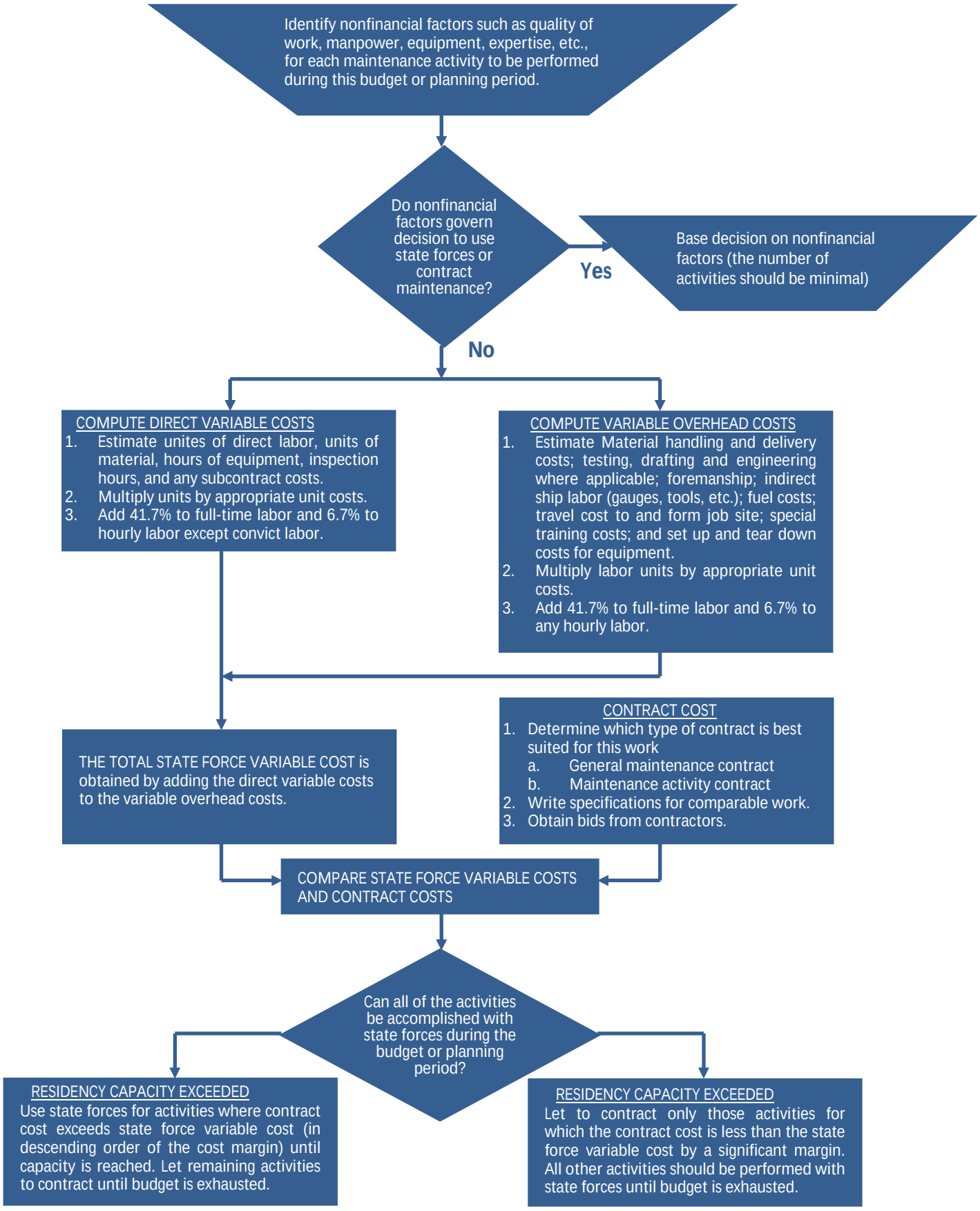


Figure 3.1: Virginia's Contract Maintenance Decision Tree

3.2 Innovative Maintenance Contracting Strategies

3.2.1 Terminology and Definitions

Pakkala et al. (2007) pointed out that there has been little standardization of the terminology that applies to maintenance contracting. Some examples of various terminology used around the world, as identified by Pakkala et al. (2007), include: Asset Management Contracts, Asset Maintenance Contracts, Performance Specified Maintenance Contracts (PSMC), Managing Agent Contracts, Performance-Based Contracts, Total Maintenance Contracting, and other contract methods. These terms basically refer to the outsourcing of either routine maintenance, preventive maintenance, both routine and preventive maintenance, or all maintenance services, that use some form of outcome-based specification (performance levels) or required "Level of Service" that must be met over a long time duration (often 3-10 years). Some of the terminology used in many cases describes a new philosophy and attempts to minimize the deterioration of the asset through lower "Life Cycle Cost." Some of these contracts may even include improvements or rehabilitation, and hence use the term called asset management contracting (Pakkala et al. 2007).

Definitions of maintenance processes vary from agency to agency. But, the AASHTO Highway Subcommittee on Maintenance provides its own definitions of pavement maintenance (routine and preventive) for reference. According to the AASHTO Highway Subcommittee on Maintenance, Routine Pavement Maintenance "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service" (Geiger, 2005). However, according to the AASHTO Standing Committee on Highways (1997), Preventive Pavement Maintenance is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)" (Geiger, 2005).

A Contracting Strategy, as defined in this study, is a process for allocating the risks and responsibilities for maintaining an existing road asset, and consists of three components: (1) a Delivery Method, (2) a Type of Contract Specification, and (3) a Pricing Strategy (Figure 3.2).

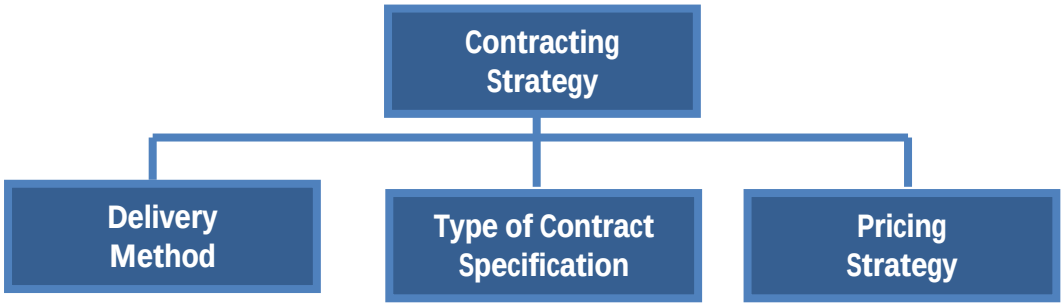


Figure 3.2: Components of a Contracting Strategy

3.2.2 Delivery Methods

The delivery method, as well as the type of contract specification and pricing strategy, must be selected as part of the maintenance outsourcing process. A recent report by Pakkala et al.

(2007) investigated and summarized traditional and non-traditional maintenance delivery models implemented by various countries, including Australia, Canada, England, Estonia, Finland, The Netherlands, New Zealand, Norway, Sweden, and the USA. He characterized an *In-house Maintenance Model* (also referred to as "*Traditional Model*") as one in which the road agency's personnel carry out nearly all of the maintenance activities. He also identified seven innovative (or non-traditional) maintenance delivery models, including:

1. *Activity-Based Maintenance Model*: Specific routine maintenance activities are outsourced by the road agency. This model is usually based on the lowest price with a unit price payment and its duration is typically for one year or season.
2. *Partial Competitive Maintenance Model*: A portion of routine maintenance activities is specifically retained for in-house personnel while the remainder is outsourced. Some agencies allow their own workforce to publicly tender against any private sector competitors.
3. *Routine Maintenance Model*: All routine maintenance activities are outsourced. The duration of this model varies and the present trend is between seven to ten years. Lump sum or the hybrid of lump sum and unit price is the typical payment of this model.
4. *Integrated Maintenance Model*: A combination of both routine and preventive maintenance activities are outsourced together as one contract. This model typically uses lump sum payment but unit price also can be implemented if unforeseen conditions require extra work.
5. *Long-term Separate Maintenance Model*: A single maintenance activity is outsourced for a long duration, often because it is unique or risky.
6. *Framework Model*: Several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects.
7. *Alliance Model*: A contractor is selected entirely on qualifications and has the opportunity to gain or lose 15% of the contract value based on performance. The contractor is paid actual cost plus a fixed rate of overhead and profit.

Pakkala et al. (2007) pointed out that there can be some variations in the models as each country adopts its own practices. It is also interesting to note that there are many combinations of models and all countries use more than one model.

According to Pakkala et al. (2007), the delivery models currently used in New Zealand for highway maintenance contracting included: *Activity-Based Maintenance Model*, *Routine Maintenance Model*, and *Integrated Maintenance Model*. In New Zealand the Integrated Maintenance Model is called Performance Specified Maintenance Contracts (PSMC). In 1998 the first PSMC was introduced in New Zealand to maintain 405 km of national roads and until 2005 15% of New Zealand national network was covered under this type of contract (Stankevich et al. 2005). The duration of a PSMC was typically up to ten years. During the period of the contract, the contractor was responsible for keeping the highway assets meeting the prescribed performance measures by performing all maintenance activities for a fixed lump sum price. Noticeably, Pakkala et al. (2007) indicated that there has been no new 10-year PSMC contracts in New Zealand because these types of contracts have not produced successful results as expected.

There are two main delivery methods used in South America for highway maintenance outsourcing: *Kilometer per Month Contract* and *CREMA Contract*, which originated in Argentina. Both of the two contract models are performance-based lump sum contracts. Kilometer per Month Contracts cover the roads that are in good to fair condition and require only routine maintenance to maintain the asset in that condition over a few years (Liautaud 2004). A contract was also designed for Combined REhabilitation and MAintenance (CREMA) of paved roads. This contract, called contrato de recuperación y mantenimiento (CREMA), requires the contractor to rehabilitate and then maintain a network of roads for five years for a lump sum amount (Liautaud 2004).

In 1996, VDOT established an interstate *Asset Management Contract* as a pilot to prove the soundness of this new contracting technique. The contractor was generally responsible for maintaining all assets between the right-of-way fences on all sections of the interstate highway and was paid a lump sum amount each month. The type of contract specification was a performance-based specification, which required the contractor to meet or exceed specific maintenance performance targets for five asset groups that are located within VDOT's right-of-way: Pavement, Roadside, Drainage, Traffic and Bridges. Each asset group was subdivided further into a number of individual assets related to the group. For example, the traffic asset group included the subcategories of signs, signals, highway lighting, pavement markings, and guardrails. The contractor was responsible for providing all work, materials, labor, services, and equipment necessary to achieve the established performance targets (Joint Legislative Audit and Review Commission (JLARC) of the Virginia General Assembly Report 2001).

In late 1998, TxDOT implemented a *Total Maintenance Contract* for highway maintenance outsourcing. The contract was a performance-based contract, whereby the contractor was required to maintain a prescribed level of service for a lump sum bid. The contractor in effect took over operation of a prescribed stretch of the highway and had authority to make all decisions about the maintenance and operation of the highway. The contractor determined what work to perform and what materials and methods to use. They planned and scheduled work, subcontracted for work, had the authority to utilize experimental materials, filed claims to collect for third party damages, and so forth (Graff 2000).

3.2.3 Types of Contract Specifications

Once a road agency has decided to outsource all or a portion of their maintenance activities, and after a delivery method has been chosen, the type of contract specification must be selected. Segal et al. (2003) identified three primary types of contract specifications used to outsource maintenance work: (1) traditional (i.e., method-based), (2) performance-based, and (3) warranty contract specifications. Hybrid methods that combine multiple types are also used.

Traditional contract specifications are often referred to as "method-based" and contractors are typically "paid for the amount of work they do — not on the quality of work that is provided" (Segal et al. 2003). These specifications typically are based on a number of line items that describe the scope of the work to be performed. The road agency typically specifies the methods, materials, and quantities to be used, and payment is based on amount of output (i.e., area of grass mowed) (Stankevich et al. 2005).

Under performance-based contract specifications, the contracting agency defines an end outcome goal (e.g., high quality roads) and the contractor decides how best to achieve the desired outcome. The contract specification identifies clearly defined performance measures, clearly defined outcomes and timetables, and allows for new and innovative methods to be used (Segal

et al. 2003). Hence, the road agency must establish a minimum performance standard, where payment is based on performance, with options for penalties and rewards. Performance-based contract specifications may cover individual assets (e.g., only traffic signs, only bridges) or all road assets (from right-of-way to right-of-way) within a road corridor. According to Stankevich et al. (2005), some road agencies (e.g., Virginia DOT (VDOT)) have found it advantageous to give the contractor responsibility for all assets within the right-of-way, including all maintenance activities and traffic assistance services. Such an approach provides the contracting agency with a single point of contact for quality assurance on the network. Hence, it avoids the situation in which the agency is unable to clearly allocate responsibility for defective work due to several different contractors working on the network. Some agencies have also recognized the benefit of including rehabilitation in this contract, since it encourages contractors to render services at higher level in order to reduce their future maintenance related expenses. For example, the contract used in Argentina, which is a combination of rehabilitation and maintenance (referred as to Combined REhabilitation and MAintenance or "CREMA"), has reduced the risk of unsatisfactory quality in the rehabilitation work (Liautaud 2004). It has been noted that similar contracts are already employed in Brazil, Chile, Colombia, Guatemala, Paraguay, and Uruguay.

A warranty contract specification is another form of performance-based contract specification in which the contractor is required to warrant the work for a specified length of time. There is an increasing trend towards the employment of warranty contracts whereby the contractor places a long-term guarantee on his work. This further shields the road agency from risk.

3.2.4 Pricing Strategies

Typical payment methods for maintenance contracting include unit price, lump sum, cost plus fee, or a hybrid of these methods. Unit price is typically used for method-based contracts because payment is based on the amount of output of a particular line item, such as area of grassed mowed during the payment period. However, payment of performance-based contracts is made on a lump sum basis normally through twelve equal monthly installments. A hybrid payment method can be used on a performance-based contract that includes line items for emergencies or unknown activities. This allows lump sum payment for regularly monthly maintenance while providing unit price payment for additional line items of work and helps to minimize the unforeseen risks on activities, such as guard rail repair / replacement, sign damage, and other high risk items (Pakkala et al. 2007). Under the CREMA method, rehabilitation that is part of a performance-based contract can be paid either on a fixed price lump sum or unit price basis (Stankevich et al. 2005).

3.3 Challenges with the Innovative Maintenance Contracting Strategies

In the 1990s many states began to initiate pilot programs to test the efficiency of various innovative maintenance contracting strategies. Although numerous reports have been published to demonstrate the success of many states' programs (Pakkala et al. 2007; Segal et al. 2003; Stankevich et al. 2005), contradictory reports, such as the one published by Ribreau (2004), suggested the outcomes were not as beneficial as agencies have reported.

Segal et al. (2003) reported that Massachusetts launched a pilot project in the early 1990s, contracting for all routine highway maintenance using a method-based approach in Essex County. He also reported that "The contract greatly improved highway conditions, delivering considerably more work for the same amount of money. The contract has saved $2.5 million

annually. According to a Kennedy School analysis, the contractor was 21 percent more cost-effective than the state had been." In contrast, Ribreau (2004) reported that "Lax state oversight and poor contractor performance led to many problems in the short term…the postaudit report found, among other things, that state workers were performing as much as 35% of the work supposedly covered in the outsourcing."

Furthermore, Segal et al. (2003) reported that Florida DOT awarded a Total Asset Management contract using a performance-based approach for fence-to-fence maintenance on I-75. He stated that "Florida has realized significant savings from using total asset management…the winning bid was 12.2% below the Florida DOT's funding estimates in year one…quality has not been sacrificed at the expense of cost savings…the last Level of Service rating conducted on the asset greatly surpasses the required score set forth in the contract documents" (Segal et al. 2003). In contrast, Ribreau (2004) reported that "The Office of Program Policy Analysis and Government Accountability in the Florida Legislature concluded that FDOT could not demonstrate overall savings from reducing in-house employees and expanding privatization in other program areas." Ribreau also identified several additional risks that might increase as a result of Florida's outsourcing practices, including failure to obtain the required performance from the contractor, paying for inadequate products, and diminished competition.

In 1996, VDOT awarded a 5-year asset management contract using a performance-based approach. VDOT initially claimed that the contract saved $23 million. A JLARC Report (2001) identified that the projected cost savings was largely based on estimates and forecasts of its future maintenance costs as compared to the payments it would make to the contractor. However, estimates of planned maintenance expenditures completed in 1996 may have little relationship to the actual maintenance costs in subsequent years. Therefore, the JLARC Report (2001) stated that VDOT's estimate of savings was not useful in assessing the effectiveness of the contract. In 2000, an independent study performed by Virginia Tech reduced the savings range from $23 million to $16 million (Ribreau 2004). In terms of this study, the JLARC Report (2001) stated that "The study approach appears to be a reasonable effort at comparing certain costs for the contractor and VDOT…but because of its narrow scope may not provide conclusive findings on the overall cost effectiveness of the asset management approach."

In 1999, TxDOT awarded two contracts for the total maintenance and operation of two sections of the state's interstate highways. Unlike previous method-based contracts, the new contracts developed a set of well-defined performance standards, which defined the minimum level of service acceptable. Because TxDOT had not previously measured maintenance conditions, a system had to be developed to measure the existing and resulting level of service. The outcome was the development of the Texas Maintenance Assessment Program (TxMAP) (Graff 2000), which proved to be a useful tool for evaluating contractor performance as well as for evaluating the overall level of service on numerous other roads in Texas. Graff (2000) also reported that "Although TxDOT anticipated the cost of these projects would be higher than previous costs, the bids came in lower than expected." Ribreau (2004) further noted that "Although TxDOT considers asset-management contracts with sufficient performance evaluations and substantial disincentive–incentive clauses as another useful tool, it will not enter into them as a money-saving endeavor."

Overall, innovative maintenance contracting methods have been largely successful, but the initial implementation of such contracts has often been accompanied by a large learning curve that can only be overcome through patience, persistence, and hard work.

3.4 Summary of Delivery Methods Investigated in this Study

Through an extensive literature review, the researchers assembled an initial list of 14 delivery methods to investigate through a questionnaire and interview. The questionnaire was developed to determine which of the various maintenance delivery methods have been implemented within TxDOT and in the other 49 states. The 14 delivery methods include:

1. Individual Activity Contract Method
2. Activity-Based Maintenance Contract Method
3. Moderately Bundled Activities Contract Method
4. Significantly Bundled Activities Contract Method
5. Partial Competitive Maintenance Contract Method
6. Jointly-Performed Maintenance Contract Method
7. Routine Maintenance Contract Method
8. Kilometer (or Mile) per Month Contract Method
9. Total Asset Management Contract Method
10. Integrated Maintenance Contract Method
11. CREMA Contract Method
12. Long-term Separate Maintenance Contract Method
13. Framework Contract Method
14. Alliance Contract Method

After implementing the questionnaire and conducting six TxDOT site visits, four site visits and one phone interview to other states, the researchers realized that some of the 14 delivery methods were conceptually the same but had minor variations in the activities, specification type, or pricing strategy implemented with the delivery method. It became apparent that a delivery concept was often referred to by more than one name because of these minor variations. For example, an Activity-Based Maintenance Contract Method might also be a type of Individual Activity Contract Method or a Moderately Bundled Activities Contract Method. Furthermore, the researchers realized that the definition of the delivery methods should be clarified in light of the information collected during the interviews. Consequently, the original 14 delivery methods were reduced to 13 delivery methods by eliminating Activity-Based Maintenance Contract Method. The definitions of the 13 delivery methods are provided below.

3.4.1 Thirteen Delivery Methods Investigated in this Study

1.	**Individual Activity Contract Method**: a single maintenance activity is outsourced, such as mowing.
2.	**Jointly-Performed Maintenance Contract Method:** a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or

labor. For example, snow removal or small rehabilitation projects can be jointly performed.

3. **Long-term Separate Maintenance Contract Method:** a single maintenance activity is outsourced across many areas, regions, or even the entire county for a long duration, typically more than five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years.

4. **Framework Contract Method**: several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects. The method is often called a Multi-Agency Contract (MAC) and is used widely by the U.S. military. Some states use this model for traffic control contracts.

5. **Moderately Bundled Activities Contract Method**: a few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up.

6. **Partial Competitive Maintenance Contract Method**: a certain percentage of the in-house workforce is retained to perform various routine maintenance activities, while the rest of the activities are bid out. In this method, in-house forces can competitively bid against contractors for the work. Often, the scope of work is large and may include all maintenance activities or a very large bundle of activities.

7. **Routine Maintenance Contract Method**: *all* routine maintenance activities are outsourced together as one contract. If a performance-based specification and lump sum pricing are used, the method can be regarded as a Total Asset Management Contract Method. If a method-based specification and unit pricing are used, the method can be regarded as Significantly Bundled Activities Contract Method.

8. **Integrated Maintenance Contract Method**: a combination of both routine and preventive maintenance activities are outsourced together as one contract. If a performance-based specification and lump sum pricing are used, the method can be regarded as a Total Asset Management Contract Method. If a method-based specification and unit pricing are used, the method can be regarded as a Significantly Bundled Activities Contract Method.

9. **Significantly Bundled Activities Contract Method**: *nearly all* maintenance activities are let out together, other than a few activities that are special or unique. A method-based specification and unit price are required to implement this method. This contract method has also been called a General Maintenance Contract.

10. **Total Asset Management Contract Method**: a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (*Source: AASHTO Subcommittee on Asset Management in January 2006*). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method. Florida calls

this method *Total Asset Maintenance Contracting* and Texas calls this method *Total Maintenance Contracting.*

11. **Alliance Contract Method**: a contractor is selected based entirely on qualifications and has the opportunity to gain or lose 15% of the contract value depending on performance. This method typically carries out performance-based specification and used cost plus fee as the pricing strategy.

12. **Kilometer (or Mile) per Month Contract Method**: applies essentially to a sub-network of paved roads which is in good to fair condition and is further expected to remain substantially in that condition over the next few years through routine maintenance activities alone, without any major strengthening or rehabilitation. This methods is used widely in Latin America but is not used in the United States. A performance-based specification and lump sum pricing are required to implement this method.

13. **CREMA Contract Method**: a Combined Rehabilitation and Maintenance (CREMA) Contract that requires contractors to rehabilitate and subsequently maintain a sub-network of roads under a lump sum contract for a total period of five years. This model originated in Argentina and is currently used in Latin America. In the U.S., this method has been used for traffic signal rehabilitation and maintenance, for example. A performance-based specification and lump sum pricing are required to implement this method.

The researchers acknowledge that some of the delivery methods can be used for contracting out either an individual activity or a bundled set of activities or "nearly all" activities. Consequently, to resolve the potential confusion about which methods are appropriate for outsourcing individual, multiple, or nearly all maintenance activities, the researchers developed the following diagram (Figure 3.3.) for the purpose of illustrating the 13 available innovative delivery methods.

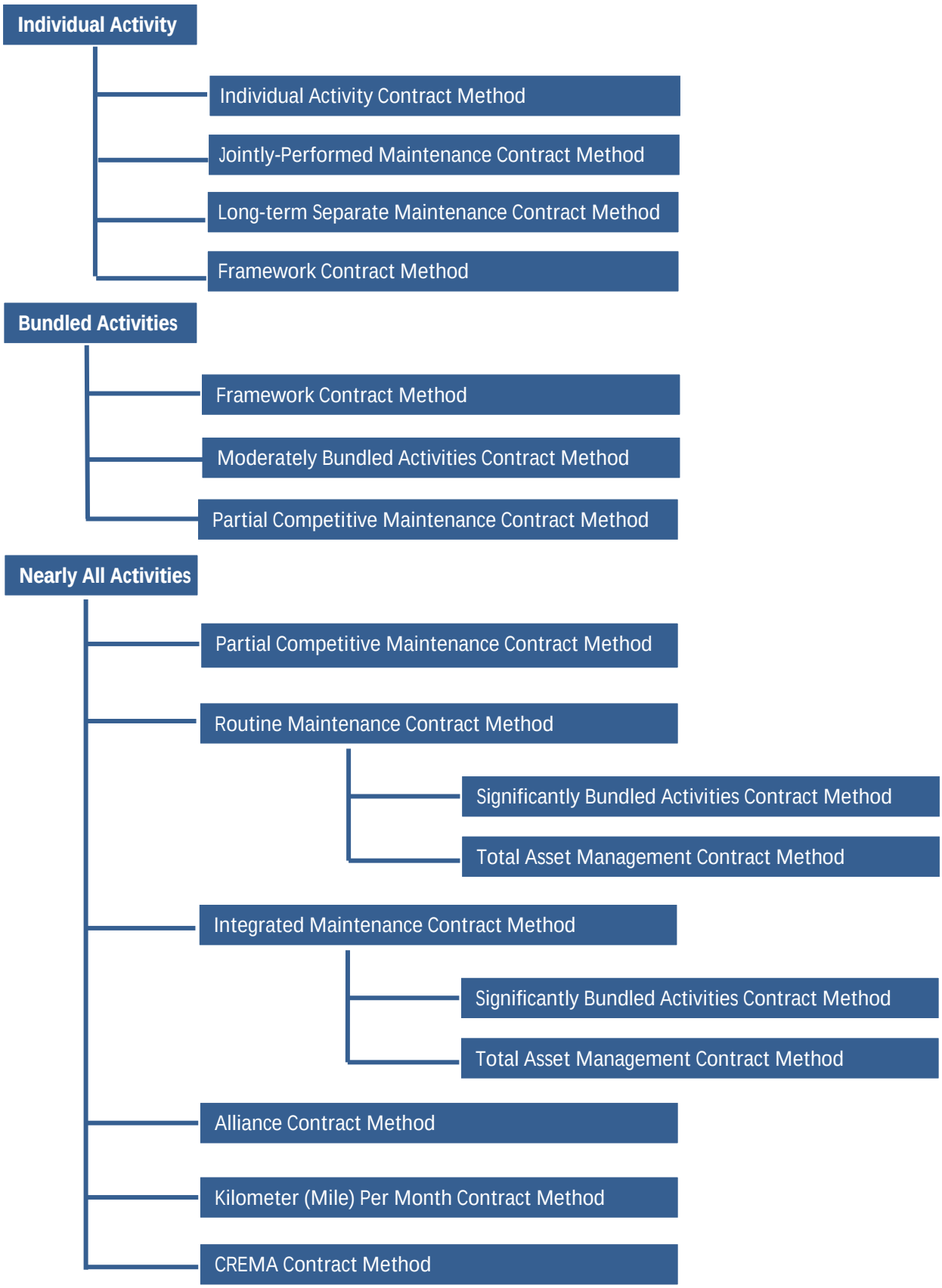


Figure 3.3: Diagram of the 13 Innovative Maintenance Delivery Methods

Chapter 4. Survey of Maintenance Contracting Strategies Used in the United States (Phase 1): Summary of Delivery Methods Used

4.1 Development and Implementation of the Questionnaire

Through a comprehensive literature review, the researchers identified 14 delivery methods that are used nationally and internationally for highway maintenance contracting. An on-line questionnaire was distributed to all 25 TxDOT districts and state highway agencies within the other 49 states to get an overall picture of how frequently these 14 delivery methods were used and who was using them. The questionnaire also sought to identify which types of contract specifications were used, which pricing strategies were used, and whether the delivery methods resulted in successful maintenance performance. An excerpt from the questionnaire is shown in Figure 4.1.

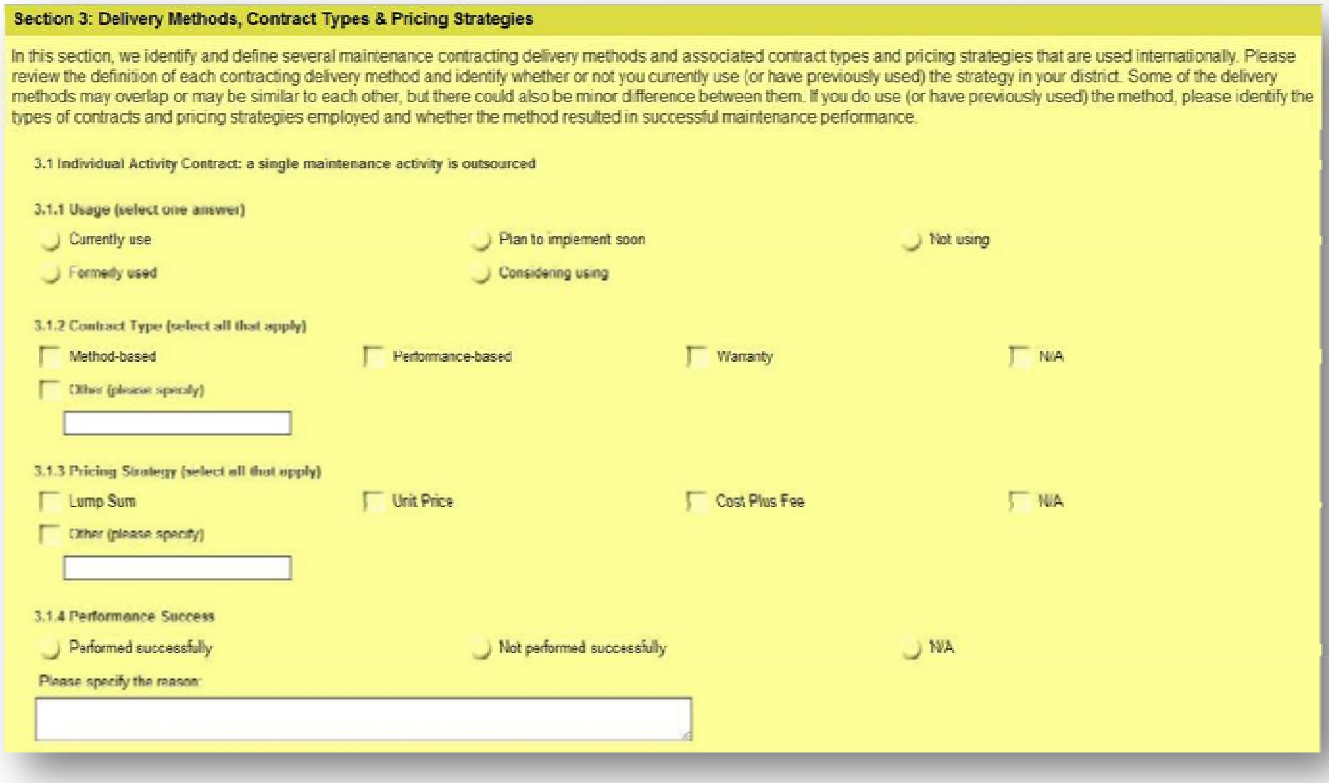


Figure 4.1: Excerpt from the on-line questionnaire for maintenance contracting strategies

Overall, seventy-nine agencies responded to the questionnaire. Twenty responses were from the districts within TxDOT, and fifty-nine responses were from either central offices or district offices of other state transportation agencies. The responses to the questionnaire are categorized by the fourteen delivery methods.

4.2 Summary of the Methods Used

4.2.1 Individual Activity Contract Method

In the Individual Activity Contract Method, a single maintenance activity is outsourced.

A total of fifty-two (52) agencies indicated that they have successfully performed maintenance activities by this delivery method. The districts of TxDOT and the other states that employ this delivery method are shown in Tables 4.1 and 4.2, respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.2.

Table 4.1: TxDOT districts that use Individual Activity Contract Method

Abilene	Atlanta	Austin	Beaumont
Brownwood	Bryan	Childress	Fort Worth
Houston	Laredo	Lubbock	Lufkin
Paris	Pharr	San Antonio	Tyler
Waco	Wichita Falls	Yoakum	

Table 4.2: Other states that use Individual Activity Contract Method

Alaska (1)	California (6)	Indiana (1)	Iowa (1)
Kentucky (1)	Maine (1)	Mississippi (1)	Missouri (1)
Montana (1)	North Carolina (1)	North Dakota (6)	Ohio (1)
Pennsylvania (1)	South Carolina (4)	Utah (1)	Vermont (3)
Virginia (1)	Wyoming (1)		

Delivery Method: Fifty-two (52) agencies (66% of the responses) stated that they are currently using this delivery method for maintenance outsourcing. Of the fifty-two agencies, nineteen (19) are the district agencies within TxDOT and thirty-three (33) are the agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.2.

Type of Contract Specification: Of the 19 TxDOT responses, seventeen (17) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method, three (3) agencies stated that performance-based contract specifications are employed, and one (1) agency responded that warranty contract specifications are used. It should be noted that three (3) agencies actually implement more than one type of contract specifications.

Of the 33 other states responses, twenty-three (23) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method, sixteen (16) agencies stated that performance-based contract specifications are employed, and four (4) agencies responded that warranty contract specifications are used. It should be noted that nine (9) agencies actually implement more than one type of contract specifications and two of the nine agencies employ all three.

Pricing Strategy: Of the 19 TxDOT responses, all nineteen (19) agencies implement unit price and three (3) agencies also use lump sum. Of the 33 other states responses, three agencies

only use lump sum; thirty (30) agencies implement unit price, eleven (11) also use lump sum, and only one (1) also uses cost plus fee in addition to the other two pricing strategies.

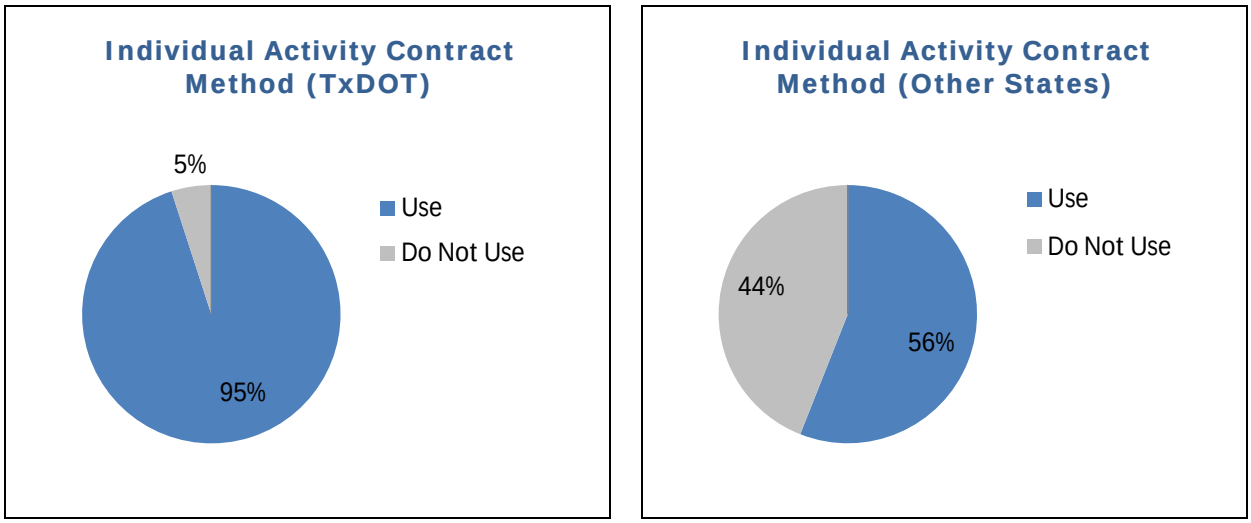


Figure 4.2: Chart showing percent the agencies use Individual Activity Contract Method versus percent that do not use it for both TxDOT and other states

4.2.2 Activity-Based Maintenance Contract Method

In the Activity-Based Maintenance Contract Method, a specific routine maintenance activity is contracted out separately or a few routine maintenance activities are outsourced together. (Note: This model is similar to the Individual Activity Contract and Moderately Bundled Activities Contract).

A total of thirty-seven (37) agencies indicated that they have successfully performed maintenance activities by this delivery method. The districts of TxDOT and other states that employ this delivery method are shown in Tables 4.3 and 4.4, respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.4.

Table 4.3: TxDOT districts that use Activity-Based Maintenance Contract Method

Abilene	Atlanta	Austin	Beaumont
Brownwood	Bryan	Childress	Fort Worth
Houston	Laredo	Lubbock	Lufkin
Paris	Pharr	San Antonio	Tyler
Wichita Falls	Yoakum		

Table 4.4: Other states that use Activity-Based Maintenance Contract Method

California (6)	Indiana (1)	Maine (1)	Mississippi (1)
Montana (1)	North Carolina (1)	North Dakota (2)	Ohio (1)
Pennsylvania (1)	South Carolina (3)	Vermont (2)	Virginia (1)

Delivery Method: Thirty-nine (39) agencies (49% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the thirty-nine agencies, eighteen (18) are the district agencies within TxDOT and twenty-one (21) are the agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.3.

Type of Contract Specification: Of the 18 TxDOT responses, fifteen (15) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method, four (4) agencies indicated that performance-based contract specifications are employed, and two (2) agencies stated that they use warranty contract specifications. It should be noted that four (4) agencies actually implement more than one type of contract specifications.

Of the 21 other states responses, fifteen (15) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method, and eight (8) agencies indicated performance-based contract specifications are employed. It should be noted that three agencies actually implement more than one type of specifications.

Pricing Strategy: Of the 18 TxDOT responses, sixteen (16) agencies implement unit price strategy and one (1) also uses lump sum. Of the other 21 states responses, two agencies only use lump sum strategy; eighteen (18) agencies implement unit price, seven (7) also use lump sum, and three (3) also use cost plus fee in addition to the other two strategies.

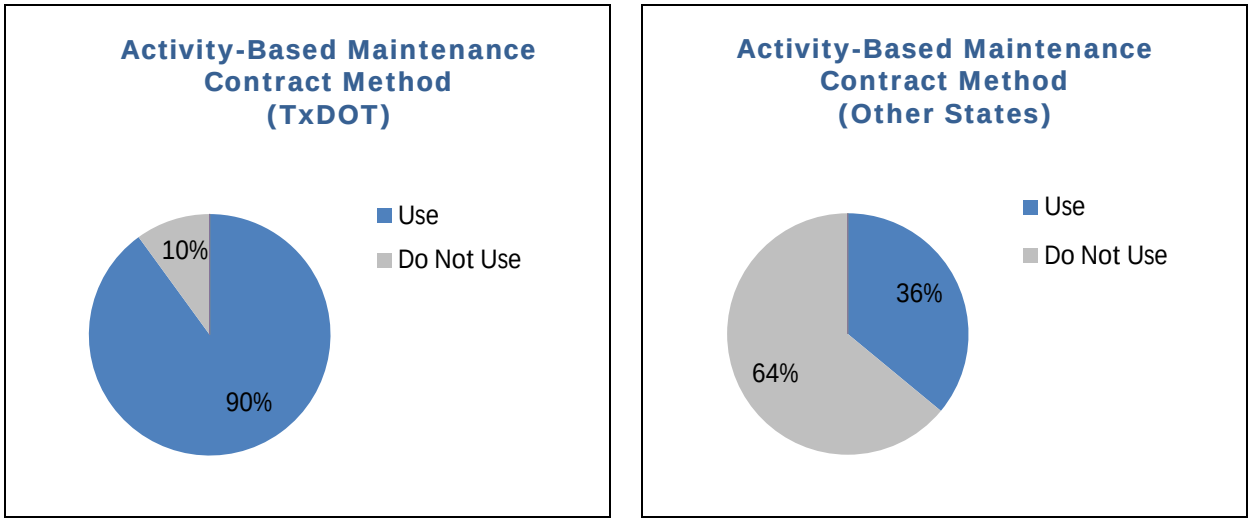


Figure 4.3: Chart showing percent the agencies use Activity-Based Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.3 Moderately Bundled Activities Contract Method

In the Moderately Bundled Activities Contract Method, a few main maintenance activities are let out together, where each activity is of a very different nature or a totally different type of work

Fourteen (14) agencies indicated that they have successfully performed maintenance activities by this delivery method. The districts of TxDOT and states that employ this delivery method are shown in Tables 4.5 and 4.6 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.6.

Table 4.5: TxDOT districts that use Moderately Bundled Activities Contract Method

Atlanta	Austin	Bryan	Houston
Lubbock	Paris	Pharr	San Antonio
Tyler	Yoakum		

Table 4.6: Other states that use Moderately Bundled Activities Contract Method

California (2)	Montana (1)	North Dakota (2)	Virginia (1)

Delivery Method: A total of fifteen (15) agencies (19% of the responses) stated that they are currently using this delivery method for maintenance outsourcing. Of the fifteen agencies, nine (9) are the district agencies within TxDOT and six (6) are the agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.4.

Type of Contract Specification: Of the nine TxDOT responses, eight (8) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method, two (2) agencies stated that performance-based contract specifications are employed, and one (1) agency responded that warranty contract specifications are used. It should be noted that three (3) agencies actually implement more than one type of specifications.

Of the six other states responses, four (4) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method, three (3) agencies stated that performance-based contract specifications are employed, and one (1) agency responded that warranty contract specifications are used. It should be noted that one (1) agency actually employs all three types of contract specifications.

Pricing Strategy: Of the nine TxDOT responses, eight (8) agencies implement unit price and two (2) agencies also use lump sum pricing. Of the six (6) other states responses, two (2) agencies only implement unit price, two (2) agencies only use lump sum, and two (2) agencies use both unit price and lump sum.

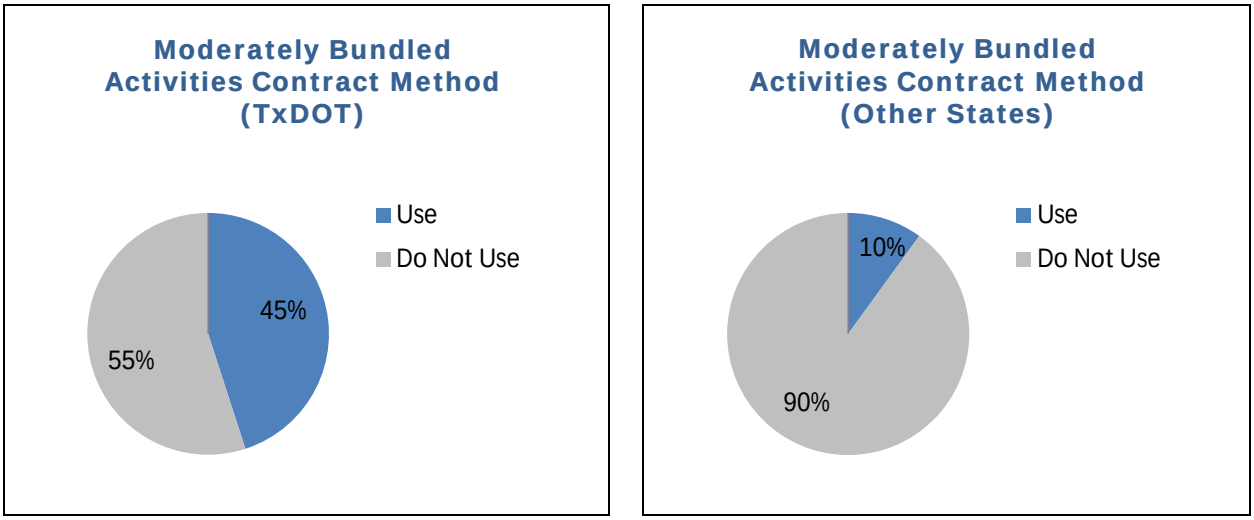


Figure 4.4: Chart showing percent the agencies use Moderately Bundled Activities Contract Method versus percent that do not use it for both TxDOT and other states

4.2.4 Significantly Bundled Activities Contract Method

In the Significantly Bundled Activities Contract Method, nearly all maintenance activities are let out together, other than a few activities that are special or unique. (Note: This model is similar to the Routine Maintenance Contract Method, which outsources all maintenance activities together.)

Seven (7) agencies indicated that they have successfully performed maintenance activities by this delivery method. One agency of TxDOT indicated that this delivery method was not performed successfully because this method was not cost effective when compared to performing the same work through a series of individual activity contracts and activity- based contracts. The districts of TxDOT and other states that employ this method are shown in Tables 4.7 and 4.8, respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.8.

Table 4.7: TxDOT districts that use Significantly Bundled Activities Contract Method

Austin	Houston

Table 4.8: Other states that use Significantly Bundled Activities Contract Method

California (2)	Montana (1)	North Carolina (1)	North Dakota (1)

Delivery Method: A total of seven (7) agencies (9% of the responses) stated that they are currently using this delivery method for maintenance outsourcing. Of the seven agencies, two (2) are the district agencies within TxDOT and five (5) are the agencies of other states. A chart showing the percent of agencies use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.5.

Type of Contract Specification: Of the two (2) TxDOT responses, both of them indicated that method-based contract specifications have been adopted for the implementation of this delivery method.

Of the five (5) other states responses, two (2) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method and three (3) agencies stated that performance-based contract specifications are employed.

Pricing Strategy: Of the two (2) TxDOT responses, one (1) agency only implements unit price and the other uses both unit price and lump sum. Of the five (5) other states responses, one (1) agency only implements lump sum, two (2) agencies only use unit price, one (1) uses both unit price and lump sum, and one (1) also uses cost plus fee in addition to the other two pricing strategies.

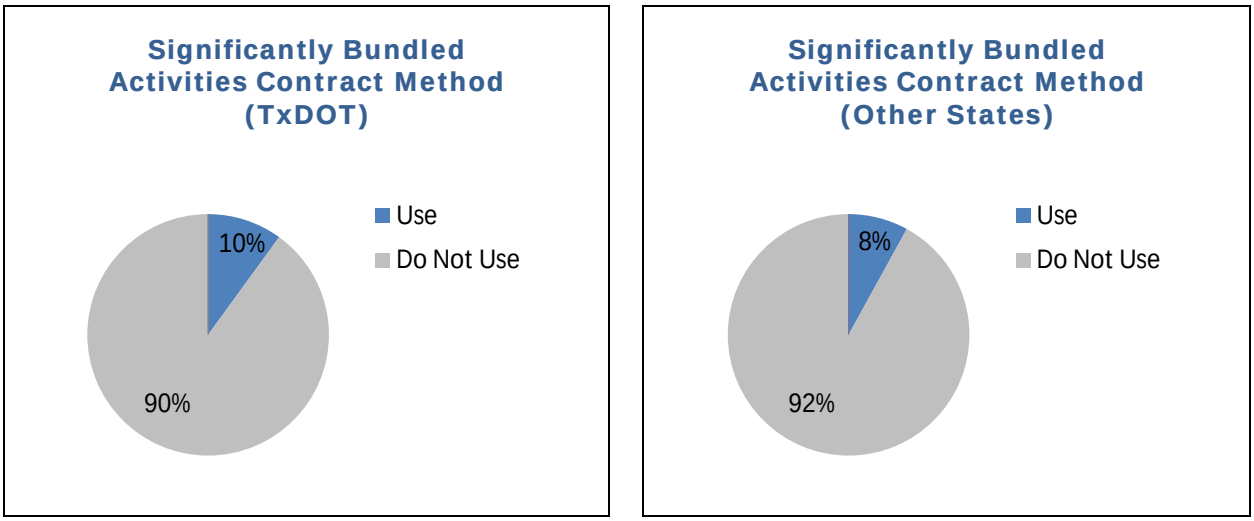


Figure 4.5: Chart showing percent the agencies use Significantly Bundled Activities Contract Method versus percent that do not use it for both TxDOT and other states

4.2.5 Partial Competitive Maintenance Contract Method

In the Partial Competitive Maintenance Contract Method, a certain percentage of the in-house workforce is retained to perform various routine maintenance activities, while the rest of the activities are bid out. In this model, in-house forces can competitively bid against contractors for the work.

Two (2) agencies indicated that they have successfully performed maintenance activities by this delivery method and one agency did not indicate. The districts of TxDOT and other states that employ this delivery method are shown in Tables 4.9 and 4.10 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.10.

Table 4.9: TxDOT districts that use Partial Competitive Maintenance Contract Method

Pharr

Table 4.10: Other states that use Partial Competitive Maintenance Contract Method

California (2)

Delivery Method: A total of three (3) agencies (4% of the responses) stated that they are currently using this delivery method for maintenance outsourcing. Of the three agencies, one (1) is a district agency within TxDOT and two (2) are agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.6.

Type of Contract Specification: The one district in TxDOT that indicated they are using this delivery method did not identify what type of contract specification they use for the implementation of this delivery method. Two agencies of other states indicated that performance-based specifications have been adopted for the implementation of this delivery method.

Pricing Strategy: The one district in TxDOT that indicated they are using this delivery method responded that unit price is used as the pricing strategy. As for the two agencies of other states, one indicated they use unit price as the pricing strategy, and the other indicated that lump sum is used.

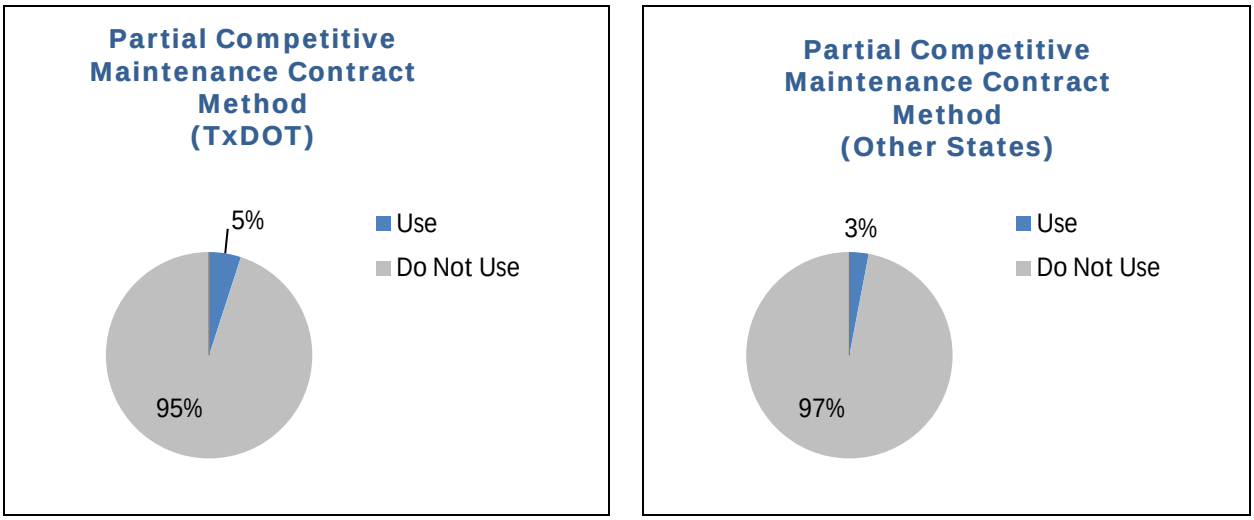


Figure 4.6: Chart showing percent the agencies use Partial Competitive Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.6 Jointly-Performed Maintenance Contract Method

In the Jointly-Performed Maintenance Contract Method, a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor.

Twenty-seven (27) agencies indicated that they have successfully performed maintenance activities by this contracting strategy. The districts of TxDOT and states that employ this contracting strategy are shown in Tables 4.11 and 4.12 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.12.

Table 4.11: TxDOT districts that use Jointly-Performed Maintenance Contract Method

Abilene	Austin	Houston	Laredo
Lufkin	Pharr	San Antonio	Tyler

Table 4.12: Other states that use Jointly-Performed Maintenance Contract Method

Alaska (1)	California (2)	Indiana (1)	Mississippi (1)
Missouri (1)	Montana (1)	North Carolina (1)	North Dakota (2)
Ohio (1)	Pennsylvania (1)	South Carolina (2)	Utah (1)
Vermont (3)	Virginia (1)	Wyoming (1)	

Delivery Method: Twenty-eight (28) agencies (35% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the twenty-eight agencies, eight (8) are district agencies within TxDOT and twenty (20) are agencies of other states. A chart showing the percent of the agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.7.

Type of Contract Specification: Of the eight TxDOT responses, five (5) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method. One (1) agency indicated that a performance-based contract specification is employed.

Of the 20 other states responses, twelve (12) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method, seven (7) agencies indicated performance-based contract specifications are employed, and one (1) stated that a warranty contract specification is used. In fact, two (2) agencies implement both method-based and performance-based specifications.

Pricing Strategy: Of the eight TxDOT responses, seven (7) agencies implement a unit price strategy, and two (2) agencies use lump sum. In fact, one (1) agency uses both unit price and lump sum as the pricing strategy. Of the 20 other states responses, eighteen (18) agencies implement unit price, four (4) use lump sum, and two (2) use a cost plus fee pricing strategy. Likewise, four agencies actually use more than one kind of pricing strategy, and one of the four agencies uses all three: lump sum, unit price and cost plus fee.

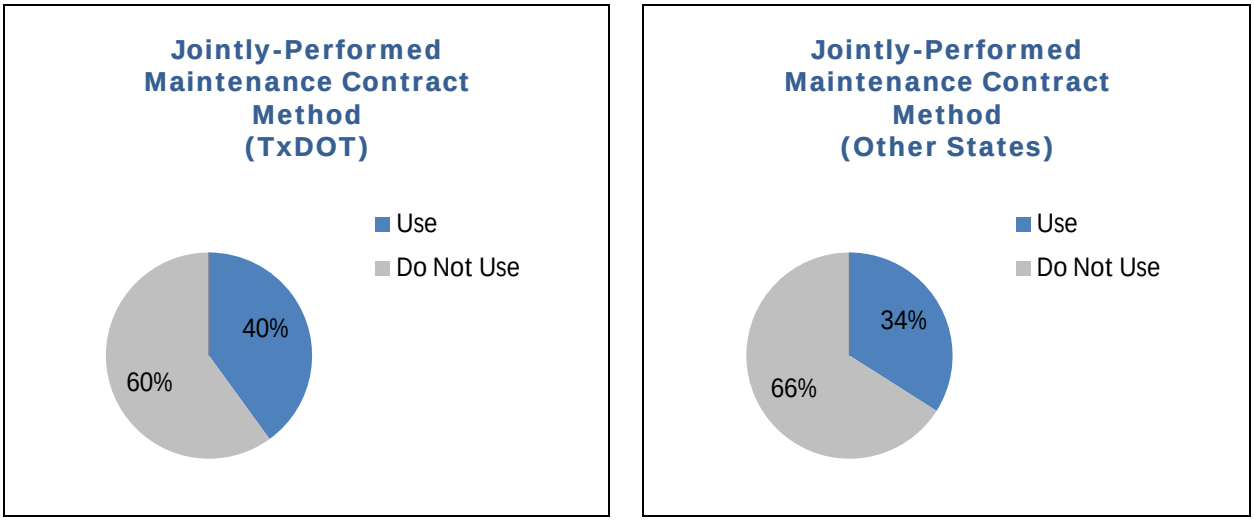


Figure 4.7: Chart showing percent the agencies use Jointly-Performed Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.7 Routine Maintenance Contract Method

In a Routine Maintenance Contract Method, all routine maintenance activities are outsourced together as one contract

Four (4) agencies of other states and one (1) agency of TxDOT indicate that they have successfully performed maintenance activities by this delivery method. The districts in TxDOT and other states that employ this delivery method are shown in Tables 4.13 and 4.14, respectively.

The number of districts that responded to the survey from each state is shown in parentheses in Table 4.14.

Table 4.13: TxDOT districts that use Routine Maintenance Contract Method

Austin	Fort Worth

Table 4.14: Other states that use Routine Maintenance Contract Method

California (1)	Idaho (1)	North Carolina (1)	Virginia (1)

Delivery Method: Six (6) agencies (8% of all the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the six agencies, two (2) are district agencies within TxDOT and four (4) are agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.8.

Type of Contract Specification: Of the two TxDOT responses, both agencies responded that method-based contract specifications have been adopted for the implementation of this method.

Of the four other states responses, three (3) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method, and two (2) agencies indicated performance-based contract specifications are employed. In fact, one agency implements both method-based and performance-based specifications.

Pricing Strategy: Of the two TxDOT responses, both agencies use a unit price strategy, and one (1) agency also uses lump sum. Of the four other states responses, two (2) agencies implement unit price, four (4) use lump sum, and one (1) uses a cost plus fee pricing strategy. Likewise, two agencies actually use more than one kind of pricing strategy, and one of the two agencies uses all three.

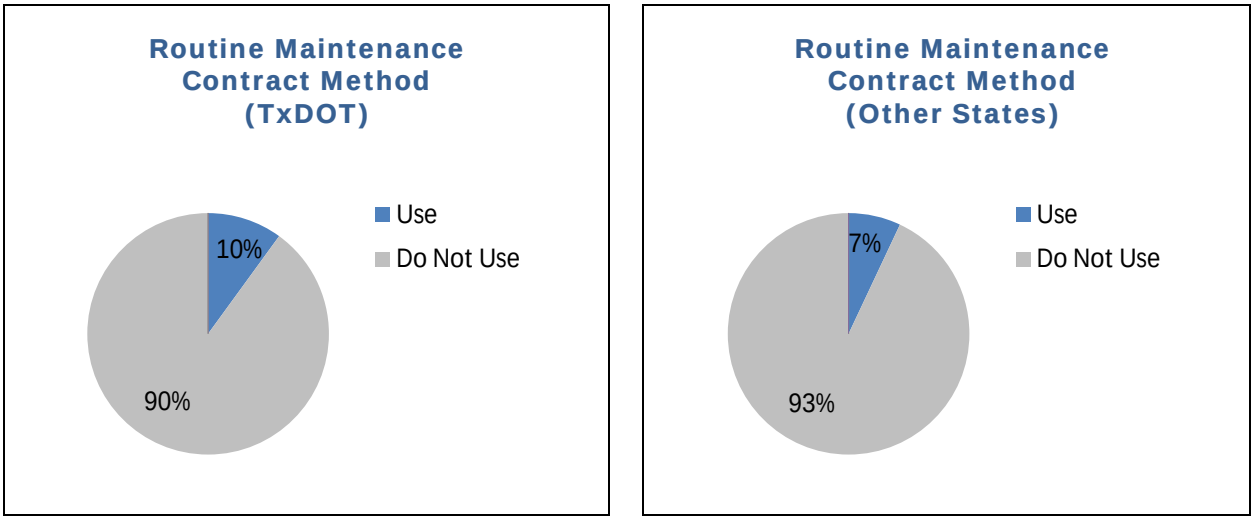


Figure 4.8: Chart showing percent the agencies use Routine Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.8 Kilometer (or Mile) per Month Contract Method

The Kilometer (or Mile) per Month Contract Method applies essentially to a sub-network of paved roads that is in good to fair condition and is further expected to remain substantially in that condition over the next few years through routine maintenance activities alone, without any major strengthening or rehabilitation. (Note: This methods is used widely in Latin America.)

One state indicated that they have successfully performed maintenance activities by this contracting strategy. The agency that employs this contracting strategy is shown in Tables 4.15. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.15.

Table 4.15: Other states that use Kilometer (or Mile) per Month Contract Model

California (1)

Delivery Method: One (1) agency of a state other than Texas (1% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. A chart showing the percent of the agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.9.

Type of Contract Specification: The one agency that reported using this method did not indicate what type of specification they are using for the implementation of this delivery method.

Pricing Strategy: The one agency that reported using this method responded that they use both unit price and lump sum as the pricing strategy.

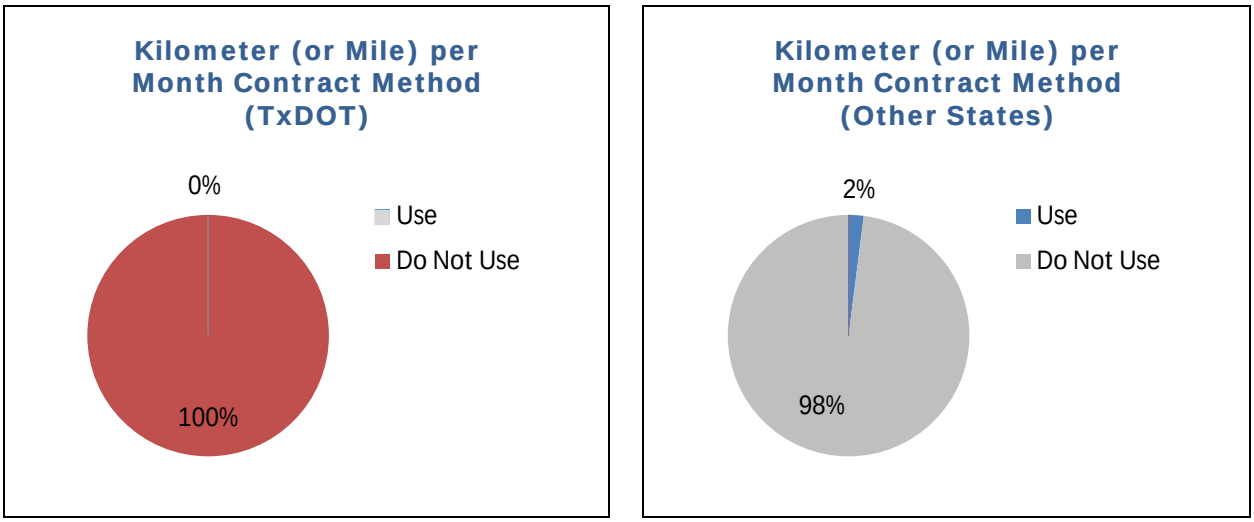


Figure 4.9: Chart showing percent the agencies use Kilometer (or Mile) per Month Contract Method versus percent that do not use it for both TxDOT and other states

4.2.9 Total Asset Management Contract Method

The Total Asset Management Contract Method is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management in January 2006). In the

context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset.

Three (3) agencies indicated that they have successfully performed maintenance activities using this delivery method. The districts in TxDOT and other states that employ this contracting strategy are shown in Tables 4.16 and 4.17, respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.17.

Table 4.16: TxDOT districts that use Total Asset Management Contract

Laredo

Table 4.17: Other states that use Total Asset Management Contract

Alaska (1)	Vermont (1)

Delivery Method: Three (3) agencies (4% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the three agencies, one (1) is a district agency within TxDOT and two (2) are agencies of other states. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.10.

Type of Contract Specification: Of the one TxDOT response, the agency responded that a performance-based contract specification has been adopted for the implementation of this delivery method.

Of the two other states responses, one (1) agency responded that both method-based and performance-based specifications have been adopted for the implementation of this delivery method. The other agency did not indicate what type of specification they are using.

Pricing Strategy: Of the one TxDOT response, the agency responded that they use a unit price strategy. Of the two other states responses, one (1) agency indicated that they implement both lump sum and unit price as the pricing strategy, and the other responded that they use lump sum.

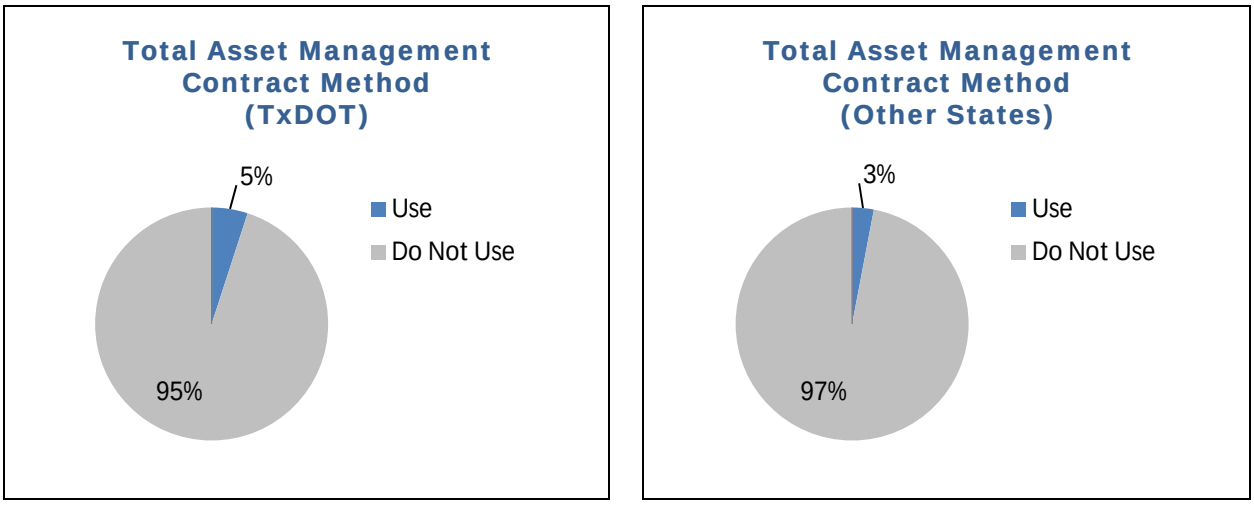


Figure 4.10: Chart showing percent the agencies use Total Asset Management Contract Method versus percent that do not use it for both TxDOT and other states

4.2.10 Integrated Maintenance Contract Method

An Integrated Maintenance Contract Method is a combination of both routine and preventive maintenance activities that are outsourced together as one contract.

Six (6) agencies indicated that they have successfully performed maintenance activities by this contracting strategy. The districts of TxDOT and states that employ this contracting strategy are shown in Tables 4.18 and 4.19 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.19.

Table 4.18: TxDOT districts that use Integrated Maintenance Contract Method

Austin	Waco

Table 4.19: Other states that use Integrated Maintenance Contract Method

California (2)	Kentucky (1)	Virginia (1)

Delivery Method: Six (6) agencies (8% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the six agencies, two (2) are district agencies within TxDOT and four (4) are agencies of other states. A chart showing the percent of the agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.11.

Type of Contract Specification: Of the two TxDOT responses, one (1) agency responded that method-based contract specifications have been adopted for the implementation of this delivery method. The other agency indicated that they use both method-based and performance-based contract specifications.

Of the four other states responses, three (3) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method, and two (2) agencies also indicated that performance-based specifications are employed. In fact, one agency implements both method-based and performance-based specifications.

Pricing Strategy: Of the two TxDOT responses, they both use unit price and lump sum as pricing strategy. Of the four other states responses, three (3) agencies implement unit price, three (3) use lump sum, and one (1) uses cost plus fee strategy. Likewise, two agencies actually use more than one kind of pricing strategy, and one of the two agencies uses all three.

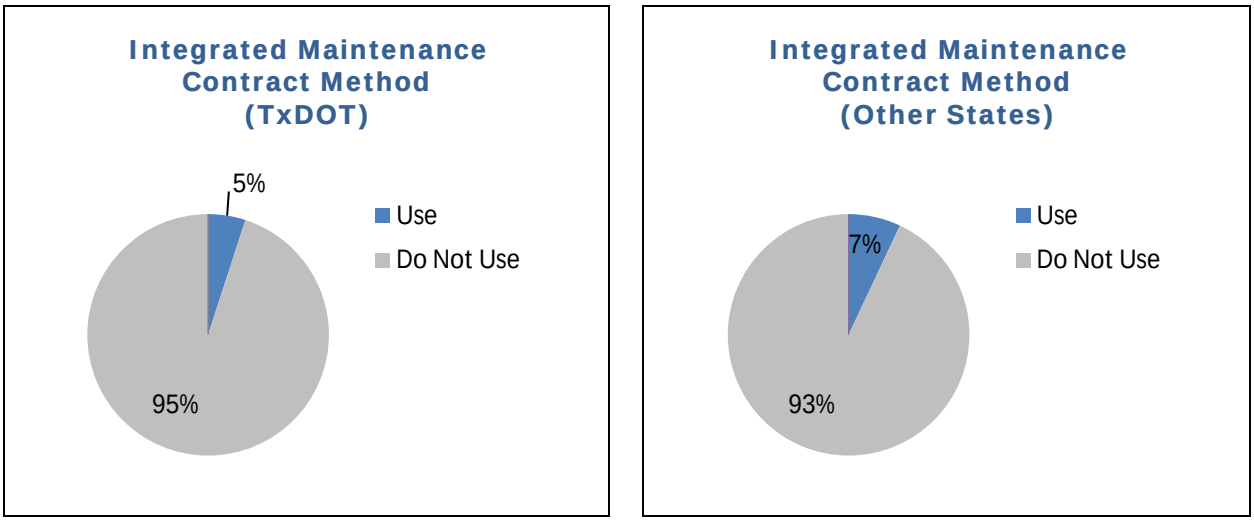


Figure 4.11: Chart showing percent the agencies use Integrated Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.11 CREMA Contract Method

A Combined Rehabilitation and Maintenance (CREMA) Contract requires contractors to rehabilitate and subsequently maintain a sub-network of roads under a lump sum contract for a total period of five years. This model originated in Argentina and is currently used widely in Latin America.

No agencies in the U.S. are currently using this delivery method.

4.2.12 Long-term Separate Maintenance Contract Method

In the Long-term Separate Maintenance Contract Method, a single maintenance activity is outsourced for a long duration, typically over five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years.

Twelve (12) agencies indicated that they have successfully performed maintenance activities using this delivery method. The districts in TxDOT and other states that employ this delivery method are shown in Tables 4.20 and 4.21 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.21.

Table 4.20: TxDOT districts that use Long-term Separate Maintenance Contract Model

San Antonio

Table 4.21: Other states that use Long-term Separate Maintenance Contract Model

Alaska (1)	Maine (1)	Montana (2)	Pennsylvania (1)
South Carolina (3)	Utah (1)	Virginia (1)	Wyoming (1)

Delivery Method: Twelve (12) agencies (15% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the twelve agencies, one (1) is a district agency within TxDOT and eleven (11) are agencies of other states. A chart showing

the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.12.

Type of Contract Specification: The district in TxDOT using this method indicated that a performance-based contract specification has been adopted for the implementation of this delivery method.

Of the eleven other states responses, five (5) agencies indicated that method-based contract specifications have been adopted for the implementation of this delivery method, eight (8) agencies indicated performance-based specifications are employed, and one (1) agency responded that a warranty contract specification is used. In fact, two agencies use more than one type of contract and one of the two agencies employs all three.

Pricing Strategy: The district in TxDOT using this method responded that they use lump sum as the pricing strategy. Of the eleven other states responses, two (2) agencies implement unit price and ten (10) use lump sum. In fact, one agency actually uses both unit price and lump sum as their pricing strategy.

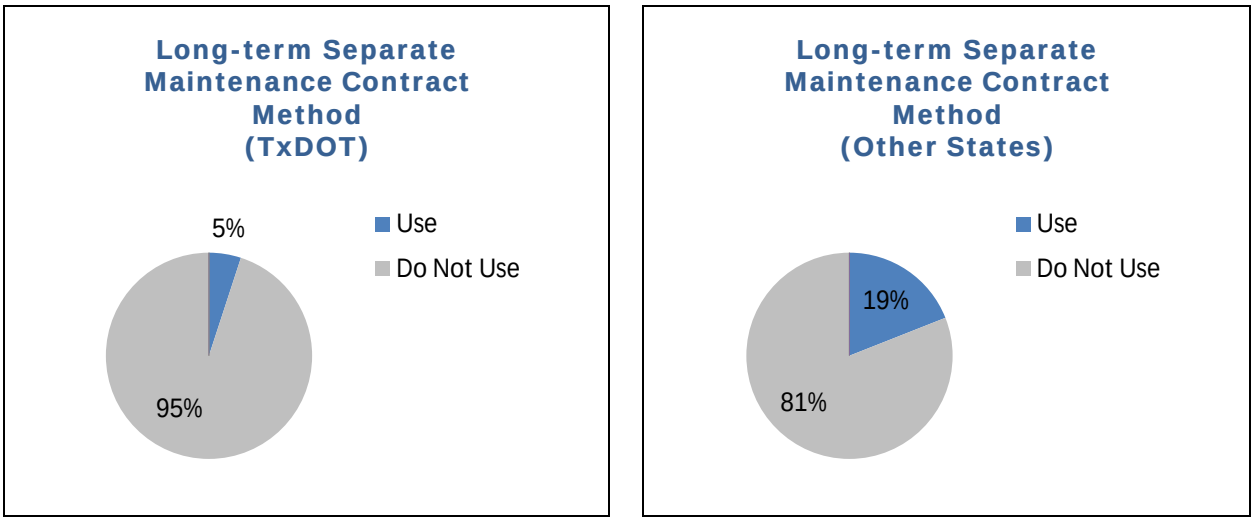


Figure 4.12: Chart showing percent the agencies use Long-term Separate Maintenance Contract Method versus percent that do not use it for both TxDOT and other states

4.2.13 Framework Contract Method

In the Framework Contract Method, several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects (often called Multi-Agency Contracts and used widely by the U.S. military).

Eight (8) agencies indicated that they have successfully performed maintenance activities by this delivery method. The districts in TxDOT and other states that employ this delivery method are shown in Tables 4.22 and 4.23 respectively. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.23.

Table 4.22: TxDOT districts that use Framework Contract Model

Houston

Table 4.23: Other states that use Framework Contract Model

Alaska (1)	California (1)	North Carolina (1)	North Dakota (1)
Pennsylvania (1)	South Carolina (1)	Vermont (1)	

Delivery Method: Eight (8) agencies (10% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. Of the eight agencies, one (1) is a district agency within TxDOT and seven (7) are agencies of other states. A chart showing the percent of the agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.13.

Type of Contract Specification: The district in TxDOT that is using this method responded that a method-based contract specification has been adopted for the implementation of this method.

Of the seven other states responses, five (5) agencies responded that method-based contract specifications have been adopted for the implementation of this delivery method and two (2) agencies indicated performance-based specifications are employed. In fact, one agency uses both method-based and performance-based specifications.

Pricing Strategy: The district in TxDOT that is using this method responded that they use unit price as the pricing strategy. Of the seven other states responses, seven (7) agencies indicated that they implement a unit price strategy.

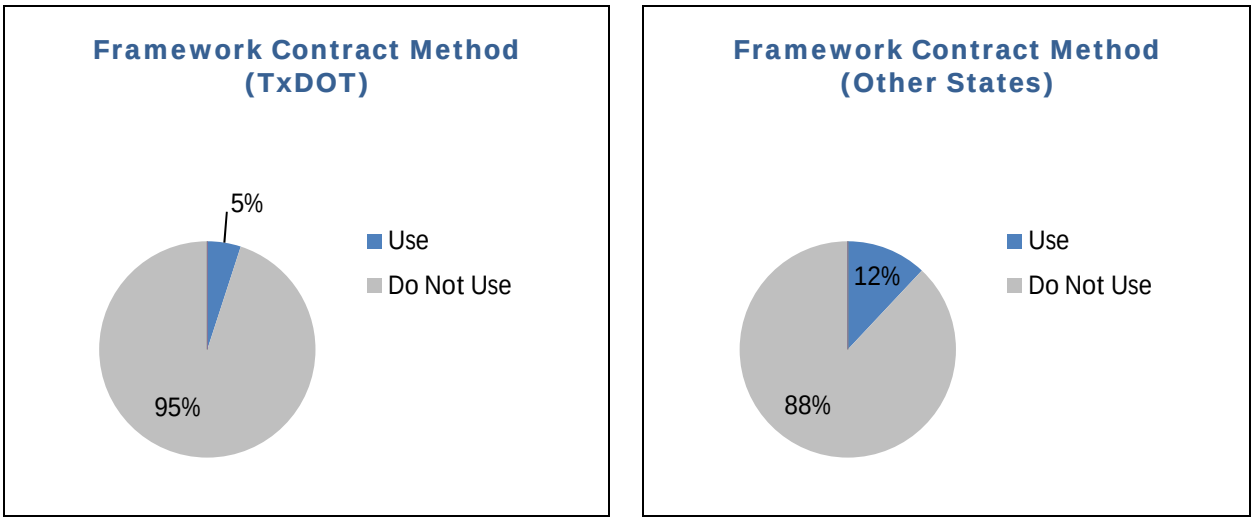


Figure 4.13: Chart showing percent the agencies use Framework Contract Method versus percent that do not use it for both TxDOT and other states

4.2.14 Alliance Contract Method

In the Alliance Contract Method, a contractor is selected based entirely on qualifications and has the opportunity to gain or lose 15% of the contract value depending on performance

Two (2) agencies stated that they have successfully performed maintenance activities by this contracting strategy. The agencies of other states that employ this contracting strategy are shown in Tables 4.24. The number of districts that responded to the survey from each state is shown in parentheses in Table 4.24.

Table 4.24: Other states that use Alliance Contract Model

California (1)	Pennsylvania (1)

Delivery Method: Two (2) agencies of other states (3% of the responses) indicated that they are currently using this delivery method for maintenance outsourcing. A chart showing the percent of agencies that use this method versus percent that do not use it for both TxDOT and other states is shown in Figure 4.14.

Type of Contract Specification: One of the two agencies that use this method indicated that a method-based contract specification is used for the implementation of this delivery method. The other agency stated that they use performance-based specifications.

Pricing Strategy: One of the two agencies that use this method indicated that they use cost plus fee as the pricing strategy and the other agency responded that they use all three strategies: unit price, lump sum and cost plus fee.

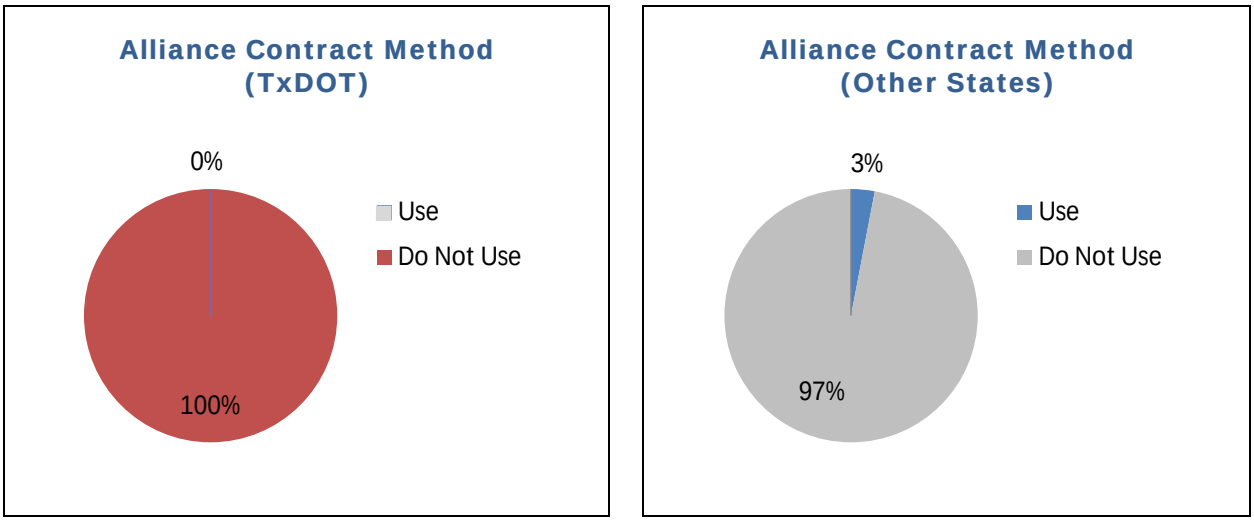


Figure 4.14: Chart showing percent the agencies use Alliance Contract Method versus percent that do not use it for both TxDOT and other states

4.3 Conclusions of the Survey

4.3.1 Maintenance Delivery Methods Used by TxDOT

- The delivery methods commonly used by TxDOT (used by more than 10% of all agencies within TxDOT who responded to the survey) include Individual Activity Contract Method, Activity-based Maintenance Contract Method, Moderately Bundled Activities Contract Method, Significantly Bundled Activities Contract Method, Routine Maintenance Contract Method, and Jointly-Performed Maintenance Contract Method.
- Of the fourteen contracting methods investigated, three are not used by TxDOT: Kilometer (or Mile) per Month Contract Method, CREMA Contract Method, and Alliance Contract Method.
- Method-based contract specifications are widely used by TxDOT for maintenance contracting as opposed to performance-based or warranty contract specifications.

- Unit price is more commonly used as the pricing strategy by TxDOT for maintenance contracting as opposed to lump sum or cost plus fee.
- Nearly all districts indicated that the delivery methods they use are performed successfully; one district indicated a Significantly Bundled Activities Contract was not performed successfully.

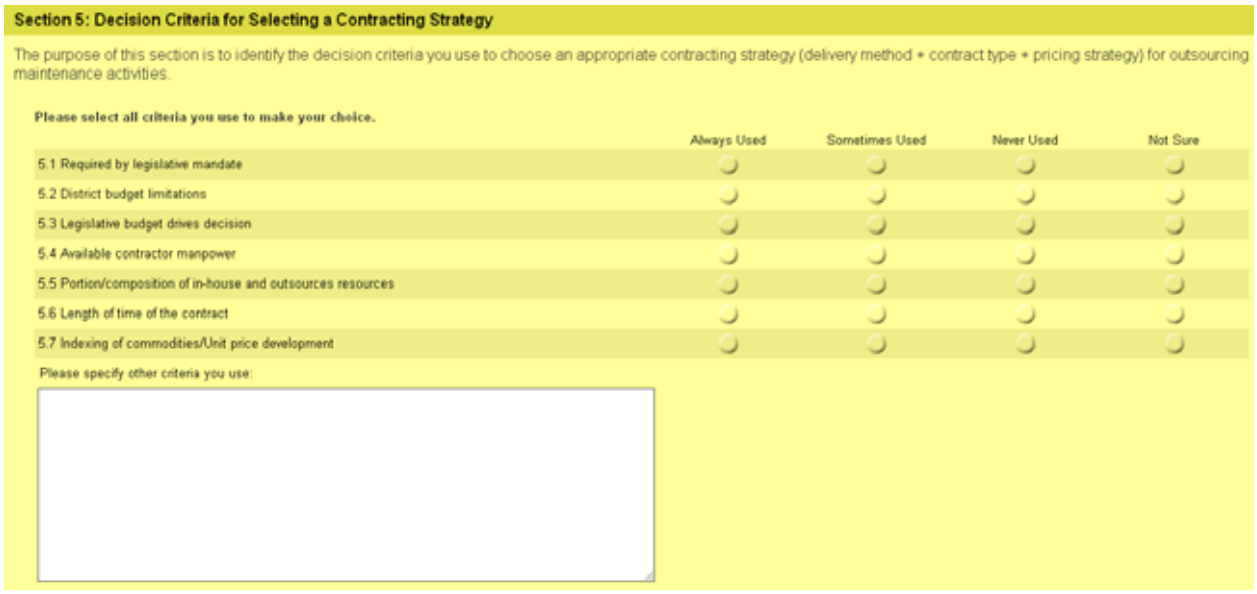
4.3.2 Maintenance Delivery Methods Used by Other States

- The delivery methods commonly used by other states (used by more than 10% of all the agencies of other states that responded to the survey) include Individual Activity Contract Method, Activity-based Maintenance Contract Method, Moderately Bundled Activities Contract Method, Long-term Separate Maintenance Contract Method, Routine Maintenance Contract Method, Jointly-Performed Maintenance Contract Method, and Framework Contract Method.
- Of the fourteen contracting methods investigated, only CREMA Contract Model is not used by any other state.
- Method-based and performance-based contract specifications are used equally by other states for maintenance contracting.
- Unit price and lump sum are used equally as a pricing strategy by other states for maintenance contracting.
- All of the agencies respond that the delivery methods they use are performed successfully.

Chapter 5. Survey of Maintenance Contracting Strategies Used in the United States (Phase 2): Criteria Used to Select a Method

5.1 Development and Implementation of the Questionnaire

In the course of selecting a maintenance contracting strategy, a set of criteria are needed to help maintenance directors make decisions at different stages of the contracting process. Initially, maintenance directors must make a decision about whether or not to outsource one or more specific maintenance activities. Once the decision to outsource has been made, maintenance directors must select appropriate contracting strategies for the maintenance activities. They also must decide which kind of specification should be used (method-based or performance-based specifications). Finally, bidding and contractor selection criteria must be established and included in the Request for Proposal to solicit proposals from prospective bidders. The researchers sought to identify the criteria used by maintenance personnel to make decisions at each stage of the contract strategy selection process. Hence, an on-line questionnaire was distributed to four TxDOT districts and four state highway agencies that had previously responded to a survey of delivery methods (presented in Chapter 4). An excerpt from the questionnaire is shown in Figure 5.1.



Section 5: Decision Criteria for Selecting a Contracting Strategy

The purpose of this section is to identify the decision criteria you use to choose an appropriate contracting strategy (delivery method + contract type + pricing strategy) for outsourcing maintenance activities.

Please select all criteria you use to make your choice.

	Always Used	Sometimes Used	Never Used	Not Sure
5.1 Required by legislative mandate	○	○	○	○
5.2 District budget limitations	○	○	○	○
5.3 Legislative budget drives decision	○	○	○	○
5.4 Available contractor manpower	○	○	○	○
5.5 Portion/composition of in-house and outsources resources	○	○	○	○
5.6 Length of time of the contract	○	○	○	○
5.7 Indexing of commodities/Unit price development	○	○	○	○

Please specify other criteria you use:

Figure 5.1: Excerpt from the on-line questionnaire for maintenance contracting strategies (Phase 2)

The questionnaire included eight sections. Section 1 collected basic information about survey's participants. Section 2 presented the definitions of Routine Pavement Maintenance and Preventive Pavement Maintenance for reference. Section 3 listed 33 major maintenance activities in order to investigate the scope and extent of maintenance outsourcing by each participant's organization. Participants are asked to give the respective percentages of work performed by their in-house staff and outsourced to contractors. Section 4 asked participants to identify the decision criteria their organization use to choose whether to perform maintenance activities in-

house or to outsource performance. Section 5 requested participants to identify the decision criteria their organization use to choose an appropriate contracting strategy for outsourcing maintenance activities. Section 6 asked participants to identify the decision criteria their organization use to select a method-based or performance-based approach for maintenance contracting. Section 7 requested participants to identify the criteria their organization use to select an appropriate contractor for method-based, performance-based and warranty contracting. Section 8 explored how different districts within different states bundle a variety of activities together into one contract by asking participants to complete an exercise. Section 4 to Section 7 covered all the criteria needed to make various decisions in the course of selecting a maintenance contracting strategy.

Overall, eight agencies responded to the questionnaire. The summary of the responses to the questionnaire identifies those decision criteria used to make a contracting decision and is categorized by different types of criteria.

5.2 Summary of the Criteria Used

5.2.1 Criteria for Selecting In-house or Outsourced Performance

The questionnaire included a list of 25 factors that might be used as decision criteria for selecting in-house or outsourced maintenance performance. Some factors may be frequently used as decision criteria; however, other factors may be used less frequently as criteria. The districts of TxDOT and the other states that use all or part of the factors as decision criteria are shown in Tables 5.1 and 5.2, respectively.

Table 5.1: Decision Criteria for Selecting In-house or Outsourcing (TxDOT Districts)

	TxDOT Districts			
Factors used as Criteria	**Bryan**	**Houston**	**Lufkin**	**Pharr**
1. Available budget	x	o	x	x
2. Available in-house workforce	x	o	x	o
3. Available contractors	o	x	o	o
4. Quality of contractors	o	o	o	x
5. Average Daily Traffic on the road	x	o	o	o
6. Political reasons or pressure	o	o		o
7. To increase the Level of Service	o	o	o	o
8. To address weather challenges	o	o		o
9. To achieve cost savings	o	o	x	x
10. Volume of work	x	o	o	o
11. Contract price (Dollar value)	x	o	o	x
12. Materials availability	x	o	o	o
13. Night work availability	o	o	o	o
14. Equipment availability	x	o	o	o
15. Available expertise	x	o	o	o
16. To achieve efficiency	x	o	o	o
17. To augment peak workloads	o	o	x	o
18. Legislative mandate	o	x	o	o
19. To encourage innovation		o	o	o
20. As a risk management strategy		o	o	o
21. Speed up project delivery	o	o	o	x
22. To increase responsiveness	o	o	o	x
23. To accomplish emergency work	o	o	o	x
24. Uniqueness of the work	o	o	o	o
25. Ability to develop a contracting industry		o	o	o

"x" denotes the district *always* uses the factor as decision criteria.
"o" denotes the district *sometimes* uses the factor as decision criteria.
Blank denotes the district *does not* use the factor as decision criteria.

Table 5.2: Decision Criteria for Selecting In-house or Outsourcing (Other States)

Factors used as Criteria	Other States			
	Montana	North Carolina	Pennsyl-vania	Washington
1. Available budget	x	x	x	x
2. Available in-house workforce	x	x	x	x
3. Available contractors	x	x	o	
4. Quality of contractors	x	x	x	
5. Average Daily Traffic on the road	o	o	x	
6. Political reasons or pressure	o	o	o	
7. To increase the Level of Service	x	o	o	
8. To address weather challenges	o		o	
9. To achieve cost savings	x	x	o	o
10. Volume of work	x	o	x	o
11. Contract price (Dollar value)	o	x	x	o
12. Materials availability	x	o	x	o
13. Night work availability	o	o	o	o
14. Equipment availability	x	o	x	o
15. Available expertise	x	x	o	o
16. To achieve efficiency	x	o	o	o
17. To augment peak workloads	x	o	o	
18. Legislative mandate	o	x	o	
19. To encourage innovation	x		o	
20. As a risk management strategy	x		o	
21. Speed up project delivery	x	o	x	
22. To increase responsiveness	x	o	o	
23. To accomplish emergency work	x		o	o
24. Uniqueness of the work	x	x	o	o
25. Ability to develop a contracting industry	o		o	

"x" denotes the state *always* uses the factor as decision criteria.
"o" denotes the state *sometimes* uses the factor as decision criteria.
Blank denotes the district *does not* use the factor as decision criteria.

Through basic data analysis, the criteria that were used by the eight agencies most frequently ("Always Used"), less frequently ("Sometimes Used"), and never ("Not Used") in making decisions about maintenance outsourcing have been identified. Table 5.3, 5.4, and 5.5 provide the details of each decision criterion and its degree of usage (percentage) for the three categories: Always Used, Sometime Used, and Not Used. The number shown in parentheses in Table 5.3, 5.4 and 5.5 denotes the number of agencies that used each criterion most frequently, less frequently and never.

Table 5.3: The Ranking of the Criteria That Are Always Used for Selecting In-house or Outsourcing

Decision Criteria	Always Used	Decision Criteria	Always Used
Available budget	87.5% (7)	To augment peak workloads	25.0% (2)
Available in-house workforce	75.0% (6)	Legislative mandate	25.0% (2)
Quality of contractors	50.0% (4)	To increase responsiveness	25.0% (2)
To achieve cost savings	50.0% (4)	To accomplish emergency work	25.0% (2)
Contract price (Dollar value)	50.0% (4)	Uniqueness of the work	25.0% (2)
Available contractors	37.5% (3)	To increase the Level of Service	12.5% (1)
Volume of work	37.5% (3)	To encourage innovation	12.5% (1)
Materials availability	37.5% (3)	As a risk management strategy	12.5% (1)
Equipment availability	37.5% (3)	Political reasons or pressure	0.0% (0)
Available expertise	37.5% (3)	To address weather challenges	0.0% (0)
Speed up project delivery	37.5% (3)	Night work availability	0.0% (0)
Average Daily Traffic on the road	25.0% (2)	Ability to develop a contracting industry	0.0% (0)
To achieve efficiency	25.0% (2)		

Table 5.4: The Ranking of the Criteria That Are Sometimes Used for Selecting In-house or Outsourcing

Decision Criteria	Sometimes Used	Decision Criteria	Sometimes Used
Night work availability	100.0% (8)	To accomplish emergency work	62.5% (5)
To achieve efficiency	75.0% (6)	To address weather challenges	62.5% (5)
Uniqueness of the work	75.0% (6)	Ability to develop a contracting industry	62.5% (5)
To increase the Level of Service	75.0% (6)	To achieve cost savings	50.0% (4)
Political reasons or pressure	75.0% (6)	Contract price (Dollar value)	50.0% (4)
Volume of work	62.5% (5)	Available contractors	50.0% (4)
Materials availability	62.5% (5)	Speed up project delivery	50.0% (4)
Equipment availability	62.5% (5)	To encourage innovation	50.0% (4)
Available expertise	62.5% (5)	As a risk management strategy	50.0% (4)
Average Daily Traffic on the road	62.5% (5)	Quality of contractors	37.5% (3)
To augment peak workloads	62.5% (5)	Available in-house workforce	25.0% (2)
Legislative mandate	62.5% (5)	Available budget	12.5% (1)
To increase responsiveness	62.5% (5)		

Table 5.5: The Ranking of the Criteria That Are Not Used for Selecting In-house or Outsourcing

Decision Criteria	Not Used	Decision Criteria	Not Used
To address weather challenges	37.5% (3)	Volume of work	0.0% (0)
Political reasons or pressure	25.0% (2)	Contract price (Dollar value)	0.0% (0)
To encourage innovation	25.0% (2)	Materials availability	0.0% (0)
As a risk management strategy	25.0% (2)	Night work availability	0.0% (0)
Ability to develop a contracting industry	25.0% (2)	Equipment availability	0.0% (0)
Available contractors	12.5% (1)	Available expertise	0.0% (0)
Quality of contractors	12.5% (1)	To achieve efficiency	0.0% (0)
Average Daily Traffic on the road	12.5% (1)	To augment peak workloads	0.0% (0)
To increase the Level of Service	12.5% (1)	Legislative mandate	0.0% (0)
To accomplish emergency work	12.5% (1)	Speed up project delivery	0.0% (0)
Available budget	0.0% (0)	To increase responsiveness	0.0% (0)
Available in-house workforce	0.0% (0)	Uniqueness of the work	0.0% (0)
To achieve cost savings	0.0% (0)		

5.2.2 Decision Criteria for Selecting a Contracting Strategy

The questionnaire included a list of seven factors that might be used as decision criteria for selecting an appropriate contracting strategy for outsourced activities. Some factors may be frequently used as decision criteria; however, other factors may be used less frequently as criteria. The districts of TxDOT and the other states that use all or part of the factors as decision criteria are shown in Tables 5.6 and 5.7, respectively.

Table 5.6: Decision Criteria for Selecting a Contracting Strategy (TxDOT Districts)

	TxDOT Districts			
Factors used as Criteria	**Bryan**	**Houston**	**Lufkin**	**Pharr**
1. Required by legislative mandate		x		o
2. District budget limitations	o	o	o	x
3. Legislative budget drives decision	x	o		o
4. Available contractor manpower	o	o	o	o
5. Portion/composition of in-house and outsources resources	o	o	o	o
6. Length of time of the contract	o	o	o	o
7. Indexing of commodities/Unit price development		o		o

"x" denotes the district *always* uses the factor as decision criteria.
"o" denotes the district *sometimes* uses the factor as decision criteria.
Blank denotes the district *does not* use the factor as decision criteria

Table 5.7: Decision Criteria for Selecting a Contracting Strategy (Other States)

	Other States			
Factors used as Criteria	**Montana**	**North Carolina**	**Pennsylvania**	**Washington**
1. Required by legislative mandate	x	x	o	
2. District budget limitations	x		o	o
3. Legislative budget drives decision	x	o		o
4. Available contractor manpower	o		o	
5. Portion/composition of in-house and outsources resources	x		o	
6. Length of time of the contract	x		x	o
7. Indexing of commodities/Unit price development	x	o	x	o

"x" denotes the state *always* uses the factor as decision criteria.
"o" denotes the state *sometimes* uses the factor as decision criteria.
Blank denotes the district *does not* use the factor as decision criteria

Through basic data analysis, the criteria that were used by the eight agencies most frequently ("Always Used"), less frequently ("Sometimes Used"), and never ("Not Used") in making decisions about maintenance outsourcing have been identified. Table 5.8, 5.9, and 5.10

provide the details of each decision criterion and its degree of usage (percentage) for three categories: Always Used, Sometime Used and Not Used. The number shown in parentheses in Table 5.8, 5.9 and 5.10 denotes the number of agencies that used each criterion most frequently, less frequently and never.

Table 5.8: The Ranking of the Criteria That Are Always Used for Selecting a Contracting Strategy

Decision Criteria	Always Used
Required by legislative mandate	37.5% (3)
District budget limitations	25.0% (2)
Legislative budget drives decision	25.0% (2)
Length of time of the contract	25.0% (2)
Indexing of commodities/Unit price development	25.0% (2)
Portion/composition of in-house and outsources resources	12.5% (1)
Available contractor manpower	0.0% (0)

Table 5.9: The Ranking of the Criteria That Are Sometimes Used for Selecting a Contracting Strategy

Decision Criteria	Sometimes Used
Available contractor manpower	75.0% (6)
District budget limitations	62.5% (5)
Portion/composition of in-house and outsources resources	62.5% (5)
Length of time of the contract	62.5% (5)
Legislative budget drives decision	50.0% (4)
Indexing of commodities/Unit price development	50.0% (4)
Required by legislative mandate	25.0% (2)

Table 5.10: The Ranking of the Criteria That Are Not Used for Selecting a Contracting Strategy

Decision Criteria	Not Used
Required by legislative mandate	37.5% (3)
Legislative budget drives decision	25.0% (2)
Portion/composition of in-house and outsources resources	25.0% (2)
Available contractor manpower	25% (2)
Indexing of commodities/Unit price development	25% (2)
District budget limitations	12.5% (1)
Length of time of the contract	12.5% (1)

5.2.3 Decision Criteria for Selecting Method-based Specification vs. Performance-based Specification

The questionnaire included a list of five factors that might be used as decision criteria for selecting method-based specification or performance-based specification for the implementation of maintenance contracts. The districts of TxDOT and the other states that use all or part of the factors as decision criteria for selecting types of contract specification are shown in Tables 5.11 and 5.12, respectively.

Table 5.11: Criteria for Selecting Types of Contract Specification (TxDOT Districts)

	TxDOT Districts			
Factors used as Criteria	**Bryan***	**Houston**	**Lufkin**	**Pharr**
1. Level of trust in contractors		x	x	x
2. Level of control desired		x	x	x
3. Political reasons and pressure		x	x	
4. Quality of contractors		x	x	x
5. Participation of contractors in bid process		x	x	x

"x" denotes the district uses the factor as decision criteria.
Blank denotes the district *does not* use the factor as decision criteria.
* Bryan District indicated that they use method-based specification only.

Table 5.12: Criteria for Selecting Types of Contract Specification (Other States)

Factors used as Criteria	Other States			
	Montana	North Carolina	Pennsylvania	Washington
1. Level of trust in contractors			x	
2. Level of control desired	x	x	x	x
3. Political reasons and pressure		x	x	
4. Quality of contractors	x	x	x	
5. Participation of contractors in bid process	x	x	x	x
"x" denotes the state uses the factor as decision criteria. Blank denotes the district *does not* use the factor as decision criteria.				

Through basic data analysis, the criteria that were often used by the eight agencies for selecting a type of contract specification have been identified. Table 5.13 gives the priority of the decision criteria on the basis of the degree of usage (percentage). The number shown in parentheses in Table 5.13 denotes the number of agencies that used or did not use each criterion.

Table 5.13: The Ranking of the Criteria That Are Used for Selecting Types of Contract Specification

Decision Criteria	Used	Not Used
Level of control desired	87.5% (7)	12.5% (1)
Participation of contractors in bid process	87.5% (7)	12.5% (1)
Quality of contractors	75.0% (6)	25.0% (2)
Level of trust in contractors	50.0% (4)	50.0% (4)
Political reasons and pressure	50.0% (4)	50.0% (4)

5.2.4 Decision Criteria for Bidding and Contractor Selection

Lowest price and best value are common methods for bidding out and selecting a successful bidder / contractor. The questionnaire attempted to identify the methods that are used by highway agencies to select an appropriate bidder under three types of contract specifications: method-based, performance-based and warranty. It also attempted to identify additional criteria to be used other than price when the method of "Best Value" is employed. The districts of TxDOT and the other states that use lowest price or best value to select a successful bidder / contractor are shown in Tables 5.14 and 5.15, respectively.

Table 5.14: Contractor Selection Methods (TxDOT Districts)

	TxDOT Districts			
Types of Contract Specification	**Bryan**	**Houston**	**Lufkin**	**Pharr**
1. Method-based	x	x	x	o
2. Performance-based		x	x	
3. Warranty	x	x	x	

"x" denotes the district uses *Lowest Price* to select contractors.
"o" denotes the district uses *Best Value* to select contractors.
Blank denotes the district *does not* indicate the method it uses to select contractors.
Pharr District indicated that they do not use performance-based and warranty contract currently.
Bryan District indicated that they do not use performance-based contract currently.

Table 5.15: Contractor Selection Methods (Other States)

	Other States			
Types of Contract Specification	**Montana**	**North Carolina**	**Pennsylvania**	**Washington**
1. Method-based	x	x	x, o	x
2. Performance-based	x	o	x, o	x
3. Warranty	x		o	x

"x" denotes the state uses *Lowest Price* to select contractors.
"o" denotes the state uses *Best Value* to select contractors.
Blank denotes the state *does not* indicate the method it uses to select contractors.
Pharr District indicated that they do not use performance-based and warranty contract currently.
Bryan District indicated that they do not use performance-based contract currently.

Through basic data analysis, the method that was often used by the eight agencies for bidding out and selecting a successful bidder / contractor has been identified. Table 5.16 gives the percentage of lowest price and best value that are used respectively under three different types of contract specification. The number shown in parentheses in Table 5.16 denotes the number of agencies that used each method.

Table 5.16: Methods Used for Bidding and Contractor Selection

	Methods for Bidding and Contractor Selection	
Types of Contract Specification	**Lowest Price**	**Best Value**
1. Method-based*	87.5% (7)	25.0% (2)
2. Performance-based*	62.5% (5)	25.0% (2)
3. Warranty	62.5% (5)	12.5% (1)
*Pennsylvania indicated that they used both Lowest Price and Best Value to select contractors under both of method-based and performance-based types of contract specification.		

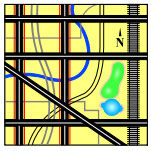
Pennsylvania and North Carolina DOTs provided the criteria and the respective percentage for each criteria used for a "Best Value" selection with respect to different types of contract specifications. Table 5.17 gives the details of each criteria and percentage.

Table 5.17: Criteria and Percentage for Best Value

Best Value (Pennsylvania)		
Method-based	Price	90%
	In-house Capability	10%
Performance-based	Price	95%
	Geographic Limitations	5%
Warranty	Price	85%
	Warranty Items	10%
	Past Performance of Vendor	5%
Best Value (North Carolina)		
Performance-based	Price	0%
	Management	20%
	Responsiveness to RFP	40%
	Safety Plan and Timeliness Tracking	35%
	Oral Interview	5%

Chapter 6. Framework for Selecting Appropriate Contracting Strategies

6.1 Introduction to the Maintenance Contracting Strategy Selection Framework



As discussed in Chapter 3, a few studies from the late 1980s and early 1990s outlined the decision criteria that should be used for selecting maintenance activities that should be outsourced. Nonetheless, because these studies were more than 10 years old, an update of the decision criteria was included in the current research. By using these criteria, a state highway agency (SHA) can select the maintenance activities that should be outsourced. However, once the outsourced activities are selected, the SHA should use a separate set of decision criteria to select a delivery method, type of specification, and pricing strategy (i.e., contract strategy) for outsourcing a single maintenance activity, bundles of activities, or all maintenance activities. The decision criteria for selecting an appropriate contracting strategy for outsourcing of maintenance activities have not been assembled so far. Therefore, in this study, the researchers developed a decision aid that personnel can use to select an appropriate maintenance contracting strategy, including the delivery method, type of specification (i.e., method-based or performance-based), and pricing strategy (i.e., fixed price, unit price, or cost plus).

The decision aid begins with the ***Maintenance Contracting Strategy Selection Framework***, shown in Figure 6.1. The researchers identified decision criteria necessary for selecting appropriate contracting strategies from among the many options available worldwide. As mentioned in Chapter 3, the researchers also eliminated the *Activity-based Maintenance Contract Method* from the original 14 delivery methods because it overlapped with two other delivery methods.

The *Maintenance Contracting Strategy Selection Framework* (Fig. 6.1) has been developed to assist maintenance contracting decision-makers in selecting appropriate contracting strategies for a variety of maintenance activities. Eight decision nodes have been identified, and appropriate criteria for making a decision are identified in the sections below. The decision tree begins with an agency first deciding how many activities they would like to outsource (e.g., nearly all or less than all) followed by which activities will be retained for in-house performance and which will be outsourced. Subsequently, the agency must select an appropriate maintenance delivery method, specification type, and pricing strategy that are appropriate for their maintenance outsourcing goals and circumstances. Chapter 8 presents advice on the selection and implementation of a delivery method, specification type, and pricing strategy.

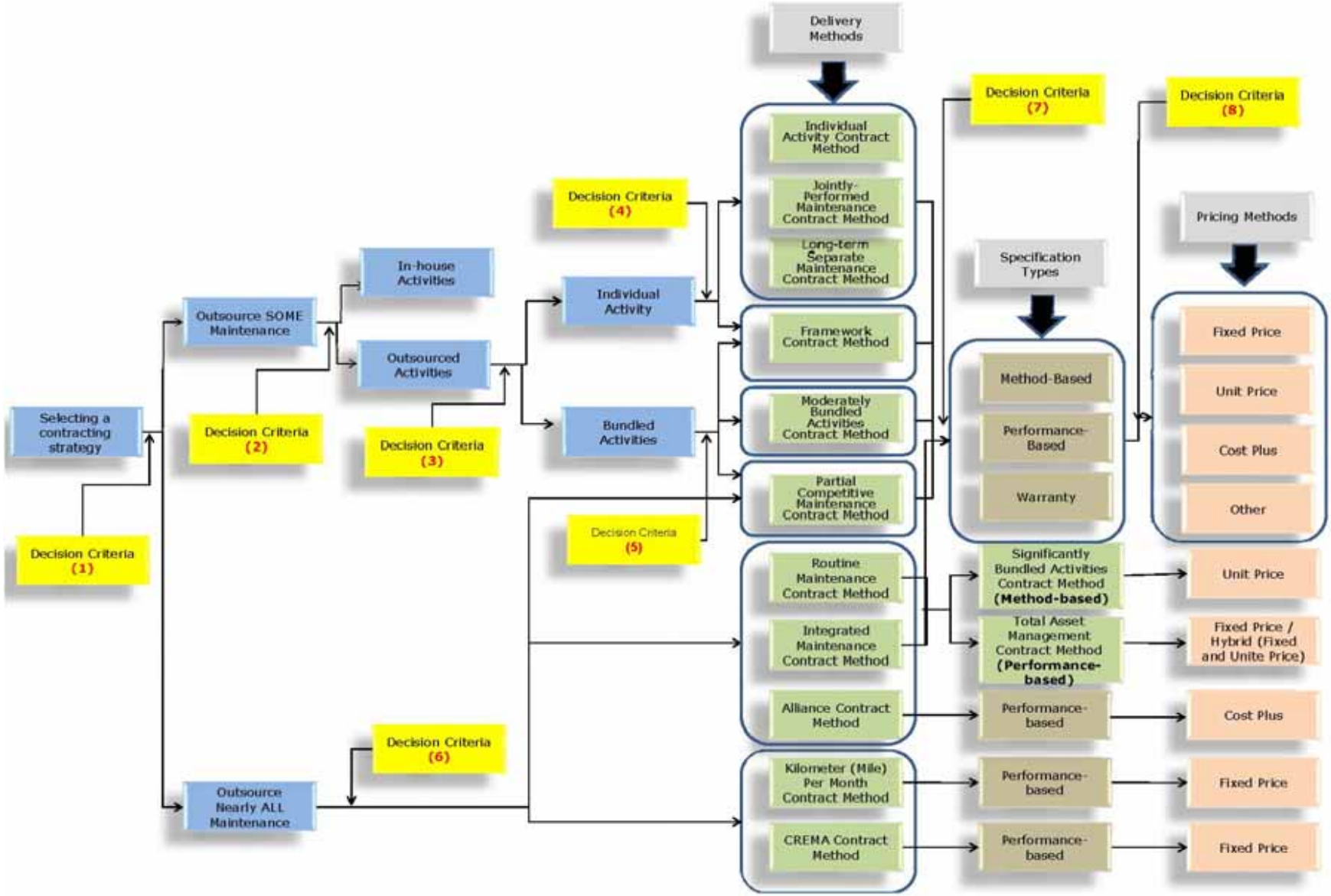


Figure 6.1: Maintenance Contracting Strategy Selection Framework

6.2 Maintenance Contracting Strategy Selection Framework Decision Criteria

The *Maintenance Contracting Strategy Selection Framework* and its associated decision criteria are presented in the paragraphs below.

6.2.1 Decision Criterion 1: Select the Number of Activities to Outsource

As illustrated in Figure 6.1, the *Maintenance Contracting Strategy Selection Framework* is a hierarchical structure. An SHA, which uses the framework to select contracting strategies for various types of maintenance activities, should first determine how many activities it intends to outsource under a contract. The contractor can decide to outsource *nearly all* maintenance activities or it can decide to select a smaller subset of activities. Through interviews with TxDOT maintenance districts and five state DOT maintenance directors, several criteria were identified that were used frequently to determine whether *nearly all* maintenance activities should be outsourced. These criteria include the following:

- A legislative mandate required all maintenance activities to be outsourced
- There was political pressure to outsource nearly all maintenance activities
- To reduce administrative time and cost, all or nearly all maintenance activities were outsourced together
- The DOT was required to reduce in-house the size of the in-house workforce; to accomplish this task, all or nearly all maintenance activities were outsourced

In the absence of one of these criteria, the SHA may elect to outsource only a portion of the maintenance activities while retaining several activities for performance by in-house personnel.

6.2.2 Decision Criterion 2: Select Which Activities to Outsource

There are many factors that SHAs consider when deciding *whether* to outsource one or more activities and *which* activities specifically to outsource or retain for in-house performance. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following factors were often considered (or the following reasons were often given) for deciding whether and which maintenance activities to outsource:

• Size of the maintenance budget	• Availability of proper equipment
• Availability of in-house workforce	• Availability of in-house expertise
• Availability of contractor expertise	• Need to improve maintenance efficiency
• Quality / experience of contractors	• Need to augment peak workloads
• Average daily traffic on the road	• Required by legislative mandate
• Political reasons or pressure	• Need to encourage innovation
• Need to increase Level of Service	• Overall risk management strategy
• Need to address weather challenges	• Need to speed up maintenance delivery
• Need to achieve a cost savings	• Need to increase responsiveness
• Need to accommodate work load	• Need to accomplish emergency work
• Large/small contract value is	• Uniqueness or specialty of the work

Some criteria might specifically compel an activity to be outsourced. For example, lack of equipment or expertise were criteria that would compel an agency to outsource an activity because the agency did not have the proper resources to perform the activity using their own in-house resources. Recognizing that conditions often vary among agencies in terms of location, in-house and external resources, experience, and maintenance needs, agencies should base their decision about whether and what to outsource on the unique characteristics of the agency.

6.2.3 Decision Criterion 3: Select Which Activities Get Let Individually or Bundled

Once the SHA has selected one or more maintenance activities to outsource, the next step is to select which activities to individually let and which to bundle together. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following factors were often considered when deciding how to combine activities when preparing a bid package:

• Level of control over the work that is desired and would be achieved
• Efficiency that would be achieved by bundling activities together
• Reduction in coordination effort that would be needed
• Reduction in administrative load that would be achieved
• Available equipment composition
• How similar the bundled activities are and the logic of grouping them
• Whether multiple subcontractors will be needed to complete all of the work
• Time-sensitivity of the bundled work (such as sign repair)
• Contractor’s experience at performing the bundled activities
• Cost effectiveness that might be achieved from individual or bundled activities
• Volume of work that would result from individual or bundled activities

6.2.4 Decision Criterion 4: Select a Delivery Method for an Individual Activity

The following criteria are typically considered when selecting a maintenance contracting delivery method. Maintenance goals and circumstances often influenced decisions; hence, the list below is generic and does not reflect the specific context in which a decision might be made (such as which activities are being outsourced or which maintenance goal must be achieved

through outsourcing). For a single activity that will be let individually, TxDOT maintenance districts and five state DOT maintenance directors indicated that the following criteria were often considered when selecting a delivery method for individual activities:

- Insufficient Equipment is available for performing the work
- The DOT needs flexibility in when and how to complete the work
- The duration of the work may be very short or very long
- The activity is special, unique, or risky
- There is a need to reduce the amount of time for bidding and awarding projects
- There is a need to select contractors quickly for urgent projects
- There is a need to reduce the overall administrative time, costs, and overhead

6.2.5 Decision Criterion 5: Select a Delivery Method for Bundled Activities

Once the activities to get bundled are selected, the SHA must select a delivery method for outsourcing of the bundled activities. As mentioned under Decision Criterion 4, the criteria listed below are generic and do not reflect the specific context in which a decision might be made. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following criteria were often considered when selecting a delivery method for moderately-bundled activities:

- There is a need to reduce the amount of time for bidding and awarding projects
- There is a need to select contractors quickly for urgent projects
- There is a need to reduce the overall administrative time, costs, and overhead
- There is a need to increase the level of competition
- There is a need to ensure that there is an equal opportunity for in-house employees to get work

6.2.6 Decision Criteria 6: Select a Delivery Method for *Nearly All* Activities

An SHA may decide to combine *nearly all* maintenance activities into one contract, based on the maintenance needs of the agency. As mentioned under Decision Criterion 4, the criteria listed below are generic and do not reflect the specific context in which a decision might be made. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following factors were often considered when selecting a delivery method for *nearly all* maintenance activities:

- There is political pressure to outsource nearly all maintenance activities
- There is a lack of manpower to perform the work in-house
- There is a need to reduce administrative load
- The long-term duration of the contract make it ideal for contracting out nearly all activities
- There is a need to reduce coordination efforts for different types of maintenance activities
- The level of control or desire to shift control are important considerations
- There is a need to reduce conflicts between owners and contractors
- There is a need to increase the level of competition among bidders

6.2.7 Decision Criterion 7: Select a Type of Contract Specification

Three types of contract specifications are generally available for use by SHAs. In most cases, each of the three can be selected unless there is a compelling reason to eliminate a type from consideration (such as legislative mandate). These three contract specifications include: method-based, performance-based, and warranty contracting. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following factors were often considered when selecting a type of contract specification for a delivery method:

- Level of Control the DOT wants to maintain
- Level of trust in the contractor
- Quality of the contractor
- Political reasons or pressure
- To encourage participation of contractors in bid process

6.2.8 Decision Criteria 8: Criteria to Select Pricing Strategy

Three typical pricing strategies are often used by SHAs, including fixed price, unit price, and cost plus pricing. TxDOT maintenance districts and five state DOT maintenance directors indicated that the following factors were often considered when selecting a type of pricing strategy for a delivery method:

- Legislative mandate requires or prohibits using a particular pricing strategy
- The method selected was the most cost effective for the DOT
- Flexibility was needed because of the unique nature of the work

6.3 Contracting Strategy Selection Aids

Additional information that can be used for the selection and implementation of maintenance contracting strategies based on the *Maintenance Contracting Strategy Selection Framework* is provided in Chapter 7, Chapter 8, and Chapter 9. Chapter 7 proposed a prototype decision support tool for maintenance contracting strategy selection. Chapter 8 provided guidance on the selection of contracting strategy. Chapter 9 presents 11 case studies discussing the implementation of five innovative contracting strategies.

Chapter 7. Development of Contracting Strategy Selection Aid Tool

One of the objectives of this study was to develop a spreadsheet-based decision support tool for selecting appropriate contracting strategies for the outsourcing of maintenance activities. A selection algorithm was developed for modeling the selection process, where the selection algorithm allows potential decision-makers to evaluate their outsourcing goals and particular maintenance circumstances in order to identify appropriate maintenance contracting strategies that will aid them in achieving their outsourcing goals and accommodating their circumstances.

The number of contracted activities is a major consideration in contracting strategy selection. In other words, some of the 13 delivery methods are particularly efficient for outsourcing a *single* activity, but others may be more efficient for outsourcing *bundles of activities*. Hence, in the spreadsheet the 13 delivery methods are divided into three worksheets representing three categories of outsourced activities: ***Individual Activity***, ***Bundled Activities***, and ***Nearly All Activities***. The category of *Individual Activity* includes four delivery methods that can be used for contracting a single maintenance activity. The category of *Bundled Activities* includes three delivery methods that can be used for outsourcing a few activities together. The category of *Nearly All Activities* includes eight delivery methods that can be used for contracting out almost all maintenance activities. Figure 2.3 (previous) illustrated the structure of the 13 maintenance delivery methods based on the number of outsourced activities.

The selection algorithm is applied to each category in a similar fashion. Figure 7.1 illustrates the selection algorithm logic.

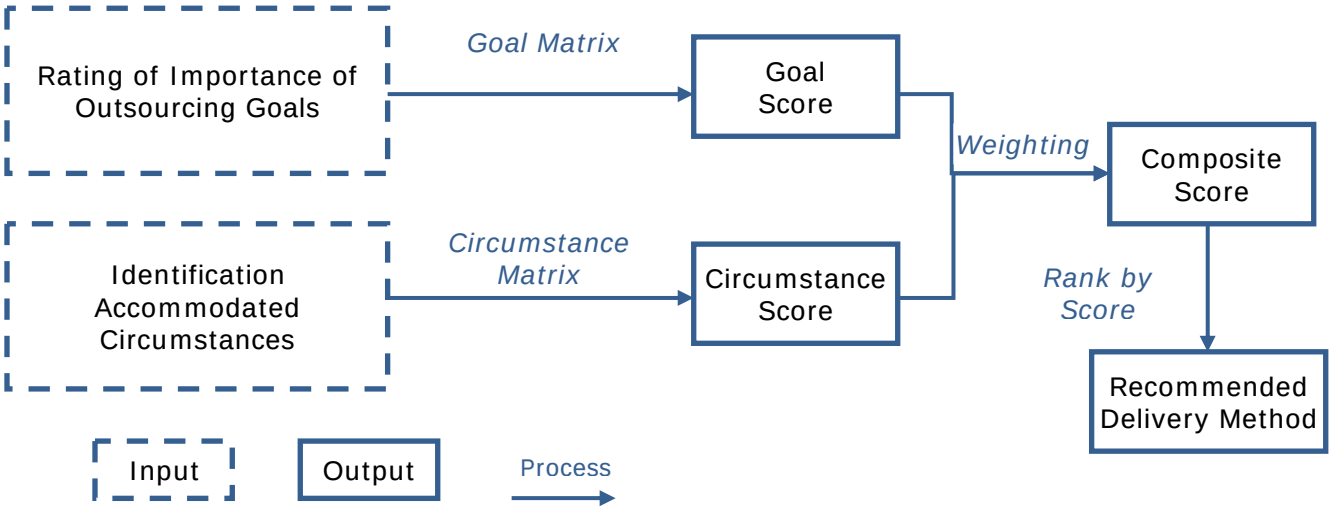


Figure 7.1: Delivery Method Selection Algorithm Logic

7.1 Maintenance Outsourcing Goals and Circumstances

Maintenance outsourcing goals and maintenance circumstances are two major factors that influence contracting strategy selection. For example, a DOT might have a goal of selecting a maintenance outsourcing strategy that fits its budget, and the district's circumstance might be that a budget limitation caused the district to consider innovative contracting strategies that could

help complete the required maintenance work at a reduced cost. Seven (7) typical maintenance outsourcing goals (Table 7.1) and thirty-one (31) typical maintenance circumstances were identified by TxDOT experts (Table 7.2 (excerpt); see Appendix D for all 31 circumstances).

7.2 Data Collection: Expert Panel Workshop

Assistance was needed from a panel of experts to evaluate the potential influence of each maintenance delivery method on the achievement of maintenance outsourcing goals and accommodation of maintenance circumstances. Experts were selected to participate on the panel because of their extensive knowledge of transportation maintenance processes within Texas. A panel of maintenance experts from the Maintenance Division and 11 TxDOT districts participated in the workshop and conducted three evaluation exercises: the evaluation of the influence of maintenance delivery methods on the achievement of outsourcing goals, the evaluation of the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing, and the evaluation of relative importance of the outsourcing goals and maintenance circumstances. Appendix D presents the materials that were used for the workshop.

Table 7.1: Typical Maintenance Outsourcing Goals

No.	Outsourcing Goals
1	The DOT wants a long-term commitment from the contractor.
2	The DOT wants to reduce the amount of time for bidding and awarding projects.
3	The DOT wants to reduce contract administrative load by bundling activities together.
4	The DOT wants to reduce the coordination effort among multiple maintenance contractors.
5	The DOT wants to reduce conflicts between owners and contractors.
6	The DOT wants to select a maintenance outsourcing strategy that fits its budget.
7	The DOT wants to make sure contractors achieve a certain level of quality.

Table 7.2: Maintenance Circumstances (excerpt)

No.	Maintenance Circumstances
Resource Constraints	
1	We were required to reduce our full-time employee (FTE) workforce, but we still have a significant amount of maintenance work to complete and not enough personnel.
2	Budget limitations caused us to consider innovative contracting strategies that could help us complete the required maintenance work at a reduced cost.
3	We have some in-house personnel who can perform some of the work associated with a particular individual activity but they cannot complete all of the work.
Timing	
7	We want to award a long-term contract to a contractor who will commit resources to the maintenance work for at least 5 years.
8	There are some unique or risky activities in our district that we would prefer to outsource rather than have our own personnel perform the work. There are also contractors willing to perform this work for a long duration, typically more than five years.

In Part 1, the definitions of the 13 maintenance contracting delivery methods were provided for the participants so that the participants could refer to these definitions when completing the workshop exercise.

In Part 2, the research team identified the major factors that DOTs consider when trying to decide whether to outsource maintenance activities or perform the work in-house. The following factors are typically considered when making this initial decision:

- the need to augment in-house resources (labor, equipment and expertise)
- the need to meet a legislative mandate for quantity of maintenance outsourced
- the level of flexibility and control needed in determining when and how to complete the work
- the desire to maintain in-house expertise while augmenting the workforce

Once the decision has been made to outsource some or all of the maintenance work, the DOT must consider what they want to achieve by outsourcing the maintenance work (referred to as “Outsourcing Goals”), and select the appropriate delivery methods to help them achieve their outsourcing goals. For example, if the goal was to “obtain a long-term commitment from the contractor” then the Long-term Separate Maintenance Contract Method might help the DOT achieve this goal. Hence, while many delivery methods might help to achieve outsourcing goals, some methods might be more effective than others. Therefore, the first objective of the workshop was to evaluate the influence of each maintenance delivery method on the achievement of outsourcing goals. The seven typical outsourcing goals were presented, and participants were asked to review the goals and to evaluate how likely the expert’s district was to achieve each of

the outsourcing goals if a given delivery method was implemented. The ratings and associated scores were assigned based on the categories identified in Table 7.3.

Table 7.3: Rating of Achievement Level of Maintenance Outsourcing Goals

Achievement Level	Description	Rating Score
Very Likely	My district is **very likely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.	2
Somewhat Likely	My district is **somewhat likely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.	1
Neutral	My district is **neither likely nor unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.	0
Somewhat Unlikely	My district is **somewhat unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.	-1
Very Unlikely	My district is **very unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.	-2

In Part 3, participants were asked to evaluate the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing. For example, if the circumstance was that a DOT has some labor, equipment, and expertise to complete an activity but not enough to complete all of the work, then the Jointly-Performed Maintenance Contract Method might help the DOT accommodate this particular circumstance. Hence, while many delivery methods might accommodate particular maintenance circumstances, some methods might be more effective than others. The maintenance outsourcing circumstances were identified by TxDOT experts, and the categories defined in Table 7.4 were used to rate and score how likely a given maintenance delivery method would accommodate a particular maintenance circumstance if the delivery method is implemented.

Table 7.4: Rating of Accommodation Level of Maintenance Circumstances

Accommodation Level	Description	Rating Score
Very Likely	The given maintenance delivery method is **very likely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.	2
Somewhat Likely	The given maintenance delivery method is **somewhat likely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.	1
Neutral	The given maintenance delivery method is **neither likely nor unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.	0
Somewhat Unlikely	The given maintenance delivery method is **somewhat unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.	-1
Very Unlikely	The given maintenance delivery method is **very unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.	-2

In the final part of the workshop, participants were asked to assess the relative importance of maintenance goals and maintenance circumstances compared to one another and assign a specific percentage to each criterion that adds up to 100%. For example, participants were asked whether they felt it was more important to achieve maintenance outsourcing goals or to accommodate particular maintenance circumstances that result in outsourcing. If they felt they were equally important, they were instructed to assign each a weight of 50%.

7.3 Data Analysis

Table 7.5 is the ***Goal Matrix*** derived from the 12 experts' evaluation of the influence of maintenance delivery methods on the achievement of outsourcing goals. Each entry in the *Goal Matrix* is the mode (i.e., most frequently selected rating) of the set of 12 ratings selected by each expert based on how likely the expert's district was to achieve each of the outsourcing goals if a given delivery method was implemented. As depicted in Table 7.3, ratings were assigned on a nominal scale from +2 to -2. The mode was used to represent the majority opinion rather than using the mean or median, which may be skewed by one or two very high or very low ratings. Thus, the researchers used the modes to create the *Goal Matrix*.

Table 7.5: Goal Matrix

Out-sourcing Goals	Indiv. Actv. Ctr. Mthd.	Jointly-Perf. Maint. Ctr. Mthd.	Long-term Separate Maint. Ctr. Mthd.	Frame-work Ctr. Mthd.	Mod-erately Bundled Actv. Ctr. Mthd.	Partial Competi-tive Maint. Ctr. Mthd.	Rout. Maint. Ctr. Mthd.	Integrated Maint. Ctr. Mthd.	Signifi-cantly Bundled Actv. Ctr. Mthd.	Total Asset Mgmt. Ctr. Mthd.	Alliance Ctr. Mthd.	Kilometer (Mile) Per Month Ctr. Mthd.	CREMA Ctr. Mthd.
1	-2.00	-1.00	2.00	1.00	-1.00	-2.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00
2	-1.00	1.00	2.00	1.00	1.00	-1.00	2.00	2.00	2.00	2.00	1.00	0.00	2.00
3	-2.00	-2.00	-1.00	1.00	1.00	-2.00	2.00	1.00	2.00	2.00	0.00	1.00	1.00
4	-2.00	0.00	1.00	1.00	1.00	-2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
5	0.00	0.00	1.00	0.00	1.00	-2.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00
6	2.00	1.00	2.00	0.00	1.00	1.00	0.00	-1.00	-1.00	-2.00	0.00	0.00	-2.00
7	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	0.00	2.00	1.00	0.00

Note:

- Please find the details of the 7 outsourcing goals in Table 7.1.
- The delivery methods have a higher score, indicating they are more likely to achieve a particular outsourcing goal.

Table 7.6 is the ***Circumstance Matrix*** derived from the 12 experts' evaluation of the ability of maintenance delivery methods to accommodate particular maintenance circumstances. Each entry in the *Circumstance Matrix* is, again, the mode of the set of 12 ratings selected by each expert based on how likely a given maintenance delivery method would accommodate a particular maintenance circumstance if the delivery method is implemented in their district. As depicted in Table 7.4, ratings were assigned on a nominal scale from +2 to -2. The mode was, again, used to represent the majority opinion rather than using the mean or median. Thus, the researchers used the modes to create the *Circumstance Matrix*.

Table 7.7 presents the averaged (mean) weighting of the relative importance of the outsourcing goals to the maintenance circumstances as obtained from the 12 experts' evaluation.

7.4 Development of the Algorithm

To initiate the algorithm in the spreadsheet, the decision-maker must first select whether a single activity, a moderate bundle of activities, or nearly all activities will be outsourced (Figure 7.2, Step 1).

Once the number of activities to be outsourced has been selected, the decision-maker must evaluate each of the seven outsourcing goals to identify how important achievement of each outsourcing goal is to the decision maker. Hence, while seven typical outsourcing goals were identified by TxDOT experts, it is likely that one or two goals will apply to a particular contracting situation and the remaining goals will not be applicable. For example, "a long-term commitment from a contractor" may be very important for a district in which it is difficult to find a qualified contractor to perform a special activity. The remaining goals may be much less important. Consequently, the decision maker must assign a relative importance to each of the seven outsourcing goals based on how important achievement of the goal is to the decision maker (N/A, Low, Median, and High) (Figure 7.2, Step 2). Scores were divided into increments as follows:

- N/A = Goal is not important to the decision-maker = 0
- Low = Goal is of low importance to the decision-maker = 0.33
- Median = Goal is of moderate importance to the decision-maker = 0.67
- High = Goal is of high importance to the decision-maker = 1.00

The decision maker's rating of the importance of achieving each of the seven outsourcing goals results in a ***Goal Adjustment Vector*** (Figure 7.2, Step 3a). The Goal Adjustment Vector records the normalized score assigned to each goal. An example is illustrated in Table 7.8. In the example, the decision-maker rated Goals 1 and 5 as N/A (i.e., not important) and they were assigned a score of 0. Goal 7 was rated as Low (i.e., of low importance) and it was assigned a score of 0.33. Goal 4 was rated as Medium (i.e., of moderate importance) and it was assigned a score of 0.67. Goals 2, 3, and 6 were rated as High (i.e., of high importance) and they were assigned a score of 1.00. When summed, the total ratings equal 4 (0 + 1 + 1 + 0.67 + 0 + 1 + 0.33). The original scores were then normalized by dividing each rating by the sum (= 4). After normalization, the Goal Adjustment Vector (Table 7.8. and Figure 7.2, Step 3a) contained the following values: 0, 0.25, 0.25, 0.1675, 0, 0.25, and 0.0825.

Table 7.6: Circumstance Matrix

Cir-cums-tances	Indiv. Actv. Ctr. Mthd.	Jointly-Perf. Maint. Ctr. Mthd.	Long-term Separate Maint. Ctr. Mthd.	Frame-work Ctr. Mthd.	Moderately Bundled Actv. Ctr. Mthd.	Partial Competi-tive Maint. Ctr. Mthd.	Rout. Maint. Ctr. Mthd.	Integrated Maint. Ctr. Mthd.	Signifi-cantly Bundled Actv. Ctr. Mthd.	Total Asset Mgmt. Ctr. Mthd.	Alliance Ctr. Mthd.	Kilometer (Mile) Per Month Ctr. Mthd.	CREMA Ctr. Mthd.
1	2.00	1.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00
2	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00
3	1.00	2.00	1.00	1.00	1.00	1.00	-1.00	1.00	1.00	1.00	-2.00	0.00	1.00
4	1.00	2.00	1.00	1.00	1.00	1.00	-1.00	1.00	1.00	1.00	-2.00	0.00	1.00
5	2.00	2.00	1.00	1.00	1.00	-2.00	-1.00	-2.00	1.00	-2.00	-2.00	0.00	0.00
6	2.00	-2.00	2.00	1.00	2.00	-2.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00
7	-2.00	-2.00	2.00	2.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00
8	1.00	0.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00
9	-1.00	-1.00	1.00	2.00	1.00	0.00	1.00	1.00	1.00	2.00	0.00	-2.00	1.00
10	-2.00	-2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	2.00	2.00
11	2.00	2.00	-1.00	1.00	1.00	-1.00	-1.00	-2.00	-1.00	-2.00	-2.00	-1.00	-2.00
12	1.00	1.00	-1.00	2.00	1.00	1.00	-1.00	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00
13	-2.00	-2.00	1.00	0.00	1.00	-2.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
14	2.00	1.00	1.00	1.00	-2.00	-1.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00
15	2.00	-1.00	-1.00	0.00	-2.00	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00	-1.00	-2.00
16	2.00	2.00	2.00	1.00	2.00	1.00	-2.00	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00
17	-2.00	1.00	0.00	2.00	-1.00	-1.00	-1.00	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00
18	-2.00	-2.00	1.00	-1.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00
19	2.00	1.00	1.00	0.00	1.00	0.00	-1.00	-2.00	-1.00	-2.00	-1.00	-1.00	-2.00
20	2.00	-1.00	1.00	1.00	0.00	-1.00	-1.00	1.00	0.00	1.00	1.00	0.00	0.00
21	-2.00	-1.00	-2.00	-2.00	1.00	-1.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00
22	-2.00	-1.00	-1.00	-2.00	1.00	-1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00
23	0.00	0.00	-1.00	0.00	1.00	0.00	2.00	1.00	1.00	1.00	1.00	2.00	-2.00
24	-2.00	-2.00	-2.00	-2.00	1.00	-1.00	0.00	1.00	1.00	2.00	1.00	-2.00	2.00
25	-2.00	-2.00	-2.00	1.00	2.00	-1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26	-2.00	-2.00	-1.00	-2.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	1.00	1.00
27	-2.00	-1.00	1.00	1.00	1.00	-1.00	1.00	2.00	2.00	2.00	1.00	2.00	1.00
28	-2.00	-2.00	-2.00	1.00	1.00	-2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00
29	-2.00	-1.00	-2.00	-1.00	1.00	1.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00
30	-2.00	-2.00	-2.00	-2.00	1.00	-1.00	1.00	2.00	2.00	2.00	0.00	0.00	1.00
31	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Note:

- Please find the details of the 31 maintenance circumstances in Appendix D.
- The delivery methods have a higher score, indicating they are more likely to help accommodate a particular circumstance.

Table 7.7: Weights of Outsourcing Goal and Maintenance Circumstance

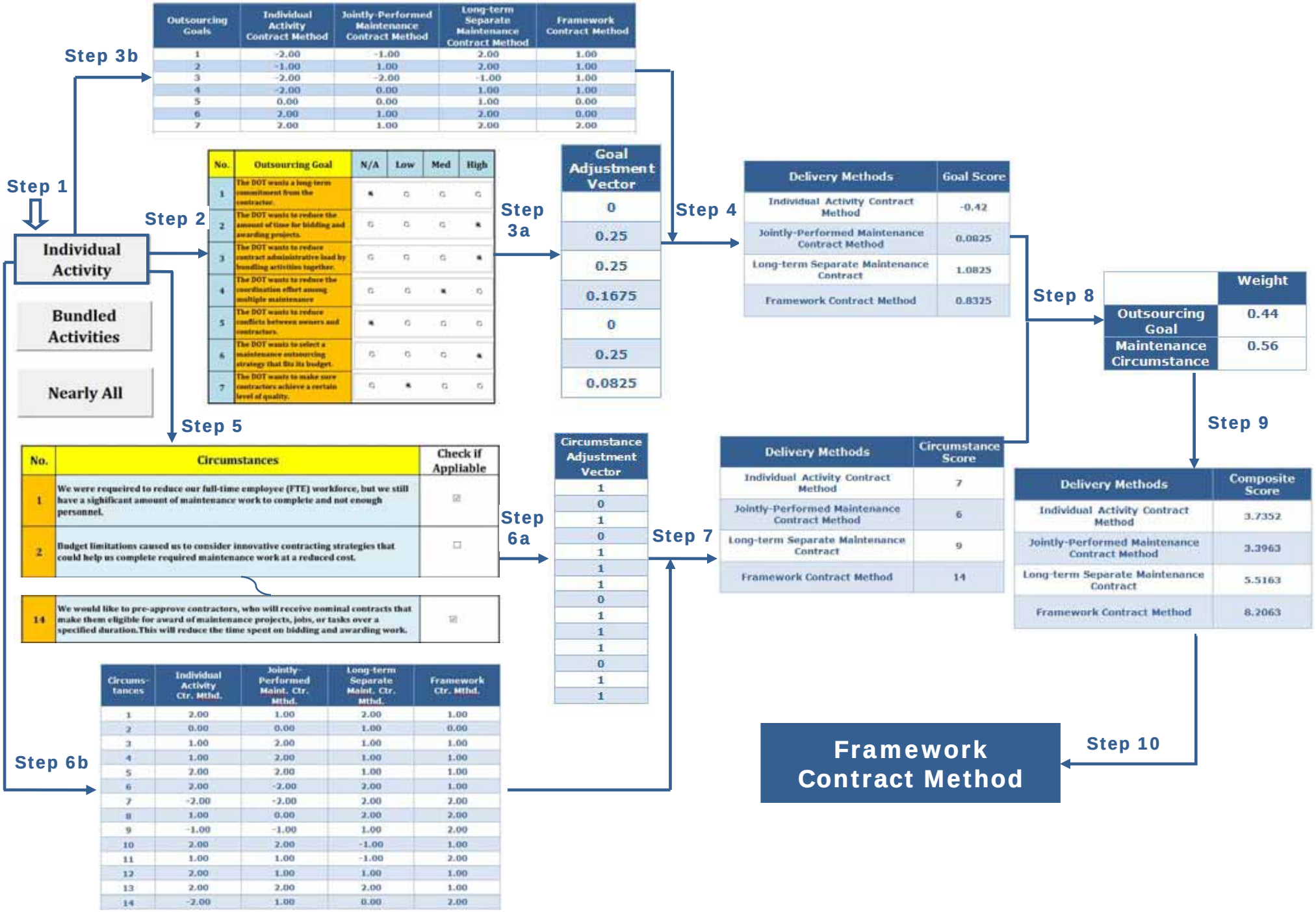
	Weight
Outsourcing Goal	0.44
Maintenance Circumstance	0.56

Table 7.8: Example of Goal Adjustment Vector

Outsourcing Goals	N/A	Low	Median	High	Normalization	Goal Adjustment Vector
1	0				0 (0/4)	0
2				1	0.25 (1/4)	0.25
3				1	0.25 (1/4)	0.25
4			0.67		0.1675 (0.67/4)	0.1675
5	0				0 (0/4)	0
6				1	0.25 (1/4)	0.25
7		0.33			0.0825 (0.33/4)	0.0825
Sub-Total	0	0.33	0.67	3	1	
Total	4					
Note: Please find the details of the 7 outsourcing goals in Table 7.1.						

Following page:

Figure 7.2: Diagram of Algorithm for Selecting Delivery Method for Individual Activity


Step 1
Individual Activity
Bundled Activities
Nearly All
Step 2
Step 3a
Step 3b
Step 4
Step 5
Step 6a
Step 6b
Step 7
Step 8
Step 9
Step 10
Framework Contract Method
Outsourcing Goals
Individual Activity Contract Method
Jointly-Performed Maintenance Contract Method
Long-term Separate Maintenance Contract Method
Framework Contract Method
1 -2.00 -1.00 2.00 1.00
2 -1.00 1.00 2.00 1.00
3 -2.00 -2.00 -1.00 1.00
4 -2.00 0.00 1.00 1.00
5 0.00 0.00 1.00 0.00
6 2.00 1.00 2.00 0.00
7 2.00 1.00 2.00 2.00
No. Outsourcing Goal N/A Low Med High
1 The DOT wants a long-term commitment from the contractor.
2 The DOT wants to reduce the amount of time for bidding and awarding projects.
3 The DOT wants to reduce contract administrative load by bundling activities together.
4 The DOT wants to reduce the coordination effort among multiple maintenance
5 The DOT wants to reduce conflicts between owners and contractors.
6 The DOT wants to select a maintenance outsourcing strategy that fits its budget.
7 The DOT wants to make sure contractors achieve a certain level of quality.
Goal Adjustment Vector
0
0.25
0.25
0.1675
0
0.25
0.0825
Delivery Methods Goal Score
Individual Activity Contract Method -0.42
Jointly-Performed Maintenance Contract Method 0.0825
Long-term Separate Maintenance Contract 1.0825
Framework Contract Method 0.8325
Weight
Outsourcing Goal 0.44
Maintenance Circumstance 0.56
No. Circumstances Check if Appliable
1 We were requeired to reduce our full-time employee (FTE) workforce, but we still have a sighificant amount of maintenance work to complete and not enough personnel.
2 Budget limitations caused us to consider innovative contracting strategies that could help us complete required maintenance work at a reduced cost.
14 We would like to pre-approve contractors, who will receive nominal contracts that make them eligible for award of maintenance projects, jobs, or tasks over a specified duration.This will reduce the time spent on bidding and awarding work.
Circumstance Adjustment Vector
1
0
1
0
1
1
1
0
1
1
1
0
1
1
Delivery Methods Circumstance Score
Individual Activity Contract Method 7
Jointly-Performed Maintenance Contract Method 6
Long-term Separate Maintenance Contract 9
Framework Contract Method 14
Delivery Methods Composite Score
Individual Activity Contract Method 3.7352
Jointly-Performed Maintenance Contract Method 3.3963
Long-term Separate Maintenance Contract 5.5163
Framework Contract Method 8.2063
Circumstances Individual Activity Ctr. Mthd. Jointly-Performed Maint. Ctr. Mthd. Long-term Separate Maint. Ctr. Mthd. Framework Ctr. Mthd.
1 2.00 1.00 2.00 1.00
2 0.00 0.00 1.00 0.00
3 1.00 2.00 1.00 1.00
4 1.00 2.00 1.00 1.00
5 2.00 2.00 1.00 1.00
6 2.00 -2.00 2.00 1.00
7 -2.00 -2.00 2.00 2.00
8 1.00 0.00 2.00 2.00
9 -1.00 -1.00 1.00 2.00
10 2.00 2.00 -1.00 1.00
11 1.00 1.00 -1.00 2.00
12 2.00 1.00 1.00 1.00
13 2.00 2.00 2.00 1.00
14 -2.00 1.00 0.00 2.00

Each category of activities (individual, bundled, or nearly all) has a separate *Goal Matrix* (Figure 7.2, Step 3b) that is activated when the user selects Individual, Bundled, or Nearly All activities during Step 1. The three separate Goal Matrices are derived from the larger Goal Matrix presented in Table 7.5 and contain a smaller subset of maintenance delivery methods that are appropriate to the category of activities (individual, bundled, or nearly all). Table 7.9, Table 7.10, and Table 7.11 present the respective Goal Matrix for Individual, Bundled, and Nearly All Activities. The *Goal Matrix* is multiplied by the *Goal Adjustment Vector* to derive a ***Goal Score*** for each applicable maintenance delivery method (Figure 7.2, Step 4).

Following the evaluation of the importance of achieving outsourcing goals, the decision maker must identify their specific maintenance circumstances. Unlike the evaluation of outsourcing goals, which are rated on a scale from N/A = 0 to High = 1.00 based on their importance, circumstances are selected when they are "applicable" or they are not selected because they are not applicable (Figure 7.2, Step 5). This essentially results in a YES/NO response, where YES = 1 and signifies that the circumstance is applicable to the user. A NO = 0 and signifies that the circumstance is not applicable to the user. The circumstances that apply to individual activities, bundled activities, and nearly all activities vary and are presented in Table 7.12, Table 7.13, and Table 7.14, respectively. These circumstances were identified by TxDOT experts and may apply to only one type of activities (such as individual) or may apply to more than type of activities (individual, bundled, or nearly all). Overall, there are 31 typical circumstances. As mentioned, scores were assigned as follows:

- Needs to be Accommodated = This circumstance is applicable = 1
- Does Not Need to be Accommodated = This circumstance is not applicable = 0

The decision maker's rating of the applicability of each circumstance results in a ***Circumstance Adjustment Vector*** (Figure 7.2, Step 6a). The Circumstance Adjustment Vector records the rating assigned to each circumstance (0 or 1). An example is illustrated in Table 7.15. In the example, the decision-maker rated Circumstance 1, 3, 5, 6, 7, 9, 10, 11, 13, and 14 as applicable (i.e., these circumstances need to be accommodated) and they were assigned a score of 1. Circumstance 2, 4, 8, and 12 was rated as not applicable (i.e., these circumstances do not need to be accommodated) and they were assigned a score of 0.

Table 7.9: Example of Goal Matrix for the Category of Individual Activity

Outsourcing Goals	Individual Activity Contract Method	Jointly-Performed Maintenance Contract Method	Long-term Separate Maintenance Contract Method	Framework Contract Method
1	-2.00	-1.00	2.00	1.00
2	-1.00	1.00	2.00	1.00
3	-2.00	-2.00	-1.00	1.00
4	-2.00	0.00	1.00	1.00
5	0.00	0.00	1.00	0.00
6	2.00	1.00	2.00	0.00
7	2.00	1.00	2.00	2.00
Note: Please find the details of the 7 outsourcing goals in Table 7.1.				

Table 7.10: Example of Goal Matrix for the Category of Bundled Activities

Outsourcing Goals	Framework Contract Method	Moderately Bundled Activities Contract Method	Partial Competitive Maintenance Contract Method
1	1.00	-1.00	-2.00
2	1.00	1.00	-1.00
3	1.00	1.00	-2.00
4	1.00	1.00	-2.00
5	0.00	1.00	-2.00
6	0.00	1.00	1.00
7	2.00	1.00	1.00
Note: Please find the details of the 7 outsourcing goals in Table 7.1.			

Table 7.11: Example of Goal Matrix for the Category of Nearly All Activities

Outsourcing Goals	Partial Competitive Maint. Ctr. Mthd.	Rout. Maint. Ctr. Mthd.	Integrated Maint. Ctr. Mthd.	Significantly Bundled Actv. Ctr. Mthd.	Total Asset Mgmt. Ctr. Mthd.	Alliance Ctr. Mthd.	Kilometer (Mile) Per Month Ctr. Mthd.	CREMA Ctr. Mthd.
1	-2.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00
2	-1.00	2.00	2.00	2.00	2.00	1.00	0.00	2.00
3	-2.00	2.00	1.00	2.00	2.00	0.00	1.00	1.00
4	-2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
5	-2.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00
6	1.00	0.00	-1.00	-1.00	-2.00	0.00	0.00	-2.00
7	1.00	1.00	1.00	1.00	0.00	2.00	1.00	0.00
Note: Please find the details of the 7 outsourcing goals in Table 7.1.								

Table 7.12: Maintenance Circumstances for the Category of Individual Activity

No.	Maintenance Circumstances
1	We were required to reduce our full-time employee (FTE) workforce, but we still have a significant amount of maintenance work to complete and not enough personnel.
2	Budget limitations caused us to consider innovative contracting strategies that could help us complete required maintenance work at a reduced cost.
3	We have some in-house personnel who can perform some of the work associated with a particular individual activity but they cannot complete all of the work.
4	We have some in-house equipment that is need to complete the work of a particular individual activity, but we do not have enough pieces of that equipment to do it all in-house.
5	A particular activity requires multiple pieces of equipment, and we only have one type of equipment. Hence, we need to outsource the remaining pieces of equipment and an operator to complete the remainder of the activity.
6	We do not have any in-house personnel, equipment, material, or expertise to perform a particular maintenance activity or a bundle of activities.
7	We want to award a long-term contract to a contractor who will commit resources to the maintenance work for at least 5 years.
8	There are some unique or risky activities in our district that we would prefer to outsource rather than have our own personnel perform the work. There are also contractors willing to perform this work for a long duration, typically more than five years.
9	We would like to reduce the amount of time for bidding and awarding specific maintenance work, select contractors quickly for urgent projects, and meanwhile reduce overall administration time and costs.
10	We want to make full use of our personnel and equipment, while purchasing contracted maintenance service only when we need it.
11	Only a few small highway sections need emergency repair work, so we would like to contract this work out.
12	For some unique activities, our district does not have equipment or expertise to perform the work in-house, and we do not have a contractor in our region that can do all of the activities together, so we must contract out each activity separately.
13	We do not want to outsource all of our maintenance work, just some of it.
14	We would like to pre-approve contractors, who will receive nominal contracts that make them eligible for award of maintenance projects, jobs, or tasks over a specified duration. This will reduce the time spent on bidding and awarding work.

Table 7.13: Maintenance Circumstances for the Category of Bundled Activities

No.	Maintenance Circumstances
1	We would like to reduce the amount of time for bidding and awarding specific maintenance work, select contractors quickly for urgent projects, and meanwhile reduce overall administration time and costs.
2	We would like to pre-approve contractors, who will receive nominal contracts that make them eligible for award of maintenance projects, jobs, or tasks over a specified duration. This will reduce the time spent on bidding and awarding work.
3	We want to reduce the number of maintenance contracts we need to manage.
4	We have been required to outsource more of the maintenance work, but our in-house employees are opposed to more outsourcing. Thus, we need a compromise.
5	Our district believes it is more efficient to bundle a few activities into one contract rather than award separate contracts in order to reduce administration, overhead, and inspection load, and thus relieve the impacts of a shortage of in-house personnel.
6	For some controlled access routes, we want one contractor to do most or almost all of the maintenance work in order to achieve efficient management of the work.
7	We are seeking a contracting strategy that can help us reduce administrative load.
8	We do not have the equipment and expertise to perform maintenance using in-house personnel, and individual contracts will be too inefficient for us.
9	Traffic is interrupted repeatedly by different contractors when they perform their own work at different times. Hence, we need to implement a maintenance outsourcing strategy that better integrates the outsourced maintenance work.

Table 7.14: Maintenance Circumstances for the Category of Nearly All Activities

No.	Maintenance Circumstances
1	A fixed price long-term contract would allow us to establish a budget that covers a few years rather than just one year.
2	If all of the maintenance work associated with a specific interstate highway is contracted out together, our personnel can totally focus on county roads and secondary roads, while limiting their exposure to the risk of working on the interstate highway.
3	It is difficult for our district to combine preventive maintenance with routine maintenance into one contract because contractors are not available to do this combination of work or because weather conditions make this combination inefficient.
4	We want to reduce the number of maintenance contracts we need to manage.
5	We have been required to outsource more of the maintenance work, but our in-house employees are opposed to more outsourcing. Thus, we need a compromise.
6	There are numerous conflicts between our District and our contractors, so we would like to implement a contracting strategy that mitigates potential conflicts.
7	Many maintenance activities are already outsourced, and the availability of contractors is plentiful, so we believe it is possible to outsource nearly all maintenance activities together as one contract.
8	Contractors blame each other when something bad happens during the performance of maintenance work, and it is often difficult to figure out who was actually responsible. Hence, we need an outsourcing strategy that eliminates contractor conflicts.
9	Our paved roads are in good condition now, and we would like to maintain them in that condition by outsourcing routine maintenance activities alone without any major strengthening or rehabilitation.
10	We would like to integrate rehabilitation and routine maintenance contracts together in order to encourage contractors to increase the quality of rehabilitation.
11	Our district believes it is more efficient to bundle a few activities into one contract rather than award separate contracts in order to reduce administration, overhead, and inspection load, and thus relieve the impacts of a shortage of in-house personnel.
12	We are seeking a contracting strategy that can help us reduce administrative load.
13	We do not have the equipment and expertise to perform maintenance using in-house personnel, and individual contracts will be too inefficient for us.
14	Traffic is interrupted repeatedly by different contractors when they perform their own work at different times. Hence, we need to implement a maintenance outsourcing strategy that better integrates the outsourced maintenance work.
15	It is possible in our region to combine routine and preventive maintenance into one contract, and it would be more efficient to perform maintenance work through such a combined contract.

Table 7.15: Example of Circumstance Adjustment Vector for the Category of Individual Activity

Circumstances No.	Circumstance Adjustment Vector
1	1
2	0
3	1
4	0
5	1
6	1
7	1
8	0
9	1
10	1
11	1
12	0
13	1
14	1
Note: Please find the details of the 14 maintenance circumstances in Table 7.9.	

Each category of activities (individual, bundled, or nearly all) has a separate *Circumstance Matrix* (Figure 7.2, Step 6b) that is activated when the user selects Individual, Bundled, or Nearly All activities during Step 1. The three separate Circumstance Matrices are derived from the larger Circumstance Matrix presented in Table 7.6 and contain a smaller subset of maintenance delivery methods that are appropriate to the category of activities (individual, bundled, or nearly all). Table 7.16, Table 7.17, and Table 7.18 present the respective Circumstance Matrix for Individual, Bundled, and Nearly All Activities. The *Circumstance Matrix* is multiplied by the *Circumstance Adjustment Vector* to derive a ***Circumstance Score*** for each applicable maintenance delivery method (Figure 7.2, Step 7).

The ***Goal Score*** and the ***Circumstance Score*** are each multiplied by the respective weights assigned by TxDOT experts (0.44 and 0.56, respectively as discussed previously) (Figure 7.2, Step 8). A ***Composite Score*** (Table 7.19) for each applicable maintenance delivery method is then derived by adding the weighted *Goal Score* to the weighted *Circumstance Score* (Figure 7.2, Step 9). Finally, the applicable delivery methods are ranked by their composite scores (Figure 7.2, Step 10). Ultimately, a higher ***Composite Score*** indicates that the delivery method can better aid in achieving a user's maintenance outsourcing goals and accommodating their maintenance circumstances.

It should be noted that the recommended delivery methods identified by the algorithm will vary depending on the inputs of the decision maker. However, the ability to implement a delivery method will be affected by other factors, such as whether there are contractors available in the district to implement the particular delivery method, or whether state or local legislation allows the method to be implemented.

Table 7.16: Example of Circumstance Matrix for the Category of Individual Activity

Circumstances	Individual Activity Ctr. Mthd.	Jointly-Performed Maint. Ctr. Mthd.	Long-term Separate Maint. Ctr. Mthd.	Framework Ctr. Mthd.
1	2.00	1.00	2.00	1.00
2	0.00	0.00	1.00	0.00
3	1.00	2.00	1.00	1.00
4	1.00	2.00	1.00	1.00
5	2.00	2.00	1.00	1.00
6	2.00	-2.00	2.00	1.00
7	-2.00	-2.00	2.00	2.00
8	1.00	0.00	2.00	2.00
9	-1.00	-1.00	1.00	2.00
10	2.00	2.00	-1.00	1.00
11	1.00	1.00	-1.00	2.00
12	2.00	1.00	1.00	1.00
13	2.00	2.00	2.00	1.00
14	-2.00	1.00	0.00	2.00
Note: Please find the details of the 14 maintenance circumstances in Table 7.9.				

Table 7.17: Example of Circumstance Matrix for the Category of Bundled Activities

Circumstances	Framework Contract Method	Moderately Bundled Activities Contract Method	Partial Competitive Maintenance Contract Method
1	2.00	1.00	0.00
2	2.00	-1.00	-1.00
3	-1.00	2.00	1.00
4	0.00	1.00	0.00
5	1.00	2.00	-1.00
6	-2.00	1.00	1.00
7	1.00	1.00	-1.00
8	1.00	1.00	-2.00
9	-1.00	1.00	1.00
Note: Please find the details of the 9 maintenance circumstances in Table 7.10.			

Table 7.18: Example of Circumstance Matrix for the Category of Nearly All Activities

Circums-tances	Partial Competitive Maint. Ctr. Mthd.	Rout. Maint. Ctr. Mthd.	Integrated Maint. Ctr. Mthd.	Signifi-cantly Bun-dled Actv. Ctr. Mthd.	Total Asset Mgmt. Ctr. Mthd.	Alliance Ctr. Mthd.	Kilometer (Mile) Per Month Ctr. Mthd.	CREMA Ctr. Mthd.
1	1.00	1.00	1.00	1.00	2.00	1.00	2.00	2.00
2	-2.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
3	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00	-1.00	-2.00
4	1.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00
5	0.00	-1.00	-2.00	-1.00	-2.00	-1.00	-1.00	-2.00
6	-1.00	-1.00	1.00	0.00	1.00	1.00	0.00	0.00
7	-1.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00
8	-1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00
9	0.00	2.00	1.00	1.00	1.00	1.00	2.00	-2.00
10	-1.00	0.00	1.00	1.00	2.00	1.00	-2.00	2.00
11	-1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	-1.00	1.00	2.00	2.00	2.00	1.00	2.00	1.00
13	-2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00
14	1.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00
15	-1.00	1.00	2.00	2.00	2.00	0.00	0.00	1.00

Note: Please find the details of the 15 maintenance circumstances in Table 7.11.

Table 7.19: Example of Algorithm for the Category of Individual Activity

Delivery Methods	Individual Activity Contract Method	Jointly-Performed Maintenance Contract Method	Long-term Separate Maintenance Contract	Framework Contract Method
Goal Score	-0.42	0.0825	1.0825	0.8325
Circumstance Score	7	6	9	14
Composite Score	3.7352	3.3963	5.5163	8.2063

Note: For instance of Individual Activity Contract Method:

- Goal Score = -0.42 = 0×(-2)+0.25×(-1)+0.25×(-2)+0.1675×(-2)+0×0+0.25×2+0.0825×2
- Circumstance Score = 7 = 1×2+0×0+1×1+0×1+1×2+1×2+1×(-2)+0×1+1×(-1)+1×2+1×1+0×2+1×2+1×(-2)
- Composite Score = 3.7352 = 0.44 (-0.42)+0.56×7

7.5 Conclusion and Recommendation

A spreadsheet-based contracting strategy selection tool was created to implement a selection algorithm that was developed based on data obtained from TxDOT experts' evaluations. Although the selection algorithm shows tremendous promise as a means to aid decision-makers in selecting an appropriate maintenance contracting strategy that will help them achieve their maintenance outsourcing goals and accommodate their circumstances, the pilot

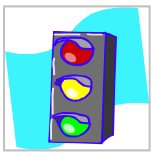
results indicated that the selection aid tool did not work as well as expected. The major reasons identified by the research team include:

- Many of TxDOT's experts were not familiar with all 13 maintenance delivery methods so that it was difficult for them to evaluate how effectively each delivery method would aid in achieving outsourcing goals or accommodating maintenance circumstances. Hence, the data obtained from their evaluation may not accurately represent the most effective delivery methods. A broader range of international experts is needed to conduct this exercise.
- The Composite Score tends to be dominated by the Circumstance Score because the value of the Goal Score tends to be smaller than that of the Circumstance Score, such as for the Individual Activity Contract Method (Table 7.19), in which the Goal Score is –0.42 and is much less than the Circumstance Score of 7. Hence, the selection algorithm mostly depends on circumstances.
- For each circumstance, there is always a delivery method that is more effective than the others. In other words, each circumstance is inherently linked with a particular delivery method. For example, Circumstance No. 3 in Table 7.12 ("We have some in-house personnel who can perform some of the work associated with a particular individual activity but they cannot complete all of the work") is inherently linked with the Jointly-Performed Maintenance Contract Method because this delivery method combines in-house with outsourced resources to accomplish a task.

In order to improve the selection aid tool, additional steps should be taken, such as collecting data from maintenance contracting experts from around the world (such as Pakkala, etc.) who are more familiar with the 13 delivery methods. A well-designed validation process is also necessary to validate the selection aid tool prior to putting it into practice.

Chapter 8. Contracting Strategy Selection Guide

8.1 Introduction to the Contracting Strategy Selection Guide



The purpose of this chapter is to provide guidance on the selection of an appropriate maintenance contracting strategy that will help SHAs achieve their maintenance goals and accommodate various circumstances (such as lack of equipment or expertise). Each of the 13 maintenance contracting strategies is discussed based on six aspects:

1. Description of the delivery method
2. Conditions for appropriate implementation
3. Selecting a type of specification
4. Pricing strategy options
5. Selecting an award strategy
6. Additional information and references.

The chapter begins with general guidelines for selecting an appropriate contracting strategy and then discusses each of the 13 delivery methods.

The Maintenance Contracting Strategy Selection Framework (Chapter 6) identifies 13 delivery methods that are appropriate for individually-let and bundled maintenance activities, including the bundling of nearly all maintenance activities. As shown previously in Figures 3.3 and 6.1, four delivery methods are appropriate for individually-let maintenance activities, three are appropriate for bundling a moderate number of maintenance activities, and six are appropriate for bundling nearly all maintenance activities. One delivery method is appropriate for either individually-let or moderately-bundled activities, and one delivery method is appropriate for either moderately-bundled or the bundling of nearly all maintenance activities. The framework also identifies three types of contract specifications and three pricing strategies that are widely used by SHAs for maintenance contracting.

The definitions of the 13 delivery methods were presented in Chapter 3, along with Figure 3.3, Diagram of the 13 Innovative Maintenance Delivery Methods, which depicts the delivery methods that are appropriate for outsourcing individual, multiple, or nearly all maintenance activities. This information is restated in Table 8.1. The definitions of the types of contract specifications, pricing strategies, and contract award strategies are restated in Tables 8.2, 8.3 and 8.4 respectively. These definitions are restated in this chapter so that readers can easily refer to this information as they review the guidelines for selecting an appropriate contracting strategy that will help them achieve their maintenance outsourcing goals.

Table 8.1: Delivery Methods Used for Different Types of Maintenance Outsourcing

Delivery Methods for Individually-Let Maintenance Activities
1. Individual Activity Contract Method
2. Jointly-Performed Maintenance Contract Method
3. Long-term Separate Maintenance Contract Method
Delivery Methods for Either Individually-Let or Moderately-Bundled Maintenance Activities
4. Framework Contract Method
Delivery Methods for Moderately-Bundled Maintenance Activities
5. Moderately Bundled Activities Contract Method
Delivery Methods for Either Moderately-Bundled or Bundling of Nearly All Maintenance Activities
6. Partial Competitive Maintenance Contract Method
Delivery Methods for Bundling of Nearly All Maintenance Activities
7. Routine Maintenance Contract Method
8. Integrated Maintenance Contract Method
9. Significantly Bundled Activities Contract Method
10. Total Asset Management Contract Method
11. Alliance Contract Method
12. Kilometer (Mile) Per Month Contract Method
13. CREMA Contract Method

Table 8.2: Definitions of Types of Contract Specifications

Types of Contract Specification
• ***Method-based Specification*** allows the contracting agency to specify the methods, materials, and quantities that can be used by a contractor to perform a special maintenance activity, and payment is based on the amount of work the contractor has completed.
• ***Performance-based Specification*** enables the contracting agency to define a set of measurable outcome that allows the contractor to decide which methods and materials to use for achieving the outcome. The contracting agency must establish a set of minimum performance standards or targets, and payment is based on the performance, typically with options for penalties and rewards.
• ***Warranty specification*** is another form of performance-based specification in which the contractor is required to warrant the work for a specified length of time.

Table 8.3: Definitions of Pricing Strategies

Pricing Strategies
• ***Unit Price*** enables the contracting agency to pay the contractor for the number of units completed based on the unit price for each maintenance activity or line item.
• ***Fixed Price (Lump Sum)*** allows the contracting agency to pay the contractor on a monthly basis over the contract period based on a lump sum amount. Reductions or increases in payments may occur if the contract includes disincentives or incentives respectively for falling short or exceeding the performance standard or target.
• ***Cost Plus Fee*** enables the contracting agency to pay the contractor in accordance with the cost it incurs for performing the maintenance work plus a fee for its profit.

Table 8.4: Definitions of Contract Award Strategies

Contract Award Strategies
• ***Low Bid*** requires contractors to be selected based only on price. The contract is awarded to the bidder who has the lowest price.
• ***Best Value*** enables contract to be awarded based on a combination of several factors, such as contractor's experience, work plan, and price. Two examples are presented in Case Study 8 and Case Study 9 in Chapter 9.

8.2 General Guidelines for Selecting a Contract Strategy

8.2.1 General Guidelines for Selecting a Delivery Method

Many of the guidelines for selecting a contracting strategy are similar for each of the delivery methods discussed in the remainder of this chapter. Hence, to avoid repetition, identified in the next few paragraphs are general guidelines that can be considered for all 13 delivery methods. These general guidelines should be considered along with other special considerations identified for each particular delivery method.

8.2.2 General Guidelines for Selecting a Type of Specification

Typically, any one of the following three types of specifications may be selected:

1. Method-based specifications
2. Performance-based specifications
3. Warranty specifications

The type of contract specification is often dependent on the particular maintenance goals or circumstances that an SHA needs to accommodate. The following considerations often drive the selection of a particular type of specification:

- If an SHA is concerned about controlling the quality of materials and methods used to accomplish the maintenance work, a method-based specification is typically an appropriate choice.

- If the district wants to limit the inspections their in-house personnel perform, due to limitations in experience or personnel, a performance-based specification can accommodate this goal.
- If the district needs or wants a warranty that is longer than the standard one-year materials and workmanship warranty, then a warranty specification that identifies the length of the warranty period should be selected.

8.2.3 General Guidelines for Selecting a Pricing Strategy

Typically, any one of the following three pricing strategies may be selected:

1. Unit Price
2. Lump Sum
3. Cost Plus Fee

The pricing strategy is often driven by the type of specification that has been selected. The following considerations often drive the selection of a particular pricing strategy:

- If an SHA has selected a method-based specification with bid items, then unit pricing is the most frequently selected pricing strategy because it allows payment to be made for specific bid items and quantity of work (i.e., number of units) completed.
- If an SHA has selected a performance-based specification, then lump sum payment is the most frequently selected pricing strategy because it allows payment to be made for all work completed during a month minus any subtractions for work that does not meet the performance standard. Hence, only performance is evaluated rather than measuring units completed.
- Cost Plus Fee is rarely used on road maintenance contracts in the U.S. However, if not prohibited by statute or legislation, the SHA may elect to reimburse the contractor for all direct costs (such as materials and labor for bid items), and a fee that covers the contractor's overhead and profit. This pricing strategy is most appropriate when the contractor has been selected based on qualifications and work plan.

8.2.4 General Guidelines for Selecting an Award Strategy

Typically, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- Low bid is appropriate for maintenance that is considered straightforward without any complicated activities and when keeping the price as low as possible is a key consideration.

- Best value is appropriate when the SHA is especially interesting in ensuring that a high level of quality is achieved during maintenance performance because the contractor's past performance and plan of work may be considered when selecting the best contractor.
- Best value is the most frequently used award strategy for performance-based contracts because contractors can be selected, in part, based on their plan for accomplishing the work.

For more information about selection criteria for Best Value awards, see Case Study 8 and Case Study 9 in Chapter 9.

8.3 Individual Activity Contract Method

8.3.1 Definition of Individual Activity Contract Method

On an Individual Activity Contract, a single maintenance activity is outsourced, such as mowing. This delivery method is a common contracting strategy that has been used by most transportation agencies in many countries. Compared to Jointly-Performed Maintenance Contract Method, where in-house and contractor personnel jointly perform a single activity, Individual Activity Contract Method assumes that all of the work of a single activity will be performed by a contractor. Compared to a Long-term Separate Maintenance Contract, which typically has a duration of five or more years, the duration of this contract is usually one or two years.

8.3.2 Conditions for Appropriate Implementation

Due to a lack of in-house resources (labor, equipment, or expertise) to perform a particular maintenance activity, many agencies must outsource an entire activity. The following circumstances make this an appropriate strategy to implement:

- The SHA does not have much maintenance outsourcing experience and needs to gain experience by letting out only one activity.
- Letting a single maintenance activity will increase bid competition.
- The maintenance district does not have a contractor that can perform a set of bundled activities, so individual activities must be let separately.

8.3.3 Selecting a Type of Specification

On an Individual Activity Contract, any one of the following three types of specifications may be used:

1. Method-based specifications
2. Performance-based specifications
3. Warranty specifications

The following considerations often drive the selection of a particular type of specification:

- If the individual activity does not have easily-definable and measurable performance criteria, then a method-based, rather than performance-based, specification would be appropriate.
- If an SHA wants to implement a performance-based contract on a small-scale as a pilot test, selection of a performance-based specification for an individual maintenance activity is one way to accomplish the task.
- If the individual activity is unique or risky, the district may want a warranty that is longer than the standard one-year materials and workmanship warranty. Then a warranty specification should be selected.

Also refer to the General Guidelines for Selecting a Type of Specification for additional considerations.

8.3.4 Pricing Strategy Options

On an Individual Activity Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus Fee
   The pricing strategy will be driven by the type of specification that has been selected.

Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.3.5 Selecting an Award Strategy

On an Individual Activity Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value
   The following considerations often drive the selection of a particular award strategy:
   - If the individual activity is not unique, risky, or complex, and if it does not have any complicated activities, then low bid is appropriate.
   - For individual activities that are unique, risky, or complex, requiring a high level of quality, best value is appropriate because the contractor's past performance and plan of work may be considered when selecting the best contractor.

Refer to the General Guidelines for Selecting an Award Strategy for specific considerations.

8.3.6 Additional Information and Reference

- None

8.4 Jointly-Performed Maintenance Contract Method

8.4.1 Definition of Jointly-Performed Maintenance Contract Method

On a Jointly-Performed Maintenance Contract, a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor. For example, snow removal or small rehabilitation projects can be jointly performed.

8.4.2 Conditions for Appropriate Implementation

Under specific circumstances, an SHA may need additional personnel or equipment to assist in-house personnel in performing a particular individual activity. As a result, the agency may contract out a portion of the work to augment its in-house resources. The following circumstances make this an appropriate strategy to implement:

- Circumstances such as severe weather, emergencies, seasonal conditions, or significant time constraints make this method appropriate to implement.
- The SHA can make full use of its existing workforce and/or equipment and augment these resources only when needed, thus paying for service only when work is being performed.
- For seasonal, short-term maintenance, such as milling and overlays that typically occur during the summer, an SHA can reduce their equipment costs by contracting for the equipment and an operator during work timeframe.
- Jointly-performed maintenance can often be procured using a purchase of services agreement or purchase order.

8.4.3 Selecting a Type of Specification

On a Jointly-Performed Maintenance Contract, two types of specifications may be used:

1. Method-based specifications
2. Performance-based specifications

However, because the work is being jointly-performed, and the in-house personnel will perform the work in accordance with the SHA's (method-based) maintenance specifications, it is appropriate to likewise select a method-based specification for awarding the contracted portion so that all personnel are performing according to the same requirements. A warranty specification is generally *inappropriate* because the contractor will not warrant work that was performed by SHA personnel.

8.4.4 Pricing Strategy Options

On a Jointly-Performed Maintenance Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus Fee

The most commonly selected pricing strategy for jointly-performed maintenance is unit pricing because unit pricing allows payment to be made for specific bid items and quantity of work (i.e., number of units) completed. Because this delivery method often uses a method-based specification, unit pricing is the appropriate pricing strategy. Unit pricing is also very common for work procured using a purchase order.

8.4.5 Selecting an Award Strategy

On a Jointly-Performed Maintenance Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If price is the chief concern of the SHA, then low bid is appropriate.
- If the SHA wants to evaluate the contractor's equipment, personnel, access to materials, other commitments, and/or planned approach to the work, then best value is appropriate because the contractor's resources, past performance and plan of work may be considered when selecting the best contractor.

Refer to the General Guidelines for Selecting an Award Strategy for additional considerations.

8.4.6 Additional Information and Reference

- Details about the implementation of the Jointly-Performed Maintenance Contract Method can be found in Chapter 9 under Case Study 1 for Pennsylvania DOT and Case Study 2 for Lufkin District of TxDOT.

8.5 Long-term Separate Maintenance Contract Method

8.5.1 Definition of Long-term Separate Maintenance Contract Method

On a Long-term Separate Maintenance Contract, a single maintenance activity is outsourced across many areas or regions for a long duration, typically more than five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years. Another example is the letting of a single contract for bridge maintenance across many areas or regions. This method is relatively new and requires additional research to fully understand its benefits and barriers as the method matures.

8.5.2 Conditions for Appropriate Implementation

Because a lack of in-house resources has become a pervasive and on-going challenge for SHAs, many agencies would like to contract out certain maintenance activities for a long time, typically for five or more years. These activities are often unique, risky, or are not part of the SHA's core competencies, such as herbicide application or rest area maintenance. Hence, a Long-Term Separate Maintenance Contract, which is similar to an Individual Activity Contract, allows a contractor to perform a particular maintenance activity for a long duration over many areas or regions. The following circumstances make this an appropriate strategy to implement:

- If the SHA has a general lack of expertise *statewide* for performing a particular maintenance activity, then this method may be appropriate to implement.
- If the maintenance activity requires a unique type of expertise that takes time to establish, a Long-term Separate Maintenance Contract may be appropriate to avoid losing that expertise through yearly re-letting of contracts.
- If the activity requires special equipment that is expensive to acquire, a Long-term Separate Maintenance Contract may be appropriate so that the contractor can achieve a return on their investment.
- If the work is geographically dispersed or located in remote areas, then a Long-term Separate Maintenance Contract may be appropriate.

Prior to the implementation of this method, the SHA should consider issues such as which activity might be suitable to perform by this method and how to locate and select qualified contractors.

8.5.3 Selecting a Type of Specification

On a Long-term Separate Maintenance Contract, three types of specifications may be used:

1. Method-based specifications
2. Performance-based specifications
3. Warranty specifications

The following considerations often drive the selection of the type of specification:

- If the maintenance activity is geographically dispersed across a large area, a performance-based specification may be appropriate because it requires less frequent inspections by in-house personnel.
- The activity to be outsourced may drive the selection of the type of specification. For example, rest area maintenance may implement a performance-based specification because the work has measurable performance criteria and does not involve sophisticated expertise or equipment. In contrast, milling and overlays may implement a method-based specification because performance is hard to measure and the SHA typically has well-defined method-based specifications that can be easily implemented.

8.5.4 Pricing Strategy Options

On an Individual Activity Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus Fee

The pricing strategy will be driven by the type of specification that has been selected. Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.5.5 Selecting an Award Strategy

On a Long-term Separate Maintenance Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If the activity has been performed by in-house personnel until now and will be contracted out for the first time, consider using a best value award strategy so that the bidders' qualifications and work plan can be evaluated.
- If the activity is not unique, risky, or complex, and if it does not have any complicated activities, then low bid may be appropriate.
- For individual activities that are unique, risky, or complex, requiring a high level of quality, best value may be appropriate because the contractor's past performance and plan of work may be considered when selecting the best contractor.

Refer to the *General Guidelines for Selecting an Award Strategy* for specific considerations.

8.5.6 Additional Information and Reference

- Details about the implementation of the Long-term Separate Maintenance Contract Method can be found in Chapter 9 under Case Study 3 for Maine DOT.
- For more information about the Long-term Separate Maintenance Contract Method, see: Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.6 Framework Contract Method

8.6.1 Definition of Framework Contract Method

On a Framework Contract, several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects. The method is also called a

Multi-Agency Contract (MAC) and is used widely by the U.S. military. However, this method is seldom used in maintenance outsourcing; thus, as the method matures, additional research will be needed to identify its benefits and barriers.

8.6.2 Conditions for Appropriate Implementation

The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- Due to a lack of in-house resources available to develop, award, and administer contracts, an SHA may implement a Framework Contract (i.e., Multi-Agency Contract) to reduce the need for developing numerous bid packages and requests for proposals.
- This method is unique because contractors are selected not for an existing maintenance project but for future maintenance needs.
- Multiple contractors (typically up to three) are awarded the contract and are promised a minimum value regardless of whether any work orders are issued or performed. Hence, an SHA must be prepared to pay the minimum value.
- Throughout the contract term, typically each contractor is selected to perform various maintenance work orders based on a pre-determined method for awarding work orders. Hence, the SHA must develop the method for awarding work orders, which might be by rotation or by limited competition.
- This method can be implemented as a hybrid of another delivery method. For example, it can be implemented as an Individual Activity Framework Contract, where multiple contracts are selected to perform a particular maintenance activity and are issued work orders when the work becomes necessary.
- This method allows contractors to be selected quickly for urgent projects by reducing the amount of time for awarding work orders of purchase orders.
- This method reduces the overall contract administrative overhead.

8.6.3 Selecting a Type of Specification

On a Framework Contract, any one of the following three types of specifications may be used:

1. Method-based
2. Performance-based
3. Warranty

Because a Framework Contract is often a hybrid of another contract strategy, considerations for selecting a type of specification for the other strategy should be reviewed. Also, because the type of specification and the pricing strategy go hand-in-hand, the two should be considered jointly when making a decision about the specification type. Refer to the *General Guidelines for Selecting a Type of Specification* for additional considerations.

8.6.4 Pricing Strategy Options

On a Framework Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus Fee

Because work orders for specific units of work are issued throughout the contract duration, unit pricing may be an appropriate pricing strategy because unit pricing allows payment to be made for specific bid items and quantities of work (i.e., number of units) completed. Unit pricing is also very common for work procured using a purchase order. Cost Plus Fee may also be appropriate because the SHA will pay the contractor's direct (material and labor) costs plus an agreed-upon fee as a profit. Hence, the contractor only gets paid when work is performed. Lump sum payment is only appropriate if a performance-based specification is used, but the SHA must determine how to allocate the payment (for example, by lump sum payment upon completion of specific work that a contractor provided a bid for).

8.6.5 Selecting an Award Strategy

On a Framework Contract, only the following award strategy may be used:

- Best Value

Through a request for proposals/qualifications process, up to three contractors are selected who meet a set of pre-determined evaluation criteria established by the SHA. These contractors are awarded contracts for a nominal value. Then, when the SHA needs a particular service, the SHA, at its discretion, will select one of the three contractors to perform the work based on skills or proposed price.

8.6.6 Additional Information and Reference

- Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.7 Moderately Bundled Activities Contract Method

8.7.1 Definition of Moderately Bundled Activities Contract Method

In a Moderately Bundled Activities Contract, a few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up. This method is different from a Significantly Bundled Activities Contract Method, which bundles all or nearly all maintenance activities together, because it bundles a much smaller set of activities.

8.7.2 Conditions for Appropriate Implementation

Due to a lack of in-house resources, an SHA may want to reduce the number of maintenance contracts they need to manage by bundling activities into one contract. An SHA that implements this method may be trying to gain efficiency by bundling a few activities into

one contract, rather than award separate contracts, in order to reduce administration, overhead, and inspection load. The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- If an SHA has a shortage of in-house resources, and many individual maintenance activities are already outsourced, the SHA may have developed significant experience in maintenance outsourcing. Hence, the next step might be to consider outsourcing several activities as a bundle to one contractor to reduce the administrative load.
- If the availability of contractors who are willing to bid on, and can perform, the work is plentiful in a region, then a Moderately Bundled Activities Contract Method might be appropriate.
- The SHA must have experienced in-house personnel with a diverse inspection history who can inspect the contractors work daily and administer the contract.
- If an SHA has already implemented several method-based contracts for individual activities, for which a well-defined set of maintenance specifications has been established, combining several maintenance activities into one contract might be appropriate.

8.7.3 Selecting a Type of Specification

On a Moderately Bundled Activities Contract, any one of the following three types of specifications may be used:

1. Method-based specifications
2. Performance-based specifications
3. Warranty specifications

The following considerations often drive the selection of a particular type of specification:

- If the set of bundled activities does not have easily-definable and measurable performance criteria, then a method-based, rather than performance-based, specification would be appropriate.
- If an SHA wants to implement a performance-based contract on a small-scale as a pilot test, selection of a performance-based specification for a moderate bundle of activities is one way to accomplish the task.
- If a performance-based specification is selected, the SHA may need to train in-house personnel in the administration of the contract.
- If the set of bundled activities is unique or risky, the district may want a warranty that is longer than the standard one-year materials and workmanship warranty. Then a warranty specification should be selected.

Also refer to the *General Guidelines for Selecting a Type of Specification* for additional considerations.

8.7.4 Pricing Strategy Options

On a Moderately Bundled Activities Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus

The pricing strategy will be driven by the type of specification that has been selected. Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.7.5 Selecting an Award Strategy

On a Moderately Bundled Activities Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If the set of bundled activities is not unique, risky, or complex, and if it does not have any complicated activities, then low bid may be appropriate.
- For a set of activities that are unique, risky, or complex, requiring a high level of quality, best value is appropriate because the contractor's past performance and plan of work may be considered when selecting the best contractor.

Refer to the *General Guidelines for Selecting an Award Strategy* for specific considerations.

8.7.6 Additional Information and Reference

- Details about the implementation of the Moderately Bundled Activities Contract Method can be found in Case Study 4 for Lubbock District of TxDOT, Case Study 5 for Pharr District of TxDOT and Case Study 6 for Kentucky DOT in Chapter 9.

8.8 Partial Competitive Maintenance Contract Method

8.8.1 Definition of Partial Competitive Maintenance Contract Method

On a Partial Competitive Maintenance Contract, a certain percentage of the in-house workforce is retained to perform various routine maintenance activities, while the rest of the maintenance work is outsourced. This method allows in-house personnel to competitively bid against contractors for the work. Often, the scope of work is large and may include all maintenance activities or a very large bundle of activities.

8.8.2 Conditions for Appropriate Implementation

The Partial Competitive Maintenance Contract Method has been implemented by SHAs because they were legislatively required to outsource a significant portion or percentage of the maintenance work, but in-house employees were opposed to greater outsourcing. It is essentially a compromise that encourages in-house personnel to develop more efficient methods for completing maintenance activities. The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- This method is not very common and might be considered as an interim stage prior to implementing completely open competition for outsourcing of maintenance activities.
- This method is a special delivery method that emphasizes the competition between in-house personnel and contractors. Hence, the SHA must be permitted to compete against contractors for the work.
- The method can be implemented together with other delivery methods. For example, competition can be allowed between the in-house workforce and contractors for a contract that bundles a few maintenance activities together into a Moderately Bundled Activities Contract.
- If the availability of contractors who are willing to bid against in-house personnel is sufficient, then a Partial Competitive Maintenance Contract might be appropriate.
- The SHA must evaluate the impact on morale if the in-house personnel do not win the contract. A negative impact might suggest avoiding this method.

8.8.3 Selecting a Type of Specification

On a Partial Competitive Maintenance Contract, any one of the following three types of specifications may be used:

1. Method-based
2. Performance-based
3. Warranty

The following considerations often drive the selection of a particular type of specification:

- If the set of maintenance activities does not have easily-definable and measurable performance criteria, then a method-based, rather than performance-based, specification would be appropriate.
- If an SHA wants to retain control over when and how the work is performed, then a performance-based specification is one way to accomplish the task.
- If a performance-based specification is selected, the SHA may need to train in-house personnel in the administration of the contract.
- If the SHA wants a warranty on the completed maintenance work, then a warranty specification should be selected.

Also refer to the General Guidelines for Selecting a Type of Specification for additional considerations.

8.8.4 Pricing Strategy Options

On a Partial Competitive Maintenance Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus

The pricing strategy will be driven by the type of specification that has been selected. Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.8.5 Selecting an Award Strategy

On a Partial Competitive Maintenance Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If the maintenance activities are straightforward and do not have any complicated aspects of the work, then low bid may be appropriate.
- If a well-defined set of technical specifications have been developed from which bidders can prepare an accurate estimate, then low bid may be appropriate.
- If the SHA wants to evaluate the contractor's past performance and plan of work to determine which contractors might be especially well qualified, then best value is appropriate.
- Because contractors may be bidding against in-house personnel, clearly defined evaluation criteria will need to be developed to ensure a meaningful comparison can be made for a best value award.

Refer to the *General Guidelines for Selecting an Award Strategy* for specific considerations.

8.8.6 Additional Information and Reference

- Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.9 Routine Maintenance Contract Method

8.9.1 Definition of Routine Maintenance Contract Method

On a Routine Maintenance Contract, all routine maintenance activities are outsourced together as one contract. If a performance-based specification and lump sum pricing are used, the method is essentially a Total Asset Management Contract. However, if a method-based specification and unit pricing are used, the method is essentially a Significantly Bundled Activities Contract.

8.9.2 Conditions for Appropriate Implementation

A shortage of in-house resources often drives an SHA to outsource numerous maintenance activities. However, administering several contracts may result in a significant overhead expense and effort. Consequently, bundling of many similar activities may produce greater efficiency. One way to logically bundle activities is to combine all routine maintenance activities into one contract. The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- If an SHA is already outsourcing several individual or small bundles of routine maintenance activities, the SHA might consider outsourcing ALL routine maintenance activities as a single bundle to one contractor to reduce the administrative load.
- If the availability of contractors who are willing to bid on, and can perform, the work is plentiful in a region, then a Routine Maintenance Contract Method might be appropriate.
- The SHA must have experienced in-house personnel with a diverse inspection history who can inspect the contractors work daily and administer the contract.
- If an SHA has already implemented several method-based contracts for individual routine maintenance activities, for which a well-defined set of technical specifications has been established, combining all routine maintenance activities into one contract might be appropriate.

8.9.3 Selecting a Type of Specification

On a Routine Maintenance Contract, any one of the following three types of specifications may be used:

1. Method-based
2. Performance-based
3. Warranty

The following considerations often drive the selection of a particular type of specification:

- If the set of routine maintenance activities does not have easily-definable and measurable performance criteria, then a method-based, rather than performance-based, specification would be appropriate.

- If an SHA is comfortable shifting the performance risk to the contractor, then a performance-based specification is one way to accomplish the task. Otherwise, the SHA should use a method-based specification in order to control when and how the work is performed.
- If a performance-based specification is selected, the SHA may need to train in-house personnel in the administration of the contract.
- If the SHA wants a warranty on the completed maintenance work, then a warranty specification should be selected.

Also refer to the *General Guidelines for Selecting a Type of Specification* for additional considerations.

8.9.4 Pricing Strategy Options

On a Routine Maintenance Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus

The pricing strategy will be driven by the type of specification that has been selected. Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.9.5 Selecting an Award Strategy

On a Routine Maintenance Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If the routine maintenance activities are straightforward and do not have any complicated aspects of the work, then low bid may be appropriate.
- If a well-defined set of technical specifications have been developed from which bidders can prepare an accurate estimate, then low bid may be appropriate.
- If the SHA wants to evaluate the contractor's past performance and plan of work to determine which contractors might be especially well qualified, then best value is appropriate.

Refer to the *General Guidelines for Selecting an Award Strategy* for specific considerations.

8.9.6 Additional Information and Reference

- Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.10 Integrated Maintenance Contract Method

8.10.1 Definition of Integrated Maintenance Contract Method

On an Integrated Maintenance Contract, both routine and preventive maintenance activities are outsourced together as one contract. This method differs from the Routine Maintenance Contract Method because it includes BOTH routine and preventive maintenance activities. If a performance-based specification and lump sum pricing are used, the method is essentially a Total Asset Management Contract. If a method-based specification and unit pricing are used, the method is essentially a Significantly Bundled Activities Contract.

8.10.2 Conditions for Appropriate Implementation

The conditions for implementing an Integrated Maintenance Contract are very similar to those for a Routine Maintenance Contract. Implementation is often driven by a shortage of in-house resources and a desire to increase the efficiency of outsourcing. A greater number of activities are bundled together, approaching a strategy similar to one that bundles "nearly all" activities together. The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- If an SHA is already outsourcing several individual or small bundles of routine and/or preventive maintenance activities, the SHA might consider outsourcing ALL routine and preventive maintenance activities as a single bundle to one contractor to reduce the administrative load.
- If the availability of contractors who are willing to bid on, and can perform, such a large bundle of activities is sufficient in a region, then an Integrated Maintenance Contract Method might be appropriate.
- The SHA must have experienced in-house personnel with a diverse inspection history who can inspect the contractors work daily and administer the contract.
- If an SHA has already implemented several method-based contracts for individual routine and/or preventive maintenance activities, for which a well-defined set of technical specifications has been established, combining all routine and preventive maintenance activities into one contract might be appropriate.

8.10.3 Pricing Strategy Options

On an Integrated Maintenance Contract, any one of the following three types of specifications may be used:

1. Method-based
2. Performance-based
3. Warranty

The following considerations often drive the selection of a particular type of specification:

- If the set of maintenance activities does not have easily-definable and measurable performance criteria, then a method-based, rather than performance-based, specification would be appropriate.
- If an SHA is comfortable shifting the performance risk to the contractor, then a performance-based specification is one way to accomplish the task. Otherwise, the SHA should use a method-based specification in order to control when and how the work is performed.
- If a performance-based specification is selected, the SHA may need to train in-house personnel in the administration of the contract.
- If the SHA wants a warranty on the completed maintenance work, then a warranty specification should be selected.

Also refer to the *General Guidelines for Selecting a Type of Specification* for additional considerations.

8.10.4 Selecting a Type of Specification

On an Integrated Maintenance Contract, any one of the following three pricing strategies may be used:

1. Unit Price
2. Lump Sum
3. Cost Plus

The pricing strategy will be driven by the type of specification that has been selected. Refer to the *General Guidelines for Selecting a Pricing Strategy* for specific considerations.

8.10.5 Selecting an Award Strategy

On an Integrated Maintenance Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations often drive the selection of a particular award strategy:

- If the routine and preventive maintenance activities are straightforward and do not have any complicated aspects of the work, then low bid may be appropriate.
- If a well-defined set of technical specifications have been developed from which bidders can prepare an accurate estimate, then low bid may be appropriate.
- If the SHA wants to evaluate the contractor's past performance and plan of work to determine which contractors might be especially well qualified, then best value is appropriate.

Refer to the *General Guidelines for Selecting an Award Strategy* for specific considerations.

8.10.6 Additional Information and Reference

- Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.11 Significantly Bundled Activities Contract Method

8.11.1 Definition of Significantly Bundled Activities Contract Method

On a Significantly Bundled Activities Contract, nearly all maintenance activities are let out together, other than a few activities that are special or unique. A method-based specification and unit price are an integral part of this method. This contract strategy has also been called a General Maintenance Contract in TxDOT. The duration of the contract is typically one year.

8.11.2 Conditions for Appropriate Implementation

The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- If an SHA has a shortage of in-house resources, and many maintenance activities are already outsourced, the SHA may have developed significant experience in maintenance outsourcing. Hence, the next step might be to consider outsourcing all maintenance to one contractor for a particular area or a particular asset (such as a stretch of highway).
- If the availability of contractors who are willing to bid on, and can perform, the work is plentiful in a region, then a Significantly Bundled Activities Contract Method might be appropriate.
- This method may be more appropriate for large urban areas that have well-established contracting communities that can bid on, and administer, this type and size of contract.
- In order to further reduce administrative and inspection load, an SHA can combine nearly all maintenance activities into one contract because greater bundling of activities may be more efficient. Hence, a Significantly Bundled Activities Contract Method might be appropriate.
- The SHA must have significant in-house resources to inspect the contractors work daily and administer the contract. Because the SHA retains control over when and how the work is performed, a significant inspection effort is necessary.
- A Project Manager, rather than an inspector, may be assigned to administer the contract since it involves a large and diverse scope of work.
- If an SHA has already implemented several method-based contracts for individual or moderately bundled activities, for which a well-defined set of maintenance

specifications has been established, combining nearly all maintenance activities into one contract might be appropriate.

- A few bid items may be excluded from the Significantly Bundled Activities Contract if those items can be let for a better price individually.

8.11.3 Selecting a Type of Specification

On a Significantly Bundled Activities Contract, only the following type of specification may be used:

- Method-based

Control over performance of the work—including when and how maintenance is performed—is retained by the SHA, who provides technical specifications that the contractor must follow when implementing the work. Daily inspections are performed to ensure the contractor is conforming to the specifications.

8.11.4 Pricing Strategy Options

On a Significantly Bundled Activities Contract, the following pricing strategy shall be used:

- Unit Price

Essentially, all individual maintenance activities are let out together, with each activity requiring a unit price bid.

8.11.5 Selecting an Award Strategy

On a Significantly Bundled Activities Contract, the following award strategies may be used:

1. Low Bid
2. Best Value

If low bid is legislatively required, then it must be used. Texas, for example, has successfully administered a Significantly Bundled Activities Contract using a low bid strategy. If low bid is not required, then a best value award strategy may be appropriate.

8.11.6 Additional Information and Reference

- Details about the implementation of a Significantly Bundled Activities Contract Method can be found in Chapter 9 under Case Study 7 for Houston District of TxDOT.

8.12 Total Asset Management Contract Method

8.12.1 Definition of Total Asset Management Contract Method

The Total Asset Management Contract Method is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management, January 2006). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are an integral part of this method. Florida calls this method Total Asset Maintenance Contracting and Texas calls this method Total Maintenance Contracting. The length of the contract is often more than 5 years.

8.12.2 Conditions for Appropriate Implementation

The following circumstances may make this method appropriate for implementation or the following conditions should be considered prior to implementing this strategy:

- If an SHA has a shortage of in-house resources, and many maintenance activities are already outsourced, the SHA may have developed significant experience in maintenance outsourcing. Hence, the next step might be to consider outsourcing all maintenance to one contractor for a particular area or a particular asset (such as a stretch of highway).
- If the availability of contractors that are willing to bid on, and can perform, the work is plentiful in a region, then a Total Asset Management Contract Method might be appropriate.
- In order to further reduce administrative and inspection load, an SHA can combine nearly all maintenance activities into one contract because greater bundling of activities may be more efficient. Hence, a Total Asset Management Contract Method might be appropriate.
- If an SHA has already implemented several performance-based contracts for individual or bundled activities, for which a well-defined set of performance standards has been established, combining all maintenance activities into one Total Asset Management Contract Method might be appropriate.
- If the SHA already has an efficient contractor performance evaluation method associated existing performance-based contracts, then implementing a Total Asset Management Contract Method might be appropriate.
- Evidence suggests that a period of 3-5 years may be necessary to smooth out the administration of an SHA's first Total Asset Management Contract.

8.12.3 Selecting a Type of Specification

On a Total Asset Management Contract, only the following type of specification may be used:

- Performance-based

Control over performance of the work—including when and how maintenance is performed—is essentially turned over to the contractor, who is then evaluated based on how well they meet the defined performance criteria.

8.12.4 Pricing Strategy Options

On a Total Asset Management Contract, the following pricing strategies may be used:

1. Lump Sum
2. Hybrid of Lump Sum and Unit Price

If the volume of work associated with certain maintenance activities is not easy to quantify at the time of bidding, unit pricing may be used for the payment of these activities and lump sum is used for the payment of the remainder of activities. Furthermore, if the price of materials associated with certain maintenance activities is expected to fluctuate greatly, then unit pricing may be used on those activities while using lump sum for all other activities.

8.12.5 Selecting an Award Strategy

On a Total Asset Management Contract, the following award strategies may be used:

1. Low Bid
2. Best Value

Although a best value award strategy is most frequently used with a Total Asset Management Contract, some states legislatively mandate the use of a low bid award strategy. If low bid is legislatively required, then it must be used. Texas, for example, has successfully administered a Total Asset Management Contract using a low bid strategy. If low bid is not required, then a best value award strategy is appropriate. Florida and North Carolina have both administered a Total Asset Management Contract using a best value award strategy.

8.12.6 Additional Information and Reference

- Details about the implementation of Total Asset Management Contract Method can be found in Chapter 9 as Case Study 8 for Florida DOT, Case Study 9 for North Carolina DOT, Case Study 10 for Waco District of TxDOT, and Case Study 11 for Dallas District of TxDOT.
- Review of VDOT's Administration of the Interstate Asset Management Contract. Joint Legislative Audit and Review Commission of the Virginia General Assembly (JLARC), Richmond, Jan. 11, 2001
- Graff, J. S. (2000). "Total Maintenance Contracts," the Ninth AASHTO/TRB Maintenance Management Conference, Juneau, Alaska, 2000. Pp. 10
- Ribreau, N. (2004). "Highway maintenance outsourcing experience – Synopsis of Washington State Department of Transportation's review," Maintenance Management and Services, Transportation Research Board National Research Council, Washington, 3-9.

- Stankevich, N., Qureshi, N., and Queiroz, C. (2005). "Performance-based contracting for preservation and improvement of road assets," Transport Note No. TN-27, The World Bank, Washington, D.C.

8.13 Alliance Contract Method

8.13.1 Definition of Alliance Contract Method

On an Alliance Contract, a contractor is selected based entirely on qualifications and has the opportunity to gain or lose 15% of the contract value depending on performance. This method typically carries out performance-based specification and uses cost plus fee as the pricing strategy. The method is very new, and England is the only country that is currently using it. The duration of England's contract is seven years. Hence, as the method matures, additional research will be needed to identify its benefits and barriers.

8.13.2 Conditions for Appropriate Implementation

This method was developed primarily to reduce potential conflicts between SHAs and contractors by paying the contractor for the actual cost of the work plus a negotiated fee as a profit. The following circumstances and conditions should be considered prior to implementing this strategy:

- Contractor selection is based completely on qualifications; therefore, it is necessary that legislation permit a 100% qualification-based award, where price is not a key consideration.
- A target price will be determined after the contractor is selected. Hence, the SHA needs to be able to generate a target price, which can then be further negotiated with the contractor.
- A special alliance team must be formed between the agency and the contractor to implement and administer this contract.
- Since the contractor may gain or lose 15% of the contract value depending on performance, a well-defined performance standard must be established.
- In addition to having detailed performance criteria, a method is needed to evaluate contractor performance.

8.13.3 Selecting a Type of Specification

On an Alliance Contract, only the following type of specification may be used:

- Performance-based

Because the Alliance Contract Method permits the contractor to gain or lose 15% of the contract value depending on performance, the type of specification is necessarily limited to performance-based, where the contractor can determine when and how to complete the work and is evaluated on its performance.

8.13.4 Pricing Strategy Options

On an Alliance Contract, only the following pricing strategy may be used:

- Cost Plus Fee

8.13.5 Selecting an Award Strategy

On an Alliance Contract, only the following award strategy may be used:

- 100% Qualification-Based

8.13.6 Additional Information and Reference

- Pakkala, P. A., de Jong, M., and Aijo, J. (2007). "International overview of innovative contracting practices for roads," Finnish Road Administration, Helsinki.

8.14 Kilometer (Mile) Per Month Contract Method

8.14.1 Definition of Kilometer (Mile) Per Month Contract Method

This method applies essentially to a sub-network of paved roads which is in good to fair condition and is further expected to remain substantially in that condition over the next few years through routine maintenance activities alone, without any major strengthening or rehabilitation. This methods is used widely in Latin America but is not currently used in the United States. A performance-based specification and lump sum pricing are an integral part of this method. The contractor is paid equal monthly installments on a lump sum basis in terms of US$/month/km (ml) of roads maintained, as long as the quality of outputs complies with the performance standards. The agency inspects the contractor's work monthly. The penalties are based on deficiencies noted during monthly inspections. If the outputs do not comply with standards, daily penalties are imposed and subtracted from future payments until repairs are carried out.

8.14.2 Conditions for Appropriate Implementation

The method is similar to the Total Asset Management Contract Method but includes only routine maintenance activities. The following circumstances make this an appropriate strategy to implement:

- The agencies that implement this method do not include preventive maintenance or rehabilitation associated with the contracted roads during the period of contract. Hence, the contracted roads must be in good or fair condition.
- Since this method uses a performance-based specification, a well-defined performance standard for rehabilitation as well as routine maintenance must be established.
- In addition to having detailed performance criteria, a method is needed to evaluate contractor performance.
- This method provides a daily penalty for deficiencies in performance. If the performance does not comply with standards, daily penalties are imposed by deducting from future payments until repairs are completed. No penalties are imposed for the first

two or three months upon the award of a contract, giving the contractor enough time to repair existing deficiencies.

- Because daily penalties are written into the contract, the SHA needs a method for inspecting the contractor's work to ensure compliance or to impose the penalty.
- The contractor is paid monthly based on the agreed-upon total lump sum price of the contract minus any penalties.

8.14.3 Selecting a Type of Specification

On a Kilometer per Month Contract, only the following type of specification may be used:

- Performance-based

The Kilometer per Month contract strategy is very similar to a Total Asset Management contract method, with the key difference that Kilometer per Month only includes routine maintenance. Hence, a performance-based specification is implemented, where the contractor has control over when and how various routine maintenance activities are performed.

8.14.4 Pricing Strategy Options

On a Kilometer per Month Contract, only the following pricing strategy may be used:

- Lump Sum

8.14.5 Selecting an Award Strategy

On a Kilometer per Month Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations may drive the selection of a particular award strategy:

- If price is the primary concern of the SHA, then low bid is appropriate.
- Low bid may be appropriate if the SHA feels comfortable with the completeness of the specifications and the definition of the detailed performance criteria.
- If the SHA wants to evaluate the contractor's equipment, personnel, access to materials, other commitments, and/or planned approach to the work, then best value is appropriate because the contractor's resources, past performance and plan of work may be considered when selecting the best contractor.

Refer to the General Guidelines for Selecting an Award Strategy for specific considerations.

8.14.6 Additional Information and Reference

- Liautaud, G. (2004). "Maintaining roads. Experience with output-based contracts in Argentina," The World Bank, Washington, D.C.

8.15 CREMA Contract Method

8.15.1 Definition of CREMA Contract Method

A Combined Rehabilitation and Maintenance (CREMA) Contract requires contractors to rehabilitate and then subsequently maintain a sub-network of roads under a lump sum contract for at least five years. This model originated in Argentina and is currently used in Latin America. In the U.S., this method has been used for traffic signal rehabilitation and maintenance. A performance-based specification and lump sum pricing are an integral part of this strategy.

8.15.2 Conditions for Appropriate Implementation

This method requires rehabilitation work to be carried out first, and then subsequent routine maintenance activities must be performed throughout the contract period. Hence, the contractor must have the ability to perform rehabilitation as well as routine maintenance. The agencies that implement this method believe that the combination of rehabilitation with routine maintenance will increase the quality of rehabilitation because the rehabilitation contractor is also responsible for subsequent routine maintenance. The following circumstances make this an appropriate strategy to implement:

- The roadway or asset is in a deteriorated condition, making routine maintenance less effective.
- The condition of the roadway or asset creates the potential for numerous disputes once a contractor has been hired to maintain the asset.
- Since this method uses a performance-based specification, a well-defined performance standard for rehabilitation as well as routine maintenance must be established.
- In addition to having detailed performance criteria, a method is needed to evaluate contractor performance.

8.15.3 Selecting a Type of Specification

On a CREMA Contract, only the following type of specification may be used:

- Performance-based

The CREMA contract strategy is very similar to a Total Asset Management contract method, with the key difference that CREMA requires rehabilitation first. Hence, a performance-based specification is implemented, where the contractor has control over when and how various maintenance activities are performed.

8.15.4 Pricing Strategy Options

On a CREMA Contract, either one of the following pricing strategies may be used:

1. Lump Sum
2. Cost Reimbursement

Although lump sum pricing is the primary pricing strategy used, reimbursement of cost overruns that are beyond the control of the contractor is permitted.

8.15.5 Selecting an Award Strategy

On a CREMA Contract, either one of the following two award strategies may be used if legislation does not prescribe the use of one or the other:

1. Low Bid
2. Best Value

The following considerations may drive the selection of a particular award strategy:

- If price is the chief concern of the SHA, then low bid is appropriate.
- Low bid may also be appropriate if the SHA has worked with the bidders previously and is comfortable with their capabilities.
- If the SHA wants to evaluate the contractor's equipment, personnel, access to materials, other commitments, and/or planned approach to the work, then best value is appropriate because the contractor's resources, past performance and plan of work may be considered when selecting the best contractor.

Refer to the General Guidelines for Selecting an Award Strategy for specific considerations.

8.15.6 Additional Information and Reference

- Liautaud, G. (2004). "Maintaining roads. Experience with output-based contracts in Argentina," The World Bank, Washington, D.C.

Chapter 9. Case Studies on Innovative Maintenance Contracting Strategies

This chapter discusses 11 case studies on the implementation of five maintenance delivery methods that have been investigated through 10 in-person interviews and one phone interview. Each case study is developed from an interview with either the director of maintenance or one or more maintenance expert within TxDOT or other state DOTs. Table 9.1 and Table 9.2 list the delivery methods that are being used respectively within TxDOT and other state DOTs and have been investigated and described in the case studies.

Table 9.1: List of TxDOT districts and respective delivery methods investigated

TxDOT District	Delivery Method
Dallas	Total Asset Management Contract Method (also called Total Maintenance Contract)
Houston	Significantly Bundled Activities Contract Method (also called General Maintenance Contract)
Lubbock	Moderately Bundled Activities Contract Method
Lufkin	Jointly-Performed Maintenance Contract Method
Pharr	Moderately Bundled Activities Contract Method
Waco	Total Asset Management Contract Method (also called Total Maintenance Contract)

Table 9.2: List of other state DOTs and respective delivery methods investigated

State DOT	Delivery Method
Florida	Total Asset Management Contract Method (also called Asset Maintenance Contract)
North Carolina	Total Asset Management Contract Method (also called Performance-based Contract)
Pennsylvania	Jointly-Performed Maintenance Contract Method
Kentucky	Moderately Bundled Activities Contract Method (also called Hybrid Contract)
Maine	Long-term Separate Maintenance Contract Method

9.1 Case Study 1: Jointly-Performed Maintenance Contract Method

State and District Visited: Pennsylvania DOT (PennDOT) Maintenance Division

9.1.1 Activities Outsourced Using this Contracting Strategy

Under this contracting strategy, the contractor is responsible to supply the equipment, materials, and personnel available and ready to perform:

- Snow clearance
- Ice clearance
- Application of anti-skid and/or de-icing materials for certain state highways

The work shall be performed in a prompt and efficient manner during the winter season (October 15 to April 30 of each year).

9.1.2 Description of the Contracting Strategy Investigated

Delivery Method: Jointly-Performed Maintenance Contract Method, where a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor.

Type of Contract Specifications: Method-Based

Contract Duration: Winter Season from October 15 to April 30

Pricing Strategy for this Contract Strategy: Unit Price on the basis of snow-mile per hour whereby the contractor shall perform all work with its own equipment, material and personnel. The rate is adjusted each year. The 2008 hourly rate was $200/hour, but the 2009 rate was changed to $150/hour because PennDOT provided fuel and materials for the contractor.

Award Strategy: Best Value

Best Value Criteria:

- Price (90%)
- Previous Performance (10%)

9.1.3 Why this Contracting Strategy was Selected

PennDOT is reasonably well-staffed to handle winter weather road conditions because a significant portion of their maintenance efforts are applied to maintaining the roads during adverse weather. However, during the winter season, PennDOT typically needs additional personnel and equipment to assist in-house personnel with the removal of snow and ice from the surface of roads. As a result, PennDOT must contract out a portion of their winter weather maintenance service.

Because road conditions directly affect the public, PennDOT does not want to lose control of winter maintenance activities; hence, **flexibility** is a key criterion for selecting a contracting strategy. The **Jointly-Performed Maintenance Contract Method**, which allows a portion of maintenance activity to be performed in-house and the remainder to be outsourced,

satisfies PennDOT's need to maintain control while flexibly assigning work to contractors as needed. By augmenting its staff through jointly-performed maintenance activities, PennDOT avoids retaining personnel and equipment that might otherwise be idle. Furthermore, PennDOT can meet budgetary constraints while addressing a resource shortage.

9.1.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by PennDOT for selecting the **Jointly-Performed Maintenance Contract Method** for winter snow and ice control:

Criteria
• Flexibility of this method allows PennDOT to use only as much augmented personnel and equipment as necessary to keep the roads cleared
• Level of control PennDOT will have over the work makes this option attractive
• District budget limitations made the contract method attractive as a method to augment PennDOT personnel and equipment
• The availability of contractor workforce to augment limited PennDOT personnel was a consideration
• Composition of in-house and outsourced resources made augmentation of both personnel and equipment an attractive option
• The seasonal nature of the work made the Jointly-Performed Maintenance Contract Method attractive because contractor personnel and equipment were released after the winter season ended
• Outsourcing as a means to reduce full-time employees was directed by executive management

The following criteria were used by PennDOT for selecting the **method-based** type of contract specification:

Criteria
• Level of control PennDOT would have over the work by specifying the materials and methods to be used
• Level of trust in contractors; PennDOT felt more comfortable directing how to perform the work
• Quality of contractors; because the work was seasonal, PennDOT felt more comfortable directing how to perform the work
• Participation of contractors in bid process; a method-based specification was standard and would attract numerous bidders

9.1.5 How this Contracting Strategy was Implemented

Each year in August, PennDOT districts begin the process of selecting contractors for their winter maintenance, including snow and ice control, by sending out an Invitation to Qualify

(ITQ)/Request for Quotation (RFQ) with a specification that guarantees 40 hours per week of work and the type of equipment needed. Contractors are selected based on a Best Value strategy. Once a contract has been awarded, PennDOT conducts a "snow academy" to kick off the winter season and to set expectations about the work to be performed. PennDOT subsequently conducts an inspection and calibration of the contractor's equipment, particularly of the spreader that applies salt to the road. The contract permits the contractor to park its equipment in PennDOT's yard so that it is readily available when the contractor is called to duty.

The contractor equipment and personnel are used for emergency routes or assigned a designated snow route. A route typically contains enough work to result in a cycle of 10 - 12 hours, and contractors typically complete four runs during this time. The contract establishes a two-hour on-call time whereby a contractor must take action to clear their snow route within the two hours notice from PennDOT.

9.1.6 Outcome Resulting from Implementation of this Strategy

Implementation of the Jointly-Performed Maintenance Contract Method resulted in an increase in the level of service achieved, as reported by PennDOT. To evaluate the contractor's performance, a foreman was assigned by PennDOT to spot check the work and the assistant county maintenance manager would routinely ride the roads and grade the contractor's performance. The specific criteria PennDOT used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time
• Level of Service (LOS) achieved versus LOS goals

PennDOT reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Verification of Contractor Qualifications
• Inspection of the Completed Work
• Contract Duration, which was suitable for seasonal work
• Ability to Impose Penalties (Liquated Damages) if Work Did Not Conform
• Experienced Contractor Equipment Operators

9.1.7 Best Practices and Lessons Learned

PennDOT was asked to identify those practices they recommend to other agencies that might consider implementing the Jointly-Performed Maintenance Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. For most winter seasons, approximately 800 winter maintenance agreements with local contractors receive a rate increase based on, but not limited by, the Municipal Cost Index (MCI). Frequently, PennDOT grants an increase in excess of the MCI, taking into consideration such factors as fuel and material costs.
2. For winter maintenance equipment provided by contractors, a mobilization incentive is granted. At the discretion of the particular Maintenance District, this could be a flat rate payment of, for instance $2,000, or a payment based on the contractor's hourly bid rate in compensation for the time required to have the equipment inspected and calibrated.
3. PennDOT's contingency plan also includes hiring temporary operators and the use of "standby" rentals that are not assigned to a particular route. The temporary operators must be experienced and trained to do winter maintenance and are frequently rehired each season. The standby rentals are used on an as-needed basis in emergency situations or on routes that require additional runs during particular storms.

Lesson Learned for the Contracting Strategy

1. Some winter events have highlighted the need for effective inter-departmental communication: from county to county, district to district, from counties and districts to central office and back again.
2. The varying nature of winters in Pennsylvania has led PennDOT to partner with the Department of General Services to negotiate with Sodium Chloride vendors to obtain the ability to purchase extra material at a rate of between 100% and 130% of PennDOT's bid estimate. This reduces price gouging.
3. Internal equipment and personnel reductions must be implemented with caution. It is possible that unforeseen winter events may highlight a lack of foresight.
4. Both PennDOT's and contractor's equipment must be used effectively. It is an irresponsible use of taxpayer dollars, for instance, when a piece of contractor's equipment is guaranteed a certain number of hours in a season but is seldom, if ever, used. Also, underutilization could result in equipment cutbacks, compromising PennDOT's ability to respond to events.

9.2 Case Study 2: Jointly-Performed Maintenance Contract Method

State and District Visited: Lufkin District of TxDOT

9.2.1 Activities Outsourced Using this Contracting Strategy

Lufkin District has a milling machine but does not have a laydown machine to perform pavement overlay operations. Thus, under this contracting strategy, TxDOT in-house personnel performed milling operations, but laydown, rolling and raking of the asphalt was outsourced to a contractor. In accordance with the contract (purchase order / purchase of services agreement), the contractor should provide the laydown machine and the roller along with an operator while TxDOT would perform milling operations.

Furthermore, TxDOT purchased traffic control services and rented dump trucks under separate contracts for the overlay operation.

9.2.2 Description of the Contracting Strategy Investigated

Delivery Method: Jointly-Performed Maintenance Contract Method, where a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor.

Type of Contract Specifications: Method-Based

Contract Duration: 24 months with the option to renew for two additional terms of 24 months.

Pricing Strategy for this Contract Strategy: Unit Price on the basis of hourly rate whereby the contractor shall perform all work with its own equipment and personnel. The hourly rate of the original contract was $249/hr. The rate may be adjusted for each renewal period in accordance with changes in a price index.

Award Strategy: Low Bid

9.2.3 Why this Contracting Strategy was Selected

Performing an asphalt overlay requires special equipment and expertise. Typically, before applying an overlay, the existing asphalt surface must be milled. Subsequently, a laydown machine with a screed is used to place the hot mix asphalt on the milled surface and then the material is leveled. An asphalt roller is then used to compact the asphalt evenly. Lufkin District has milling machines and operators but does not have a laydown machine or operator. As a result, Lufkin District contracted out the laydown operation but performed the milling operation using in-house personnel.

Since Lufkin District has milling machines with experienced operators, it would like to use its own resources when possible for overlays and spot repairs of small sections of pavement. Because many of the overlays and repairs are completed as emergency repairs or on an urgent basis, Lufkin District cannot guarantee the contractor minimum quantities of work. Hence, **flexibility** is a key criterion for selecting this contracting strategy. The **Jointly-Performed Maintenance Contract Method**, which allows a portion of maintenance activities to be performed in-house and the remainder to be outsourced, satisfies Lufkin District's need to take full advantage of existing in-house resources while flexibly assigning work to other contractors as needed. By supplementing its equipment and personnel through jointly-performed

maintenance activities, Lufkin District avoids spending extra money that would be needed to purchase and maintain special equipment. Furthermore, Lufkin District can meet budgetary constraints while addressing a resource shortage.

9.2.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Lufkin District for selecting the **Jointly-Performed Maintenance Contract Method** for emergency-type overlay maintenance:

Criteria
• Flexibility of this method allowed Lufkin District to make use of existing equipment and in-house personnel and to outsource the remaining equipment and labor that it does not have in-house
• District budget limitations made the contract method attractive as a method to augment Lufkin District personnel and equipment
• The availability of contractor workforce to augment limited Lufkin District personnel was a consideration
• Composition of in-house and outsourced resources made augmentation of both personnel and equipment an attractive option
• Length of time of the contract was a consideration as it is often difficult in rural districts to identify qualified contractors

The following criteria were used by Lufkin District for selecting the **method-based** type of contract specification:

Criteria
• Level of control Lufkin District would have over the work by specifying the materials and methods to be used
• Quality of contractors; Lufkin District has qualified contractors that can augment in-house resources and they have a well-developed contracting communities

9.2.5 How this Contracting Strategy was Implemented

Laydown is a highly specialized operation. Lufkin District assigned a team of people to write the specification for laydown operations. A Request for Proposal (RFP) was issued to solicit bids and the lowest priced bidder was selected. All aspects of the laydown operation were specified before contracting out the work. For example, while Lufkin District has its own rollers, Lufkin District decided to let the contractor perform asphalt laydown *and* rolling together in order to improve the quality of the finished product, rather than separate laydown operation (i.e., award to contractor) from rolling (i.e., perform in-house). Hence, the strategy required the contractor take full responsibility of the quality of the finished surface.

TxDOT elected to award this work through a purchase of services agreement rather than a standard contract tool. The purchase order can be renewed up to two times, and the unit price

can be adjusted in accordance with a price index. Furthermore, the district can terminate the agreement by providing a 30-day written notice to the contractor. Lufkin District indicated that the purchase order offers greater flexibility than a regular contract.

9.2.6 Outcome Resulting from Implementation of this Strategy

Implementation of the Jointly-Performed Maintenance Contract Method enabled both in-house and contractor expertise to be used effectively. Thus, the work was performed more productively, which resulted in an increase in the level of service achieved and overall cost savings, as reported by Lufkin District. The milling operator (i.e., TxDOT personnel) also acted as the inspector who evaluated the contractor's performance. The specific criteria Lufkin District used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time
• Level of Service (LOS) achieved versus LOS goals
• Quality of service achieved versus quality of service goals
• In-house costs versus contract costs

Lufkin District reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Inspection of the Completed Work
• In-House Knowledge Retention
• Contract Duration, which was appropriate to retain the contractor's service especially in an area where it is not easy to find a contractor
• Experienced Contractor Project Manager

9.2.7 Best Practices and Lessons Learned

Lufkin District was asked to identify those practices they recommend to other agencies that might consider implementing the Jointly-Performed Maintenance Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. For this particular delivery method, it is better to use a purchase of services agreement (purchase order) rather than a regular contract.
2. The purchase order should include the cost index so that the contract can be easily renewed and the same contractor can be hired for a very long period, resulting in more consistency.

Lesson Learned for the Contracting Strategy

1. The desired finished product and remediation measures required should be clearly identified in the specifications.

9.3 Case Study 3: Long-term Separate Maintenance Contract Method

State and District Visited: Maine DOT Maintenance Division

9.3.1 Activities Outsourced Using this Contracting Strategy

The activities covered under this contract consisted of:

- Constructing and maintenance of two handicap accessible restrooms
- Contractor must clean and maintain the restrooms regularly
- Contractor is also responsible for the parking lot, which shall be kept plowed and will be salted and sanded as needed

This contract combined construction and maintenance together, and a key feature of the contract was its duration, which was longer than normal to ensure the contractor and Maine DOT would experience a return on its investment as a result of constructing the restrooms.

9.3.2 Description of the Contracting Strategy Investigated

Delivery Method: On a Long-term Separate Maintenance Contract, a single maintenance activity is outsourced across many areas, regions, or even the entire county for a long duration, typically more than five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years.

Type of Contract Specifications: Performance-Based

Pricing Strategy for this Contract Strategy: Lump Sum for construction and monthly payments with inflation adjustment for maintenance

Contract Duration: 5 years with a 2-year extension

Award Strategy: Best Value

Best Value Criteria:

- Price (50%)
- Plan of Work (25%)
- References or Prior Experience (25%)

9.3.3 Why this Contracting Strategy was Selected

There is no rest area facility at the particular location for which this contract was let. The legislature required that Maine DOT build one. While other interstate rest areas are maintained by in-house personnel, Maine DOT has no other staff to construct and maintain this particular rest area because of its location. Due to the shortage of personnel, Maine DOT wanted to concentrate their labor on core functions, such as plowing or summer maintenance work. Maine DOT decided to contract out this rest area as it is not a core function. Standard maintenance contracts for rest areas are for one year, but this contract combined construction and maintenance. Because the contractor is responsible to build and operate the facility, Maine DOT wanted to allow a return on investment. Hence, Maine DOT required the contractor to commit for a long time, so they established a contract duration of five years.

9.3.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Maine DOT for selecting the **Long-term Separate Maintenance Contract Method** for rest area maintenance:

Criteria
• Length of time of the contract was a factor because Maine DOT wanted to experience a return on investment

The following criteria were used by Maine DOT for selecting the **performance-based** type of contract specification:

Criteria
• Level of trust in contractors was a consideration because the selected contractor owned property next to the rest area and had a vested interest in ensuring the restroom was clean and operational
• Participation of contractors in bid process was a consideration because this particular location is rural
• The type of work was especially suitable for a performance-based specification

9.3.5 How this Contracting Strategy was Implemented

A small team, consisting of a contract specialist and maintenance personnel, developed the specification and contract document. Best value was used to select the contractor. A very loose performance-based specification was implemented for this contract. Maine DOT conducted fairly regular inspections on the facility and also received input from tourism staff. If DOT staff

observed an unclean facility or DOT received a complaint from the public, they would request the contractor make a correction.

9.3.6 Outcome Resulting from Implementation of this Strategy

Maine DOT reported that the performance of this contract is good. They also indicated that the contractor appears to be able to complete the work more cost effectively than in-house personnel. In terms of the quality of maintenance services, Maine DOT indicated it is too early to tell how high the quality will be over time. While the quality decreased initially because of the loose performance-based specification, Maine DOT expects the quality to increase over time through more effective management. The specific criteria Maine DOT used to evaluate the contractor's performance included:

Criteria
• Delivery Timeliness
• Response Time
• Number of Warnings Issued

Maine DOT reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear Language in the Technical Specifications
• Partnering with the Contractor
• Verification of the Contractor's Qualifications
• In-House Inspection of the Completed Work
• In-House Knowledge Retention
• Contract Duration
• Experienced Contractor Project Manager

9.3.7 Best Practices and Lessons Learned

Maine DOT was asked to identify those practices they recommend to other agencies that might consider implementing the Long-term Separate Maintenance Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. The DOT must cultivate potential bidders before issuing the RFP for bidding
2. A small local company in the area is often better than a big company located elsewhere because the local contractor will take ownership of the facility.
3. It is best to select a contractor who really cares about the product or service it provides.

Lesson Learned for the Contracting Strategy

1. Don't allow internal pressure to dictate changes on the particular project. For example, do not treat the particular facility the same as the other rest area facilities owned and maintained in-house.

9.4 Case Study 4: Moderately Bundled Activities Contract Method

State and District Visited: Lubbock District of TxDOT

9.4.1 Activities Outsourced Using this Contracting Strategy

Using the moderately bundled maintenance activities contracting strategy, a few roadside maintenance activities on a specified highway and controlled access routes were let out together. The roadside maintenance activities typically covered in this contract include:

- Mowing
- Fertilizer application
- Litter control
- Hand sweeping of highways
- Plant beds
- Brush removal
- Cleaning drainage channel
- Hand sweeping of ADA ramps
- Pruning
- Tree removal
- Cleaning riprap

Guardrail maintenance is not included.

9.4.2 Description of the Contracting Strategy Investigated

Delivery Method: In a Moderately Bundled Activities Contract Method, a few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up.

Type of Contract Specifications: Method-Based

Pricing Strategy for this Contract Strategy: Unit Price

Contract Duration: Two years with a renewal option

Award Strategy: Low Bid

9.4.3 Why this Contracting Strategy was Selected

Lubbock District decided to bundle several individual roadside maintenance contracts into one contract to reduce the number of contracts it had to manage and to reduce overhead costs. The method enabled them to put their personnel mostly on pavement maintenance.

9.4.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Lubbock District for selecting the **Moderately Bundled Activities Contract Method** for roadside maintenance:

Criteria
• District budget limitations made the contract method attractive as a method to reduce overhead costs
• The availability of contractors is limited in Lubbock District, so a moderate bundle (rather than a large bundle or several individual contracts) was the best option for ensuring competitive bids

The following criteria were used by Lubbock District for selecting the **method-based** type of contract specification:

Criteria
• Level of control Lubbock District would have over the work by specifying the materials and methods to be used was a consideration
• Level of trust in contractors; Lubbock District felt more comfortable directing how to perform the work
• Quality of contractors; Lubbock District felt more comfortable directing how to perform the work rather than specifying a desired outcome

9.4.5 How this Contracting Strategy was Implemented

Initially, Lubbock District consulted with section supervisors to determine which maintenance activities they wanted to put in this contract, and then the district created a special specification and a special contract. After section supervisors approved the specification, it was sent to, and approved by, the TxDOT Specification Committee.

However, after TxDOT created the standard Maintenance Item Specification Book in 2004, Lubbock District selected maintenance activity specifications from the book which were associated with their moderately bundled activities contract, such as mowing, plant beds, pruning, fertilizer application, brush removal, tree removal, litter control, cleaning riprap and drainage channel, and sweeping. These standard maintenance specifications were tailored to meet the district's needs. After the contract and specification were prepared, the district solicited proposals from interested potential bidders. The bidder with the lowest price was awarded the contract. An inspector was assigned to oversee the contract. The contract has reduced the district's coordination effort between different contractors; for example, the district did not need to coordinate the litter contractor with the mowing contractor since the two activities are now performed by the same contractor.

9.4.6 Outcome Resulting from Implementation of this Strategy

Although Lubbock District was not certain whether or not a savings had been achieved because they did not keep detailed records on in-house costs, they believed that hiring one contractor to perform multiple maintenance functions reduced overhead costs. Furthermore, the quality of maintenance services did not change. Lubbock District evaluated the contractor's performance in accordance with the specification to determine whether the contractor met the

specification or not. The specific criteria Lubbock District used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time
• Level of Service (LOS) achieved versus LOS goals
• Quality of service achieved versus quality of service goals

Lubbock District reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Inspection of the Completed Work
• Efficiency Achieved by Bundling of Services
• In-House Knowledge Retention
• Contract Duration, which was two years rather than the standard one year contract
• Experienced Contractor and Experienced Contractor Project Manager

9.4.7 Best Practices and Lessons Learned

Lubbock District was asked to identify those practices they recommend to other agencies that might consider implementing the Moderately Bundled Activities Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. The maintenance section supervisors should be included in the development of the specification and contract because they know which activities need to be completed.
2. The DOT should meet with its own in-house staff to make sure they understand the requirements of record keeping.
3. The DOT should review and manage the budget to make sure the budget is met but not exceeded.

Lesson Learned for the Contracting Strategy

1. Establish the longest duration contract you can because maintenance work will become streamlined over the years.

2. If the Department's administration changes or the philosophy changes, the change could impact the contract.

9.5 Case Study 5: Moderately Bundled Activities Contract Method

State and District Visited: Pharr District of TxDOT

9.5.1 Activities Outsourced Using this Contracting Strategy

Using the moderately bundled maintenance activities contracting strategy, the Pharr District contracted for seal coat, which is a type of preventive pavement maintenance. Under this strategy, the contractor was responsible for:

- Removing existing pavement markers
- Applying seal coat
- Re-striping
- Replacing pavement markers

A prime contractor performed the seal coat, while a subcontractor performed traffic control and striping.

9.5.2 Description of the Contracting Strategy Investigated

Delivery Method: On a Moderately Bundled Activities Contract Method, a few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up.

Type of Contract Specifications: Method-Based

Pricing Strategy for this Contract Strategy: Unit Price

Contract Duration: April to September, and is typically completed in 6 weeks

Award Strategy: Low Bid

9.5.3 Why this Contracting Strategy was Selected

In recent years, Pharr District has focused on performing more preventive maintenance. While the district has historically applied seal coats using in-house personnel, budget limitations resulted in outsourcing the activity because contract personnel could complete the activity more efficiently. In order for the district to perform seal coats in-house, it would be necessary to divide the work functions into codes. For example, function code 231 for striping would be performed by one in-house specialist while code 799 for traffic control would be performed by another in-house specialist. However, one contractor could perform all of the functions, and typically the contractor could perform the work faster than in-house personnel. Furthermore, material suppliers tend to make a firm commitment to the contractor because they often get paid immediately after the contractors finish the work. Consequently, because of the district's limited ability to expedite the work quickly, Pharr District decided to contract seal coats out.

9.5.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Pharr District for selecting the **Moderately Bundled Activities Contract Method** for seal coat maintenance:

Criteria
• Executive management requested more seal coat and overlay as a means to prevent roadway deterioration
• District budget limitations made the contract method attractive
• The availability of the contractor's workforce to augment limited Pharr District personnel was a consideration
• Composition of in-house and outsourced resources made augmentation of both personnel and equipment an attractive option
• The seasonal nature of the work required seal coat to be performed during a limited period

The following criteria were used by Pharr District for selecting the **method-based** type of contract specification:

Criteria
• Quality of contractors; because the work was seasonal, Pharr District felt more comfortable directing how to perform the work
• Participation of contractors in bid process; a method-based specification was standard and would attract numerous bidders

9.5.5 How this Contracting Strategy was Implemented

The district went through a selection process to determine which roadways needed to have a seal coats applied for the year. Then, a team of personnel, including the director of maintenance, director of engineering, contract administrator and contract specialist, developed the specification and contract. They used the provisions from the General Notes and Special Specification from TxDOT's Technical Specifications that were associated with the contracted activities to formulate the contract and specification. The district used a Request for Proposal to solicit proposals from potential bidders. The contract was awarded to the lowest bidder.

9.5.6 Outcome Resulting from Implementation of this Strategy

The quality of maintenance services in rural areas that have low traffic volumes are equal between in-house and contractor personnel. But, in urban areas with high traffic volumes, the contractor often does a better job at controlling traffic. Furthermore, upon reviewing TxDOT's Maintenance Efficiency and Analysis Report (MEAR),that tracked district-wide and state-wide unit cost of various maintenance activities, it appears that the seal coat in Pharr District was performed more cost effectively by the contractor. An inspector was assigned to manage the

contract, and the contractor's performance was evaluated in accordance with the specification to determine whether or not the contractor met the specification. The specific criteria Pharr District used to evaluate the contractor's performance included:

Criteria
• Number of Warnings Issued
• Quality of service achieved versus quality of service goals

Pharr District reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Contractor Quality Control Plan
• In-House Inspection of the Completed Work
• Efficiency Achieved by Bundling of Services
• Knowledge Retention by Both DOT and the Contractor
• Experience and Involvement of the DOT inspector
• Experienced Contractor and Experienced Contractor Project Manager
• Prequalification of Contractors

9.5.7 Best Practices and Lessons Learned

Pharr District was asked to identify those practices they recommend to other agencies that might consider implementing the Moderately Bundled Activities Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. The DOT must have a thorough Road Selection Process to select those sections that need have seal coat applied each year.

Lesson Learned for the Contracting Strategy

1. It is important to space out the preparation work for seal coat operations. Typically, the DOT may need to do preparation work a year in advance.
2. It is important to have plans and specifications ready six months before seal coat season, because the DOT will need to give the contractor enough time to order material.

9.6 Case Study 6: Moderately Bundled Activities Contract Method

State and District Visited: Kentucky DOT (KDOT) Maintenance Division

9.6.1 Activities Outsourced Using this Contracting Strategy

The maintenance activities covered under this contract included:

- Traffic signals
- All electrical lighting
- Some intelligent transportation systems

9.6.2 Description of the Contracting Strategy Investigated

Delivery Method: On a Moderately Bundled Activities Contract Method, a few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up.

Type of Contract Specifications: Method-Based

Pricing Strategy for this Contract Strategy: Unit price for bid items and hourly rate for labor to do trouble shooting

Contract Duration: One year plus up to two renewals with cost adjustment each year

Award Strategy: Best Value

Although the award strategy is labeled as "Best Value" because KDOT wants to implement the best value strategy, the award largely depended on price. The award decision was based on criteria such as contractor's experience, certifications, delivery days, and warranty.

9.6.3 Why this Contracting Strategy was Selected

Previously, in-house personnel were in charge of maintenance of all traffic signals. Due to a shortage of in-house staff, an hourly rate contract was implemented to purchase the services of outside electricians. At that time, KDOT provided the materials and the contractor provided the electricians. Eight years ago, a hybrid contract was implemented, where unit pricing was used for bid items provided by the contractor (such as materials) and hourly rate pricing was used for labor. The hourly labor pricing was implemented to facilitate trouble shooting because the electrical work involved a significant amount of trouble shooting, which is hard to estimate at the time of bidding. This contract gave the contractor the flexibility to spend time on trouble shooting while KDOT was able to control the number of hours spent. Ultimately, KDOT decided to bundle traffic signals, electrical lightning, and some of ITS together to improve efficiency.

9.6.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by KDOT for selecting the **Moderately Bundled Activities Contract Method** for traffic signal maintenance:

Criteria
• The availability of contractor workforce to augment limited KDOT personnel was a consideration
• Type of work was a consideration for selecting this particular contract strategy

The following criteria were used by KDOT for selecting the **method-based** type of contract specification:

Criteria
• Level of control KDOT would have over the work by specifying the materials and methods to be used
• Level of trust in contractors; KDOT felt more comfortable directing how to perform the work
• Quality of contractors; because the work was very specialized, KDOT felt more comfortable directing how to perform the work
• Participation of contractors in bid process; a method-based specification was standard and would attract numerous bidders

9.6.5 How this Contracting Strategy was Implemented

Two KDOT personnel who wrote the hourly rate contract were in charge of developing the hybrid contract. They selected bid items from standard construction contracts and standard construction specifications and combined them with the specifications for the hourly rate bid items to formulate the hybrid specifications and contract. The contract was then approved by the financial cabinet prior to the bidding process.

Initially, KDOT had a meeting with district personnel to explain the new contract. However, numerous problems occurred because the districts were not familiar with the contract, and contractors did not know how to separate hourly from unit prices. Sometimes double billing would happen. Over time, as KDOT adjusted the contract each year to eliminate loopholes, all problems and issues were resolved, and the contract works well now.

9.6.6 Outcome Resulting from Implementation of this Strategy

KDOT reported that the contractor was able to complete the bid item work faster following implementation of the hybrid contract. An inspector was assigned to manage the contract, and the contractor's performance was evaluated in accordance with the specifications to determine whether or not the specification had been met. The specific criteria KDOT used to evaluate the contractor's performance included:

Criteria
• Response Time
• Number of Warnings Issued
• Estimated costs versus actual costs to complete the work

KDOT reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Verification of the Contractor's Qualifications
• In-House Inspection of the Completed Work
• Efficiency Achieved by Bundling of Services
• Experienced Contractor Project Manager

9.6.7 Best Practices and Lessons Learned

KDOT was asked to identify those practices they recommend to other agencies that might consider implementing the Moderately Bundled Activities Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. The DOT must have a good, unambiguous specification.
2. The DOT should establish work types and make sure a contracting community exists to perform the work types.

Lesson Learned for the Contracting Strategy

1. The DOT should train inspectors to do inspections for the hybrid contract strategy. For example, the inspector should understand how to approve the timesheets the contractor submits.

9.7 Case Study 7: Significantly Bundled Activities Contract Method

State and District Visited: Houston District of TxDOT

9.7.1 Activities Outsourced Using this Contracting Strategy

The Significantly Bundled Activities Contract strategy is also called a "General Maintenance Contract" in Texas. Nearly all routine maintenance and some preventive maintenance activities associated with **pavements, roadside, traffic operations and bridges on a particular interstate highway** are let out together, excluding a few special activities let under separate contract. For example, sweeping was excluded from the General Maintenance Contract because many of the bidders did not have the equipment.

9.7.2 Description of the Contracting Strategy Investigated

Delivery Method: In a Significantly Bundled Activities Contract Method, nearly all maintenance activities are let out together, other than a few activities that are special or unique.

A method-based specification and unit price strategy are required to implement this method. This contract method has also been called a General Maintenance Contract.

Type of Contract Specifications: Method-Based

Pricing Strategy for this Contract Strategy: Unit Price

Contract Duration: One year, with no extensions

Award Strategy: Low Bid

9.7.3 Why this Contracting Strategy was Selected

Historically, in the Houston District, area engineers were assigned responsibility for maintenance activities within portions of various counties. Harris County was especially large and had to be divided into four sections. However, in order to improve response time within the busiest area of Harris County, the Houtson District created the Central Houston Maintenance Office to take responsiblility for the IH-610 loop and the area inside the IH-610 Loop. The personnel assigned to this new Central Houston Maintenance Office did not have the experience or equipment to effectively perform all of the maintenance work in-house that was necessary for this busy area. Fortunately, the Area Engineer was very familiar with the contracting process because he had previously managed large construction projects. He decided to contract out most of the maintenance activities together rather than award individual activities. Rather than assigning inspectors to monitor individual activities, he was able to assign a Project Manager who was responsible for managing a large bundle of activities combined into one contract. Essentially, the contracting strategy was selected for two primary reasons: (1) because of the lack of resources to perform the work in-house, and (2) because of the inefficiency of awarding and monitoring individual activity contracts.

9.7.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Houston District for selecting the **Significantly Bundled Activities Contract Method** for all routine and some preventive maintenance activities:

Criteria
• The availability of contractor workforce to augment limited Houston District personnel was a consideration
• Composition of in-house and outsourced resources made augmentation of both personnel and equipment an attractive option

The following criteria were used by Houston District for selecting the **method-based** type of contract specification:

Criteria
• The level of control Houston District would have over the work by specifying the materials and methods to be used was an important consideration

• Participation of contractors in bid process; a method-based specification was standard and would attract numerous bidders

9.7.5 How this Contracting Strategy was Implemented

The Area Engineer worked with district maintenance contracting personnel to develop the contract. Since the District had been using individual contracts by means of method-based specification for many years, the specifications for various individual bid items were readily available. To develop the specifications for this contract, bid items that would be included in the contract were identified, and then the specifications associated with each of the identified bid items were pulled together to form the complete specifications for this contract. Since the contract implemented a method-based specification, unit pricing was used as the pricing strategy. Two bidders submitted proposals, and the contract was awarded to the lowest bidder. The length of the contract was one year with no extensions, so contractors must rebid every year.

9.7.6 Outcome Resulting from Implementation of this Strategy

The quality of maintenance services is reported as good as a result of implementing this contracting strategy. While it has not appeared to change the cost effectiveness of the outsourced maintenance work, this contracting strategy has changed the cost effectiveness of the people who administrated contracts because only one contract needs to be managed. It has also reduced user costs by reducing the number of lane closures throughout the year (i.e., many maintenance activities can be performed by the contractor during a lane closure). Houston District evaluates the contractor's performance in accordance with the method-based specification to determine whether the contractor has met the specification or not. The specific criteria Houston District used to evaluate the contractor's performance include:

Criteria
• Response Time
• Quality of service achieved versus quality of service goals

Houston District reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Verification of Contractor Qualifications
• Efficiency Achieved by Bundling of Services
• In-House Knowledge Retention
• Experienced Contractor Project Manager

9.7.7 Best Practices and Lessons Learned

Houston District was asked to identify those practices they recommend to other agencies that might consider implementing the Significantly Bundled Activities Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. A good in-house contract administrator or project manager is very important for the successful implementation of this contracting strategy.
2. A well-developed contracting industry is a prerequisite for the implementation of this contracting strategy because only a relatively few contractors are able to perform so many different maintenance activities together.
3. The DOT must be willing to use a large portion of their maintenance budget to handle this contract.

Lesson Learned for the Contracting Strategy

1. The DOT needs to make sure they do not inadvertently put something in the specification that will stifle competition.

9.8 Case Study 8: Total Asset Management Contract Method

State and District Visited: Florida DOT (FDOT) Office of Maintenance

9.8.1 Activities Outsourced Using this Contracting Strategy

The maintenance activities covered under this contract include all routine maintenance activities on a specified interstate associated with:

- roadway
- roadside
- incident management
- structures
- vegetation and aesthetics
- rest areas
- drainage
- traffic services

This particular contracting strategy is called an "Asset Maintenance Contract" in Florida. In fact, the Office of Maintenance has developed a web-based *Asset Maintenance Scope Customization System* including all maintenance activities that may be performed through Asset Maintenance Contracts. This system allows each district to develop a standardized Asset Maintenance Scope of Services by selecting optional activity items in order to formulate its own Asset Maintenance Contract. It not only addresses specific maintenance needs of the Districts, but ensures contractual clarity and consistency statewide.

For example, in the case of Interstate 75 (I-75), almost all of the routine maintenance from fenceline to fenceline is covered under an Asset Maintenance Contract except mailboxes, traffic signals, Intelligent Transportation System (ITS), and bridge painting.

9.8.2 Description of the Contracting Strategy Investigated

Delivery Method: Total Asset Management Contract Method is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management in January 2006). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method.

Type of Contract Specifications: Performance-Based

Pricing Strategy for this Contract Strategy: Lump Sum, 2%-2.25% escalation at each contract renewal; furthermore, several maintenance activity items are allowed to be paid by unit price, such as traffic operations and partnering.

Contract Duration: customized by districts from 5 to 10 years; seven years for the contract on I-75

Award Strategy: Best Value

The bidder is selected by the total proposal score based on the evaluation of its technical proposal and price proposal. Table 9.3 illustrates the criteria FDOT uses to evaluate the technical proposal. The technical proposal accounts for 60% to 70% of the total score, and the price proposal accounts for 30% to 40% of the total score. The calculation formulas are listed below:

Technical Score = (Average Technical Score from Technical Evaluation Committee) ×

(Technical Proposal %)

Price Score = 100 × (Lowest Price / Proposer's Price) × (Price Proposal %)

Total Proposal Score = Technical Score + Price Score

Table 9.3: Evaluation Criteria for the Technical Proposal

Item	Value
1. Executive Summary	00
2. Administration Plan	20
a. Identification of Key Personnel	5
b. Contractor Experience	5
c. DBE/Respect/Agency Participation	5
d. Proposed Facilities Capabilities	5
3. Management and Technical Plan	30
a. Plan to Achieve and Maintain MRP	20
b. Permit Processing Plan	5
c. Bridge Inspection	0
d. Customer Service Resolution Plan	5
4. Operation Plan	30
a. Incident Response Operations	10
b. Routine/Periodic Maintenance Operations	15
c. Bridge Maintenance Operations	0
d. Rest Area Maintenance Operations	5
5. Plan for Compliance with Standards	20

9.8.3 Why this Contracting Strategy was Selected

In 2001, Florida's governor requested FDOT to cut full time personnel by 25%. As a result, maintenance staffing was reduced. To address the staffing shortage, FDOT implement an Asset Maintenance Contract that could reduce administrative load by bundling nearly all maintenance activities into a single contract rather than awarding many separate contracts.

Asset Maintenance Contracts are performance-based contracts that emphasize the quality of contractor's performance and the contractor's responsiveness to the needs of FDOT and the traveling public. The materials, methods, equipment and quantity of maintenance work to be accomplished are left to the contractor's discretion. Therefore, this contract method requires minimum administration and inspection oversight from the districts.

Furthermore, the typical contract length for Asset Maintenance Contracts ranges from five to ten years and can be customized by districts. During the contract period, the contract price is fixed, which helps FDOT sustain a stable maintenance budget.

Currently, 40% of FDOT's maintenance work is performed by Asset Maintenance Contracts, 40% by traditional contracts (mostly method-based contracts, but also including some small performance-based contracts), and 20% by in-house forces.

9.8.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by FDOT for selecting the **Total Asset Management Contract Method** for all routine maintenance:

Criteria
• The availability of contractor workforce to augment limited FDOT personnel was a consideration
• Composition of in-house and outsourced resources was considered in order to balance Asset Maintenance Contracts, Traditional Contracts, and In-house Forces
• Long-term commitment of contractors was a consideration
• The method was selected to encourage innovation and innovative maintenance practices

The following criteria were used by FDOT for selecting the **performance-based** type of contract specification:

Criteria
• The general concept of an Asset Maintenance Contract is that the work is evaluated on performance, not conformance, requiring the performance to be defined in a performance-based specification
• The quality of contractors was a consideration when deciding whether to implement a performance-based specification

9.8.5 How this Contracting Strategy was Implemented

Asset Maintenance Contracts began to be utilized in FDOT in July 2000 and were originally called Asset Management Contracts. In 2006, FDOT assigned an Asset Maintenance Task Team, including people of each district and legal professionals, to revamp the original contracts. Contractors were also invited to review the draft of the new contract. FDOT's Asset Maintenance Contracts (2006) strive to make the contract language clear and comprehensible. Because different districts have different maintenance needs, FDOT's Office of Maintenance developed a web-based *Asset Maintenance Scope Customization System*, where districts can customize their contracts by going through a special checklist and select items that they want to include in an Asset Maintenance Contract. An Asset Maintenance Liaison Committee, made up of personnel from FDOT and contractors, routinely review any changes to the contract language.

A Request for Proposal (RFP) was used to solicit proposals from potential bidders. A pre-proposal meeting was mandatory for prospective bidders in order to provide an open forum for discussion on the Scope of Services, proposal requirements and other matters associated with the RFP. Proposals were accepted from attendees. The contract was awarded to the bidder with the highest proposal score by using "Best Value" criteria described earlier. A pre-work conference was conducted after execution of the contract and before the start of performing the contract.

The Office of Maintenance has developed a standard Asset Maintenance Monitoring Plan whereby districts develop their own monitoring plan and conduct a quality assessment review of their Asset Maintenance contractor every six months.

A Maintenance Rating Program (MRP) is used to evaluate Asset Maintenance contractors. The contractors must achieve and maintain the minimum MRP rating as required in the MRP Handbook or the increased MRP targets provided under the contract established by the district. MRP rating will be conducted three times each year.

9.8.6 Outcome Resulting from Implementation of this Strategy

Implementation of the Total Asset Management Contract Method resulted in an increase in the level of service achieved and a 12% cost savings, as reported by FDOT. There are no job losses resulting from its implementation. Instead, reductions in personnel were achieved through normal attrition and retirements. The specific criteria FDOT used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time
• Level of Service (LOS) achieved versus LOS goals
• Level of Service (LOS) now versus LOS previously
• Quality of service achieved versus quality of service goals

FDOT reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Verification of Contractor's Qualification
• Bundling of Services (all routine maintenance bundled into a contract)
• Knowledge Retention
• Contract Duration, which enables a long-term commitment of the contractor
• Experienced Contractor Project Manager
• Dynamic structure and flexibility of the contract
• Full understanding of the difference between performance-based and method-bases specifications
• District's MRP team rating

9.8.7 Best Practices and Lessons Learned

FDOT was asked to identify those practices they recommend to other agencies that might consider implementing the Total Asset Management Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. In spite of less inspection, the district can make the contractor accountable by holding its payment until the contractor fixes any problems.

2. Numerical rating to evaluate the contractor's performance greatly motivates the contractor.
3. Standardized Scope of Service ensures clarity and consistency statewide.
4. Training is recommended to make sure in-house personnel, especially project managers and inspectors, understand the contract before implementation.

Lesson Learned for the Contracting Strategy

1. Make sure all parties understand how the federal government will reimburse the contractor's work performed in response to natural disasters.
2. Some districts ride roads once a month and develop a "deficiency list" that is given to the contractor so that the contractor can correct the problems and avoid deductions. However, some contractors wait to make corrections until they receive the deficiency list. This defeats the purpose of the contract. It is the contractor's responsibility to manage their own work rather than being told by FDOT personnel what corrections to make.

9.9 Case Study 9: Total Asset Management Contract Method

State and District Visited: North Carolina DOT (NCDOT) State Road Maintenance Unit

9.9.1 Activities Outsourced Using this Contracting Strategy

In North Carolina, a Total Asset Management Contract is simply called a "Performance Based Contract." The method was introduced in North Carolina in 2005 when the North Carolina General Assembly passed legislation that allowed NCDOT to implement two performance based contracts for routine maintenance and operations, excluding resurfacing.

A pilot project was implemented in Charlotte, which included management and performance of all routine and preventive maintenance activities associated with **roadways, drainage, structures, roadside, vegetation and aesthetics, traffic services and incident response** on interstates I-85, I-77, I-277 and I-485 in Mecklenburg, Gaston, and Cleveland Counties. Rest area and snow and ice removal were excluded.

9.9.2 Description of the Contracting Strategy Investigated

Delivery Method: Total Asset Management Contract Method, a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management in January 2006). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method.

Type of Contract Specifications: Performance-Based

Pricing Strategy for this Contract Strategy: Lump Sum for 5 years; monthly payments with CPI (Consumer Price Index) adjustments

Contract Duration: five years with one 5-year renewal option

Award Strategy: Best Value

A Request for Qualifications (RFQ) was issued to narrow prospective bidders to a short list of bidders who were determined to be qualified. Then, the qualified bidders submitted a technical proposal and price proposal for evaluation.

Each technical proposal received a technical score based on established evaluation criteria (Table 9.4), and then was assigned a Quality Credit Percentage based on its technical score in accordance with an established table (Table 9.5).

The Quality Value of each Contractor's Technical Proposal was obtained by multiplying each Contractor's Total Price Proposal by the Quality Credit Percentage earned by the Contractor's Technical Proposal. The Quality Value was then subtracted from each Contractor's Total Price Proposal to obtain an Adjusted Price based upon Price and Quality combined. The contractor with the lowest Adjusted Price was awarded the contract.

Table 9.4: Evaluation Criteria for Technical Proposal

Evaluation Criteria	Points
Management	20
Responsiveness to Request for Proposal	40
Maintenance of Traffic and Safety Plan	20
Timeliness Requirements and Tracking	15
Oral Interview	5

Table 9.5: Quality Credit Percentage for Technical Proposals

Technical Score	Quality Credit (%)	Technical Score	Quality Credit (%)
100	20	89	9
99	19	88	8
98	18	87	7
97	17	86	6
96	16	85	5
95	15	84	4
94	14	83	3
93	13	82	2
92	12	81	1
91	11	80	0
90	10		

9.9.3 Why this Contracting Strategy was Selected

In 2005 the North Carolina General Assembly passed a bill to enable NCDOT to implement two performance based contracts for routine maintenance and operations, excluding resurfacing. NCDOT viewed it as a chance to pilot test a performance-based contract as a potential method to meet the growing demand of highway maintenance. In addition, the method was appealing because nearly all maintenance activities for an asset could be completed by a contractor reducing the need to award many separate contracts. It also allows NCDOT personnel to focus their maintenance efforts on other routes.

9.9.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by NCDOT for selecting the **Total Asset Management Contract Method** for all routine and preventive maintenance:

Criteria
• Although NCDOT was not technically required to implement Performance Based Contracts by legislative mandate, the passing of legislation signalled the desire by the legislature to move toward implementation of more performance-based, rather than method-based, maintenance methods.

The following criteria were used by NCDOT for selecting the **performance-based** type of contract specification:

Criteria
• The passing of legislation was a strong motivator for NCDOT to select a performance-based specification.
• The general concept of an Asset Maintenance Contract is that the work is evaluated on performance, not conformance, requiring the performance to be defined in a performance-based specification.

9.9.5 How this Contracting Strategy was Implemented

A team of in house experts was formed to investigate the scope and location of the first pilot project. Eventually, Charlotte was selected because of the abundance of contract resources, difficulty of hiring in-house maintenance personnel, and rapidly growing need for maintenance work. To develop the first contract, the NCDOT contract development team visited peer agencies, such as Virginia Department of Transportation (VDOT) and Texas Department of Transportation (TxDOT), to learn about their experiences implementing similar contracts. Then, local maintenance experts were made part of the contract development team to help develop the specifications. The contract incorporated the existing performance measures from NCDOT internal maintenance operations.

Two question and answer sessions with potential bidders were held prior to final contract development, and the suggestions from potential contractors were incorporated into the final contract, such as how to make performance targets achievable at a reasonable cost.

Seven firms participated in the RFQ phase and four were shortlisted. A draft contract document was provided to the four qualified bidders, and two question and answer meetings were held before producing a Request for Proposals (RFP).

After an award had been made, an NCDOT project manager and project inspector were appointed to manage the work. However, the shift from a traditional method-based contract, where the DOT controlled when and how the work was completed, to a performance-based contract, where the contractor had complete control over the work, proved challenging to the staff of NCDOT, the contractor, and subcontractors during the first year. It was necessary for the contractor and subcontractors to become proactive to plan and manage their work.

A Maintenance Condition Assessment Program (MCAP) was developed to evaluate the contractor's performance at 6 month intervals. To ensure the assessments were objective, NCDOT decided to assign assessors from other local divisions (rather than assigned contract personnel) to evaluate the contractor's performance. An initial condition assessment was conducted prior to award, and NCDOT established initial baseline performance targets for the first 6 months. These performance targets were increased incrementally during the first two years. Ultimately, the contract provided that payment would be based on how successfully the contractor met its performance targets.

9.9.6 Outcome Resulting from Implementation of this Strategy

According to the latest assessment conducted in June 2008, the contractor's performance had improved over time but was not as successful as anticipated. The contractor met the performance targets on 73% of the contract elements, but the level of service associated with pavements and bridges had declined. The specific criteria NCDOT used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time
• Level of Service (LOS) achieved versus LOS goals
• Level of Service (LOS) now versus LOS previously (to evaluate contract)
• Quality of service achieved versus quality of service goals

The length of the contract was originally 5 years with one 5 year renewal option, but the contract was terminated during the second year. NCDOT stated that the factors contributing to its less than successful implementation included:

Criteria
• Ambiguous Contract Language
• Performance measures were too subjective
• Lack of a contractor Quality Control Plan
• Performance targets were not established correctly

9.9.7 Best Practices and Lessons Learned

NCDOT was asked to identify those practices they recommend to other agencies that might consider implementing the Total Asset Management Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. Develop a relationship or partnership with peer state DOTs who have implemented the particular contracting strategy you intend to use.
2. Develop monitoring procedures for overseeing contractor's daily performance, such as measures of timeliness.
3. Conduct a question and answer session to gather the contracting community's advice and comments.
4. Conduct an initial assessment of the condition of the asset elements and take pictures of inventory items.

Lesson Learned for the Contracting Strategy

1. Include as much detail as you can in the contract. Fully define what is expected of the contractor and what specific requirements the contract must meet.
2. Make sure the performance measures are objective and well-defined.
3. Take the time to ensure the right technology will be utilized for data collection from the beginning because the right technology can reduce the time and labor required to conduct assessments. For example, the time of data collection for assessment was significantly reduced by using tablet PC's, Arc Pad Data Collection software, and Bluetooth recreational grade GPS receivers.
4. Make sure the size and scope of the project is reasonable because small projects are not cost effective for the contractor while larger projects will be difficult to manage.

9.10 Case Study 10: Total Asset Management Contract Method

State and District Visited: Waco District of TxDOT

9.10.1 Activities Outsourced Using this Contracting Strategy

The Total Asset Management contracting strategy is called a "Total Maintenance Contract" in Texas. In 1999, TxDOT awarded two Total Maintenance Contracts as pilot projects to evaluate how well this new contracting technique would work in Texas. The contract in Waco District covered 120 miles of IH-35, which included management and performance of all routine and preventive maintenance on the **pavements, bridges, roadsides, and traffic operations**. Currently, preventive pavement maintenance work, including full-width seal coats, micro-surfacing, mill and inlay, and thin overlays are performed under separate bid items, which are bid on a unit price basis rather than lump sum pricing within the contract. Intelligent Transportation System (ITS) and rest area were not included in the contract.

9.10.2 Description of the Contracting Strategy Investigated

Delivery Method: Total Asset Management Contract Method, a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management in January 2006). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method.

Type of Contract Specifications: Performance-Based

Pricing Strategy for this Contract Strategy: Lump Sum for 5 years; monthly payment varies every 12 months. Some maintenance activities, such as full-width seal coats, micro-surfacing, mill and inlay, and thin overlays, are not included in the lump sum price, but are paid by unit price separately.

Contract Duration: Five years

Award Strategy: Low Bid

9.10.3 Why this Contracting Strategy was Selected

In late 1998, the Texas Transportation Commission made a decision to try a pilot project to test the Total Maintenance Contract. Almost all maintenance work associated with a particular interstate highway would be performed by the contractor under this contracting strategy, which limited the exposure of in-house personnel working on the interstate and allowed them to focus on county road maintenance.

9.10.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Waco District for selecting the **Total Asset Management Contract Method** for all routine and preventive maintenance:

Criteria
• Waco District was directed to implement Total Maintenance Contract by executive management

The following criteria were used by Waco District for selecting the **performance-based** type of contract specification:

Criteria
• Executive management required Waco District to implement performance-based specifications
• The general concept of an Asset Maintenance Contract is that the work is evaluated on performance, not conformance, requiring the performance to be defined in a performance-based specification

9.10.5 How this Contracting Strategy was Implemented

A team of personnel was assigned to develop the contract. Several team members visited Virginia and Florida to investigate how this contracting strategy was implemented in these two DOTs and sought their help on contract development. The proposed specification was also reviewed by a lawyer before sending it to interested potential bidders for their input.

The contract was awarded to the lowest bidder, as mandated in Texas. The length of the contract was up to 5 years. Waco reported that the first contract did not go well. As a result, a partnering process between TxDOT and the contractor was implemented during the second 5-year contract, but Waco District still experienced numerous challenges during the contract. Initially, the contractor appeared to be losing money and was focused on trying to limit their loss each month rather than on achieving a high performance. As a result, the District enforced liquidated damages, and the contractor realized that it might lose more money once liquidated damages were enforced, so performance gradually improved. The contractor also appointed a new project manager who focused on performance, rather than profit, and ultimately performance improved and a profit was achieved.

To manage the day-to-day aspects of the contract, a full-time inspector was assigned to the project. While the inspector was not required to check each item of the contract every day, the inspector would generally drive around to examine the road. If a non-conforming item is identified, the contractor is notified and a time limit for correction is identified.

The second contract is about to expire, and Waco District will issue a new version of the specifications for bidding that has been improved based on lessons learned from the previous two contracts.

9.10.6 Outcome Resulting from Implementation of this Strategy

The level of service increased following implementation of this contracting strategy, although a significant learning curve had to be overcome by both TxDOT and the contractor. TxDOT implemented an evaluation method, called the Texas Maintenance Assessment Program (TxMAP) that involved measuring the level of service on maintenance elements in four maintenance components of pavement, bridge, traffic services and roadside (Graff 2000), which was used to evaluate the contractor's performance. However, the contractor always far exceeded the requirement of TxMAP as the performance standard in the specification is higher than the criteria of TxMAP. In the new specification, Waco District decided to take TxMAP out, and the contractor's performance will be evaluated in accordance with the performance standard (minimum level of service acceptable) defined in the specification. The specific criteria Waco District used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response Time

Waco District reported that the contracting strategy was implemented successfully, and the factors contributing to its successful implementation included:

Criteria
• Clear and Unambiguous Contract Language
• Clear Language in the Technical Specifications
• Partnering with Contractors
• Contractor Quality Control Plan
• Inspection of the Completed Work
• In-House Knowledge Retention
• Contract duration, which enables a long-term commitment of the contractor
• Liquidated damages motivate the contractor to improve the performance
• An experienced contractor Project Manager

9.10.7 Best Practices and Lessons Learned

Waco District was asked to identify those practices they recommend to other agencies that might consider implementing the Total Asset Management Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. A tough District Engineer and inspector who both know the specifications well will help to ensure the contractor ultimately meets the specification.
2. Good communication with the inspector and project manager who manage the contract.
3. Appropriate disincentives can help motivate the contractor to improve its performance.

Lesson Learned for the Contracting Strategy

1. Implementation of a new contracting strategy is a learning process; hence, in the beginning, the process may not go well, but over a period of time, the process will get better.
2. It takes time to establish trust and good relationships among the parties.
3. A good contractor project manager will greatly contribute to the successful performance of the contract.

9.11 Case Study 11: Total Asset Management Contract Method

State and District Visited: Dallas District of TxDOT

9.11.1 Activities Outsourced Using this Contracting Strategy

The Total Asset Management contracting strategy is called a "Total Maintenance Contract" in Texas. In 1999, TxDOT awarded two Total Maintenance Contracts as pilot projects to evaluate how well this new contracting technique would work in Texas. The contract in Dallas District covered 60 miles of IH-20, which included management and performance of all routine

and preventive maintenance on **pavements, bridges, roadsides, and traffic operations**. The contract excluded major accident and emergency maintnenace and driveway maintenance.

9.11.2 Description of the Contracting Strategy Investigated

Delivery Method: Total Asset Management Contract Method is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (Source: AASHTO Subcommittee on Asset Management in January 2006). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method.

Type of Contract Specifications: Performance-Based

Pricing Strategy for this Contract Strategy: Lump Sum for 5 years with graduated monthly payments

Contract Duration: Five years

Award Strategy: Low Bid

9.11.3 Why this Contracting Strategy was Selected

In late 1998, the Texas Transportation Commission made a decision to try a pilot project to test the Total Maintenance Contract. Almost all maintenance work associated with a particular interstate highway would be performed by the contractor under this contracting strategy, which limited the exposure of in-house personnel working on the interstate and allowed them to focus on county road maintenance.

9.11.4 Specific Criteria Used to Select this Contracting Strategy

The following specific criteria were used by Dallas District for selecting the **Total Asset Management Contract Method** for all routine and preventive maintenance:

Criteria
• Dallas District was directed to implement Total Maintenance Contract by executive management

The following criteria were used by Dallas District for selecting the **performance-based** type of contract specification:

Criteria
• Executive management required Dallas District to implement a performance-based specification
• The general concept of an Asset Maintenance Contract is that the work is evaluated on performance, not conformance, requiring the performance to be defined in a performance-based specification

9.11.5 How this Contracting Strategy was Implemented

A team of personnel was assigned to develop the contract. Several team members visited Virginia and Florida to investigate how this contracting strategy was implemented in these two DOTs and sought their help on contract development. The proposed specification was also reviewed by a lawyer before sending it to interested potential bidders for their input.

The contract was awarded to the lowest bidder, as mandated in Texas. The length of the contract was up to 5 years. Dallas District terminated all existing maintenance contracts and put the new contractor in charge of all previously contracted work. Two inspectors were assigned to oversee the newly contracted work but they did not receive special training on performance-based contract inspection. As a result, the inspectors conducted daily visual inspections to check whether the contractor met the specification, and the inspectors provided the contractor with action items at weekly meetings. However, the contractor did not make sufficient corrections. Eventually, the contract was terminated.

9.11.6 Outcome Resulting from Implementation of this Strategy

Texas Maintenance Assessment Program (TxMAP) and Pavement Management Information System (PMIS) that is an automated system TxDOT uses for storing, retrieving, analyzing, and reporting information to support pavement management (Karoonsoontawong et al. 2002), were used to evaluate the contractor's performance as well as daily visual inspection. Based on these evaluations, the level of service declined following implementation of this contracting strategy. Dallas District also reported that the method was not as cost effective as awarding multiple method-based unit price contracts. The criteria Dallas District used to evaluate the contractor's performance included:

Criteria
• Delivery timeliness
• Response time
• Quality of service achieved versus quality of service goals
• Estimated costs versus actual costs (for performance-based contract)

Dallas District reported that the contracting strategy was implemented unsuccessfully, and the factors contributing to its less than successful implementation included:

Criteria
• Ambiguous Contract Language
• Unclear Language in the Technical Specifications
• Inspectors Did Not Have Experience in Performance-based Contracting
• Inexperienced Contractor Project Manager

9.11.7 Best Practices and Lessons Learned

Dallas District was asked to identify those practices they recommend to other agencies that might consider implementing the Total Asset Management Contract Method. Likewise, they were asked to identify lessons learned that could be shared with other agencies.

Best Practices for the Contracting Strategy

1. Low-bid contract award strategy hinders the successful implementation of this contracting strategy. Do not implement this contract strategy until you are able to select the contract by means of a best value award strategy.
2. A hybrid pricing strategy that primarily utilizes lump sum monthly payments while keeping a few line items as unit price may help the implementation of this contracting strategy.
3. If a DOT has never implemented performance-based contracting before, the DOT should consider implementing a small individual-activity or small bundled set of activities as a performance-based contract first as a pilot test. After overcoming the learning curve on performance-based contracting, the DOT should then consider gradually implementing a Total Maintenance Contract that includes nearly all maintenance activities for a road asset.

Lesson Learned for the Contracting Strategy

1. All parties should fully understand the scope of work before execution of the contract in order to mitigate potential disputes over the scope, especially for some controversial maintenance items. For example, items such as an overlay may be disputed by the contractor as a construction activity which should not be included in a maintenance contract.
2. Consider implementing this contracting strategy on newly updated facilities that are in a highly maintainable condition.
3. Establish an objective evaluation system prior to implementation, especially for pavement sections.
4. The inspector should have experience with performance-based contracting because it is significantly different than method-based contracting.
5. The budget for a performance-based total maintenance contract should be in addition to the regular maintenance budget so that in-house personnel can be assigned to maintain other roads.

Chapter 10. Conclusions and Recommendations

10.1 Conclusions

An efficient maintenance contracting strategy can help transportation agencies to accomplish their maintenance goals given challenging in-house resources constraints. This research aimed to identify the innovative maintenance contracting strategies that are being used by other state DOTs or other countries that can be implemented by TxDOT. It also aimed to develop a decision method that can aid TxDOT in selecting appropriate contracting strategies for outsourcing various maintenance activities. Major conclusions from this study include the following:

- Three components have been identified that make up a maintenance contracting strategy: delivery method, type of contract specification, and pricing strategy.
- Thirteen (13) delivery methods that are used worldwide for highway maintenance contracting are identified, as well as three types of contract specifications, and three pricing strategies.
- There is no existing standard definition and terminology for various maintenance delivery methods because each state DOT or country tailors a delivery method to suit its needs or circumstances and names the delivery method accordingly. Hence, this research provides standard definitions that can be used throughout the United States.
- Some delivery methods, such as Multi-Agency Contract Method or Partial Competitive Maintenance Contract Method, are seldom used by DOTs in the United States, and other methods, such as Alliance Contract Method or CREMA Contract Method, are only implemented outside the United States.
- An overall picture of how frequently the thirteen delivery methods are used and who is using them is presented.
- Many factors will affect a transportation agency's ability to select an effective maintenance delivery method. A particular goal that the agency wants to achieve through outsourcing (such as a long-term commitment from contractors), or a particular circumstance (such as lack of equipment or expertise), are just two of the many factors that will impact the decision process.
- A decision tree with eight (8) decision nodes (and associated decision criteria) have been identified through 11 DOT interviews. A Maintenance Contracting Strategy Selection Framework was developed based on the decision nodes and criteria.
- A selection algorithm has been developed to assist maintenance personnel in selecting appropriate contracting strategy that can help them achieve their particular outsourcing goals and accommodate their specific maintenance circumstances.
- A selection guide provides guidance on the selection and implementation of innovative maintenance contracting strategies for the outsourcing of maintenance activities.

- Eleven (11) case studies present five (5) delivery methods that are being used within TxDOT or other state DOTs that give the reader a picture of how these delivery methods are implemented in practice.

10.2 Recommendations

While a selection algorithm has been developed in this study for selecting appropriate maintenance contracting strategies, it did not work as well as expected. The major reason is that many of TxDOT's experts were not familiar with the innovative contracting strategies so that the data obtained from their evaluation may not accurately represent the most effective contracting strategy. Hence, it is recommended that a broader range of international experts be invited to participate in a maintenance contracting strategy evaluation process to make this algorithm effective and robust. In addition, future studies have been identified and recommended as follows:

- Standard terminology and definitions of maintenance delivery methods should be studied and established by the Transportation Research Board.
- Some delivery methods that are seldom or never used in the United States should be studied in detail and potentially pilot tested to determine whether they can be successfully implemented in U.S. DOTs.
- Additional research is needed to understand how maintenance activities are bundled and how bundling affects the selection and effectiveness of delivery methods. The study might focus on the pattern of activities that are bundled and how the bundling improves maintenance performance in contrast to individual activity contracts.
- Additional research is needed to understand the outcomes resulting from the implementation of maintenance delivery methods, such as cost effectiveness.
- A comparison study between Significantly Bundled Activities Contract Method and Total Asset Management Contract Method might provide insights into why and how agencies outsource nearly all maintenance work.
- The development of a tool to select appropriate activities to outsource, and how to bundle activities effectively, should be conducted.

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Appendix A: Example Questionnaire for the Survey (Phase 1)

Maintenance Contracting Strategies Survey
The University of Texas at Austin
&
Texas Department of Transportation

The University of Texas at Austin is conducting a research project sponsored by the Texas Department of Transportation on innovative contracting techniques for routine and preventive maintenance contracts. The objective of this research is to identify innovative contracting strategies that can reduce cost, increase quality, and improve delivery of outsourced maintenance services. We would appreciate your response to the questions in this survey, which will help us understand your district's maintenance contracting practices.

Section 1: Information About the Participant:

1.1. Your State: _____

1.2. Your District: _____

1.3. Your District is: ☐ Rural ☐ Urban ☐ Metropolitan

1.4. Your name (optional): _____

1.5. Your telephone number (optional): _____

1.6. Your e-mail address (optional): _____

Section 2: Pavement Maintenance Definitions

This section provides definitions of **pavement maintenance, which** are used in this survey.

Routine Pavement Maintenance "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service." *Source: AASHTO Highway Subcommittee on Maintenance*

Preventive Pavement Maintenance is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without

significantly increasing the structural capacity)." *Source: AASHTO Standing Committee on Highways, 1997*

2.1. How do you define "routine pavement maintenance"?

☐ Same as above
☐ Different

2.2. If different, what is your definition of "routine pavement maintenance"?

_____
_____

2.3. How do you define "preventive pavement maintenance"?

☐ Same as above
☐ Different

2.4. If different, what is your definition of "preventive pavement maintenance"?

_____
_____

Section 3: Delivery Methods, Contract Types & Pricing Strategies

In this section, we identify and define several maintenance contracting delivery methods and associated contract types and pricing strategies that are used internationally. Please review the definition of each contracting delivery method and identify whether or not you currently use (or have previously used) the strategy in your district. Some of the delivery methods may overlap or may be similar to each other, but there could also be minor difference between them. If you do use (or have previously used) the method, please identify the types of contracts and pricing strategies employed and whether the method resulted in successful maintenance performance.

3.1. Individual Activity Contract: a single maintenance activity is outsourced

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.2. Activity-Based Maintenance Contract Model: a specific routine maintenance activity is contracted out separately or a few routine maintenance activities are outsourced together. (Note: This model is similar to the Individual Activity Contract and Moderately Bundled Activities Contract)

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.3. Moderately Bundled Activities Contract: a few main maintenance activities are let out together, where each activity is of a very different nature or a totally different type of work

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.4. Significantly Bundled Activities Contract: *nearly all* maintenance activities are let out together, other than a few activities that are special or unique (Note: This model is similar to the Routine Maintenance Contract Model, which outsources *all* maintenance activities together)

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.5. Partial Competitive Maintenance Contract Model: a certain percentage of the in-house workforce is retained to perform various routine maintenance activities, while the rest of the activities are bid out. In this model, in-house forces can competitively bid against contractors for the work.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.6. Jointly-Performed Maintenance Contract Model: a portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.7. Routine Maintenance Contract Model: *all* routine maintenance activities are outsourced together as one contract

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.8. Kilometer (or Mile) per Month Contract Model: applies essentially to a sub-network of paved roads which is in good to fair condition and is further expected to remain substantially in that condition over the next few years through routine maintenance activities alone, without any major strengthening or rehabilitation (used widely in Latin America)

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.9. Total Asset Management Contract: a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle (*Source: AASHTO Subcommittee on Asset Management in January 2006*). In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.10. Integrated Maintenance Contract Model: a combination of both routine and preventive maintenance activities are outsourced together as one contract

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.11. CREMA Contract Model: a Combined Rehabilitation and Maintenance (CREMA) Contract that requires contractors to rehabilitate and subsequently maintain a sub-network of roads under a lump sum contract for a total period of five years. This model originated in Argentina and is currently used widely in Latin America. In the USA, this model has been used for traffic signal rehabilitation and maintenance, for example.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.12. Long-term Separate Maintenance Contract Model: a single maintenance activity is outsourced for a long duration, typically over five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.13. Framework Contract Model: several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects (often called Multi-Agency Contracts and used widely by the U.S. military). Some states use this model for traffic control contracts.

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.14. Alliance Contract Model: a contractor is selected based entirely on qualifications and has the opportunity to gain or lose 15% of the contract value depending on performance

a. Usage (select one answer)	Currently use ☐	Formerly used ☐	Plan to implement soon ☐	Considering using ☐	Not Using ☐
b. Contract Type (select all that apply)	Method-based ☐	Performance-based ☐	Warranty ☐	Other _____	N/A ☐
c. Pricing Strategy (select all that apply)	Lump Sum ☐	Unit Price ☐	Cost Plus Fee ☐	Other _____	N/A ☐
d. Performance Success	Performed successfully ☐	Not performed successfully ☐	N/A ☐		

Please specify the reason: _____
_____

3.15. If you use any other delivery method, please provide a description:

_____

_____

3.16. Please provide your own definition or understanding of total maintenance contracting:

_____

_____

3.17. Please provide your own definition of total asset management contracting:

_____

_____

3.18. Please give your own definition or understanding of bundling of activities:

_____

_____

Section 4: Next Step

4.1. Would you be willing to fill out a longer survey, which might take 30 minutes to complete?

☐ Yes

☐ Not at this time

4.2. Would you be willing to participate in a telephone interview about your maintenance contracting practices?

☐ Yes

☐ Not at this time

4.3. Would you be willing to participate in an in-person interview about your maintenance contracting practices?

☐ Yes

☐ Not at this time

****

THANK YOU FOR PARTICIPATING IN OUR SURVEY!

For more information about this study, please contact Juan Chen at 512-300-7475 or by e-mail at juanchen@mail.utexas.edu.

Appendix B: Example Questionnaire for the Survey (Phase 2)

Maintenance Contracting Strategies Survey
The University of Texas at Austin
&
Texas Department of Transportation

The University of Texas at Austin is conducting a research project sponsored by the Texas Department of Transportation on innovative contracting techniques for routine and preventive maintenance contracts. The objective of this research is to identify innovative contracting strategies that can reduce cost, increase quality, and improve delivery of outsourced maintenance services. We would appreciate your response to the questions in this survey, which will help us understand your district's maintenance contracting practices.

Section 1: Information About the Participant:

1.1.My State: _____
1.2.My District: : _____
1.3.My district is: ☐ Rural ☐ Urban ☐ Metropolitan
1.4.Your name (optional): _____
1.5.Your telephone number (optional): _____
1.6.Your e-mail address (optional): _____

Section 2: Pavement Maintenance Definitions

This section provides definitions of **pavement maintenance, which** are used in this survey.

Routine Pavement Maintenance "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service." *Source: AASHTO Highway Subcommittee on Maintenance*

Preventive Pavement Maintenance is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)." *Source: AASHTO Standing Committee on Highways, 1997*

Section 3: Maintenance Activities

The purpose of this section is to have you identify the scope of maintenance activities performed by your organization overall and to ask you to identify the respective percentages of work performed by your in-house staff and outsourced to contractors.

Maintenance Activities	% Performed in-house	% Outsourced
Pavement		
3.1. Routine Pavement Maintenance	_____	_____
3.2. Shoulder Maintenance	_____	_____
3.3. Driveway Maintenance	_____	_____
3.4. Preventive Pavement Maintenance	_____	_____
Roadside		
3.5. Vegetation	_____	_____
3.6. Litter Control	_____	_____
3.7. Pavement Edges	_____	_____
3.8. Rest Areas	_____	_____
3.9. Picnic Areas	_____	_____
3.10. Culverts, Storm Drains and Drainage	_____	_____
3.11. Guardrail, Barriers and Attenuators	_____	_____
3.12. Ditch	_____	_____
3.13. Mailbox	_____	_____
3.14. Sweeping	_____	_____
Traffic Operation		
3.15. Safety Appurtenances	_____	_____
3.16. Illumination	_____	_____
3.17. Traffic Signals	_____	_____
3.18. Signs and Delineators	_____	_____
3.19. Pavement Markings	_____	_____
3.20. Striping	_____	_____
3.21. Temporary Markings	_____	_____
3.22. Pavement Graphics	_____	_____
3.23. Raised Reflective Pavement Markers	_____	_____
3.24. Shoulder Texturing Treatments	_____	_____
3.25. ITS	_____	_____
Bridge		
3.26. Channel, Culverts, Approaches	_____	_____
3.27. Deck, Superstructure, Substructure	_____	_____
3.28. Cleaning the roadway	_____	_____
3.29. Restoration, delineation and signing	_____	_____
3.30. Cleaning and servicing joints and bearings	_____	_____
3.31. Removal of drift from around substructures	_____	_____
3.32. Painting	_____	_____
3.33. Fender system	_____	_____

Other Activities:

3.34 _____	_____	_____
3.35 _____	_____	_____
3.36 _____	_____	_____
3.37 _____	_____	_____
3.38 _____	_____	_____

Section 4: Criteria for Selecting In-house or Outsourced Performance

The purpose of this section is to identify the decision criteria you use to choose whether to perform maintenance activities in-house or to outsource performance. Please select all criteria used by you to make your decision.

Criteria	Always Used	Sometimes Used	Never Used	Not Sure
4.1. Available budget	☐	☐	☐	☐
4.2. Available in-house workforce	☐	☐	☐	☐
4.3. Available contractors	☐	☐	☐	☐
4.4. Quality of contractors	☐	☐	☐	☐
4.5. Average Daily Traffic on the road	☐	☐	☐	☐
4.6. Political reasons or pressure	☐	☐	☐	☐
4.7. To increase the Level of Service	☐	☐	☐	☐
4.8. To address weather challenges	☐	☐	☐	☐
4.9. To achieve cost savings	☐	☐	☐	☐
4.10. Volume of work	☐	☐	☐	☐
4.11. Contract price (Dollar value)	☐	☐	☐	☐
4.12. Materials availability	☐	☐	☐	☐
4.13. Night work availability	☐	☐	☐	☐
4.14. Equipment availability	☐	☐	☐	☐
4.15. Available expertise	☐	☐	☐	☐
4.16. To achieve efficiency	☐	☐	☐	☐
4.17. To augment peak workloads	☐	☐	☐	☐
4.18. Legislative mandate	☐	☐	☐	☐
4.19. To encourage innovation	☐	☐	☐	☐
4.20. As a risk management strategy	☐	☐	☐	☐
4.21. Speed up project delivery	☐	☐	☐	☐
4.22. To increase responsiveness	☐	☐	☐	☐
4.23. To accomplish emergency work	☐	☐	☐	☐
4.24. Uniqueness of the work	☐	☐	☐	☐
4.25. Ability to develop a contracting industry	☐	☐	☐	☐
4.26. Other: _____	☐	☐	☐	☐
4.27. Other: _____	☐	☐	☐	☐
4.28. Other: _____	☐	☐	☐	☐
4.29. Other: _____	☐	☐	☐	☐
4.30. Other: _____	☐	☐	☐	☐

Section 5: Decision Criteria for Selecting a Contracting Strategy

The purpose of this section is to identify the decision criteria you use to choose an appropriate contracting strategy (delivery method + contract type + pricing strategy) for outsourcing maintenance activities. Please select all criteria you use to make your choice.

Criteria	Always Used	Sometimes Used	Never Used	Not Sure
5.1. Required by legislative mandate	☐	☐	☐	☐
5.2. District budget limitations	☐	☐	☐	☐
5.3. Legislative budget drives decision	☐	☐	☐	☐
5.4. Available contractor manpower	☐	☐	☐	☐
5.5. Portion/composition of in-house and outsources resources	☐	☐	☐	☐
5.6. Length of time of the contract	☐	☐	☐	☐
5.7. Indexing of commodities/Unit price development	☐	☐	☐	☐
5.8. Other:	☐	☐	☐	☐
5.9. Other:	☐	☐	☐	☐
5.10. Other:	☐	☐	☐	☐
5.11. Other:	☐	☐	☐	☐
5.12. Other:	☐	☐	☐	☐

Section 6: Criteria for Selecting Method-based vs. Performance-based Contracts

The purpose of this section is to identify the decision criteria you use to select a method-based or performance-based approach for maintenance contracting. Please identify all criteria you.

Criteria	Used for Selecting Method-based	Used for Selecting Performance-based	Used for Selecting Either	Not Used for Selecting Either	Not Sure
6.1. Level of trust in contractors	☐	☐	☐	☐	☐
6.2. Level of control desired	☐	☐	☐	☐	☐
6.3. Political reasons and pressure	☐	☐	☐	☐	☐
6.4. Quality of contractors	☐	☐	☐	☐	☐
6.5. Participation of contractors in bid process	☐	☐	☐	☐	☐
6.6. Other:	☐	☐	☐	☐	☐
6.7. Other:	☐	☐	☐	☐	☐
6.8. Other:	☐	☐	☐	☐	☐
6.9. Other:	☐	☐	☐	☐	☐
6.10. Other:	☐	☐	☐	☐	☐

Section 7: Contractor Selection Criteria

The purpose of this section is to identify the criteria you use to select an appropriate contractor for method-based, performance-based and warranty contracting. Please indicate whether you make your choice based on lowest price, best value, or some other method (select all that apply).

Contract Type	Lowest Price	Best Value	Other
7.1. Method-based	☐	☐	☐ _____
7.2. Performance-based	☐	☐	☐ _____
7.3. Warranty	☐	☐	☐ _____

If you employ "**Best Value**," please list additional criteria you use to make your choice, other than price, and indicate the percentage that each criterion factors into your decision method.

Contract Type	Price (%)	Best Value Other Criteria	%
7.4. Method-based	_____	_____	_____
		_____	_____
		_____	_____
		_____	_____
		_____	_____

Contract Type	Price (%)	Best Value Other Criteria	%
7.5. Performance-based	_____	_____	_____
		_____	_____
		_____	_____
		_____	_____
		_____	_____
7.6. Warranty	_____	_____	_____
		_____	_____
		_____	_____
		_____	_____
		_____	_____

Section 8: How Districts Bundle Activities

The purpose of this section is to explore how different districts within different states bundle a variety of activities together into one contract. For each set of activities identified below, please identify whether you label the set as an Individual Activity Contract, Bundled Activities Contract, Asset Management Contract, or some other contracting strategy.

Activity or Set of Activities	Individual Activity Contract	Bundled Activities Contract	Asset Management Contract	Other Contracting Strategy
8.1. Sweeping, mowing and litter pickup	☐	☐	☐	_____
8.2. Reshaping ditches and tree removal	☐	☐	☐	_____
8.3. Ditch cleaning and ditch shaping	☐	☐	☐	_____
8.4. All routine maintenance activities except unique/risky activities	☐	☐	☐	_____
8.5. Remove and replace concrete pavement and ACP shoulder	☐	☐	☐	_____
8.6. All routine and preventive maintenance activities for I-10	☐	☐	☐	_____
8.7. All roadside maintenance except Rest Areas and Picnic Areas	☐	☐	☐	_____
8.8. Spot painting and bead striping	☐	☐	☐	_____
8.9. Picnic area and landscape maintenance	☐	☐	☐	_____
8.10. Install and remove raised pavement markers	☐	☐	☐	_____
8.11. Rehabilitation of flexible base and two-course surface treatment	☐	☐	☐	_____
8.12. Cleaning and sealing cracks	☐	☐	☐	_____
8.13. Cleaning & sealing joints and cracks	☐	☐	☐	_____
8.14. Street sweeping & debris removal	☐	☐	☐	_____
8.15.Pavement Marking and pavement markers	☐	☐	☐	_____
8.16. Traffic Signals, Signs, and Delineators	☐	☐	☐	_____
8.17. Bridge Painting, and Bridge Restoration, delineation, and signing	☐	☐	☐	_____
8.18. Temporary Markings and Pavement Markings	☐	☐	☐	_____
8.19. Other:_____	☐	☐	☐	_____
8.20. Other:_____	☐	☐	☐	_____
8.21. Other:_____	☐	☐	☐	_____
8.22. Other:_____	☐	☐	☐	_____
8.23. Other:_____	☐	☐	☐	_____

Section 9: Next Step

9.1. Would you be willing to participate in a telephone interview about your maintenance contracting practices?

☐ Yes

☐ Not at this time

9.2. Would you be willing to participate in an in-person interview about your maintenance contracting practices?

☐ Yes

☐ Not at this time

****

THANK YOU FOR PARTICIPATING IN OUR SURVEY!

For more information about this study, please contact Juan Chen at 512-300-7475 or by e-mail at juanchen@mail.utexas.edu.

Appendix C: Example Interview Guide

Synthesis Study on Innovative Contracting Techniques for Routine and Preventive Maintenance Contracts
TxDOT Project 0-6388

Case Study Guide

Topic 1: General Information about the Contracting Strategy

1.1 State Visited: _____

1.2 District Visited: _____

1.3 Contact Name: _____

1.4 Contact Phone Number: _____

1.5 Contact E-mail Address: _____

1.6 Contracting Strategy Investigated: _____

1.7 Associated Pricing Strategy: _____

1.8 Contract Award Strategy: _____

1.9 For Best Value (or qualifications-based) awards, what criteria were used to determine the "best value" and what percentage did each criterion account for?

_____

_____

_____

Criteria		**%**
1.9.1	Price	_____
1.9.2	_____	_____
1.9.3	_____	_____
1.9.4	_____	_____
1.9.5	_____	_____

1.10 What is the dollar value (cost) of this contract? _____

1.11 What is the duration of this contract? _____

1.12 Please describe the maintenance activities that are covered under this contract.

_____

_____

(NOTE: Or the interviewer will check the appropriate answers below)

Maintenance Activities	Check if covered	Notes
Pavement		
1.12.1 Routine Pavement Maintenance		
1.12.2 Shoulder Maintenance		
1.12.3 Driveway Maintenance		
1.12.4 Preventive Pavement Maintenance		
Roadside		
1.12.5 Vegetation		
1.12.6 Litter Control		
1.12.7 Pavement Edges		
1.12.8 Rest Areas		
1.12.9 Picnic Areas		
1.12.10 Culverts, Storm Drains and Drainage		
1.12.11 Guardrail, Barriers and Attenuators		
1.12.12 Ditch		
1.12.13 Mailbox		
1.12.14 Sweeping		
Traffic Operation		
1.12.15 Safety Appurtenances		
1.12.16 Illumination		
1.12.17 Traffic Signals		
1.12.18 Signs and Delineators		
1.12.19 Pavement Markings		
1.12.20 Striping		
1.12.21 Temporary Markings		
1.12.22 Pavement Graphics		
1.12.23 Raised Reflective Pavement Markers		
1.12.24 Shoulder Texturing Treatments		
1.12.25 ITS		
Bridge		
1.12.26 Channel, Culverts, Approaches		
1.12.27 Deck, Superstructure, Substructure		
1.12.28 Cleaning the roadway		
1.12.29 Restoration, delineation and signing		
1.12.30 Cleaning and servicing joints and bearings		
1.12.31 Removal of drift from around substructures		
1.12.32 Painting		
1.12.33 Fender system		

Topic 2: Criteria Used to Select the Contracting Strategy

Who we want to meet with: Director/Deputy Director of Maintenance

Specific question we want to answer: What process or criteria were used to *select* the innovative contracting strategy? Explain how and why the particular strategy was *selected*.

Documents we need to collect: Selection worksheets

2.1 Please explain how this maintenance work was completed previously.

_____
_____
_____
_____

2.2 Why did you decide to implement <u>this</u> type of maintenance contract rather than another type?

_____
_____
_____
_____

2.3 Please specify the criteria you used to select the contracting strategy (identified above) for outsourced maintenance activities?

_____
_____
_____
_____
_____

(NOTE: Or the interviewer will check the appropriate answers below)

	Criteria	**Check if used**
2.3.1	We were directed to do it by executive management	_____
2.3.2	We were required to implement it by legislative mandate	_____
2.3.3	District budget limitations made this option more attractive	_____
2.3.4	The Legislative budget drove our decision	_____
2.3.5	The availability of contractor workforce vs. our own	_____
2.3.6	Portion/composition of in-house and outsourced resources	_____
2.3.7	Length of time of the contract was a factor	_____
2.3.8	Dollar Value of Contract A vs. Dollar Value of Contract B on the basis of maintaining the same level of service for the same maintenance activities	_____
2.3.9	Life Cycle Cost (annualized) within the contract duration vs. LCC formerly	_____
2.3.10	Reduction in risk (# workers not exposed to risk, # errors avoided, etc.)	_____
2.3.11	Cost (or savings) of risk reduction (DOT savings v. contractor costs)	_____

Topic 3: Process Used to Implement the Contracting Strategy

Who we want to meet with: Person that created the contracting process or contract specification

Specific questions we want to answer:
1. What process was used to *implement* the innovative contracting strategy?
2. Explain how and why the particular strategy was *implemented*.

Documents we need to collect:
1. Original and current contract documents, including specifications
2. Contractor selection worksheets
3. Other documents associated with implementation

3.1 Please describe the process you used / developed to implement this contracting strategy.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

3.2 Please describe why you decided to implement this particular contracting strategy.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Topic 4: Criteria Used to Select Method-based vs. Performance-based Contract

Who we want to meet with: Director/Deputy Director of Maintenance

Specific questions we want to answer: What criteria were used to determine performance type (i.e., method-based or performance-based)?

Documents we need to collect: None

4.1 What criteria did you use to select the type of performance (i.e., performance-based or method-based) and why did you use these criteria?

_____
_____
_____
_____
_____
_____

(NOTE: Or the interviewer will check the appropriate answers below)

Criteria		Check if used
4.1.1	Level of trust in contractors	_____
4.1.2	Level of control desired	_____
4.1.3	Political reasons and pressure	_____
4.1.4	Quality of contractors	_____
4.1.5	Participation of contractors in bid process	_____

Topic 5: Criteria Used to the Select Pricing Strategy and Award Strategy

Who we want to meet with: Director/ Deputy Director of Maintenance; Contracts Specialist

Specific questions we want to answer: What criteria were used to select the pricing and award strategies and why?

Documents we need to collect: Bid evaluation sheets

5.1 What criteria did you use to select the type of pricing strategy (unit price, lump sum, etc.) and why did you use these criteria?

_____
_____
_____
_____
_____
_____

5.2 What criteria did you use to select the type of award strategy (low bid, best value, etc.) and why did you use these criteria?

_____
_____
_____
_____
_____
_____

Topic 6: Effectiveness of the Contracting Strategy

Who we want to meet with: Director of Maintenance and the TxDOT Inspector / Project Manager

Specific questions we want to answer:
1. Explain how the maintenance contracting strategy changed the *delivery, cost effectiveness, and quality* of maintenance services.
2. Which criteria can best be used to evaluate the contract strategy's efficiency?

Documents we need to collect:
1. Reports that compare in-house to outsourced costs (or data that will allow us to make comparisons)
2. Reports that compare old performance/costs to new performance/costs
3. Quantitative data to support claims of efficiency, cost savings, etc.
4. Copy of the performance evaluation criteria and sample forms
5. Report that documents performance (LOS) goals and performance (LOS) achieved

6.1 What are the factors that make this contracting strategy particularly appealing?

6.2 In your opinion, how has the maintenance contracting strategy changed *delivery* of maintenance services?

6.3 Do you think the maintenance contracting strategy changed the *cost effectiveness* of maintenance services and how?

_____
_____

6.4 Do you think the maintenance contracting strategy has changed the *quality* of maintenance services and how?

_____
_____
_____
_____
_____
_____
_____
_____
_____

6.5 What process do you use to evaluate the effectiveness of the contractor's performance or effectiveness of the contract?

_____
_____
_____
_____
_____
_____
_____

6.6 Which specific criteria do you use to assess or evaluate contractor (or contract) performance?

_____
_____
_____
_____
_____
_____
_____

(NOTE: Or the interviewer will check the appropriate answers below)

Criteria		**Check if used**
6.6.1	Benefits (LOS) versus Costs (contract)	_____
6.6.2	Level of Service (LOS) achieved versus LOS goals	_____
6.6.3	Level of Service (LOS) now versus LOS previously	_____
6.6.4	Quality of service achieved versus quality of service goals	_____
6.6.5	Estimated costs versus actual costs	_____
6.6.6	In-house costs versus contract costs	_____
6.6.7	Delivery timeliness	_____
6.6.8	Response Time	_____
6.6.9	Number of Warnings	_____

6.7 Please explain how your budget compares to the contract cost (e.g., do you exceed the budget; do you have enough in budget to cover contract costs?)

_____
_____
_____
_____

Topic 7: Other Factors that Contribute to Maintenance Contracting Outcomes

Who we want to meet with: Director/Deputy Director of Maintenance; Project Manager/Inspector

Specific questions we want to answer:
1. What problems were encountered during implementation of the contracting strategy?
2. What successes have been achieved as a result of implementing this contract strategy?

Documents we need to collect: None

7.1 Describe any problems that were encountered, or considerations that got missed, during the implementation of the contracting strategy and how they were resolved.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

7.2 Did you make any adjustments to the contract after implementation? If yes, why and how?

_____
_____
_____
_____
_____
_____
_____
_____

7.3 Did you make any assumptions that were incorrect (such as how the work would be performed)? Please explain.

_____
_____
_____

_____
_____
_____
_____
_____

7.4 Did you, at any point, have unsuccessful performance and if yes, what factors caused it?

_____
_____
_____
_____
_____
_____

7.5 What factors may have contributed to *successful* performance?

_____
_____
_____
_____
_____
_____

(NOTE: Or the interviewer will check the appropriate answers below)

Factors		**Contributed to Successful Perf.**	**Notes**
7.5.1	Contract Language	_____	_____
7.5.2	Language in the Specifications	_____	_____
7.5.3	Partnering with Contractors	_____	_____
7.5.4	Verification of Qualifications	_____	_____
7.5.5	Quality Control Plan	_____	_____
7.5.6	Inspection of Completed Work	_____	_____
7.5.7	Bundling of Services	_____	_____
7.5.8	Knowledge Retention	_____	_____
7.5.9	Contract Duration	_____	_____
7.5.10	Bonuses and Penalties	_____	_____
7.5.11	Experienced Contractor Project Manager	_____	_____

Topic 8: Best Practices and Lessons Learned from Implementing the Strategy

Who we want to meet with: Director/Deputy Director of Maintenance; Inspector; Contracts Specialist

Specific questions we want to answer:

1. What Best Practices can you share with other DOTs about implementing this contract strategy?

2. What Lessons Learned can you share with other DOTs about implementing this contract strategy?

Documents we need to collect: None

8.1 Please identify three best practices that you would like to share based on your experience with implementing this contracting strategy.

_____
_____
_____
_____
_____

8.2 Please identify three lessons learned that you would like to share based on your experience with implementing this contracting strategy.

_____
_____
_____
_____
_____

8.3 Can you think of any other roadblock another DOT should be aware of if they decide to implement a similar contracting strategy (i.e., low bid won't work, etc.)?

_____
_____
_____
_____
_____
_____
_____

8.4 For Best Value awards, can you explain why you think the best value process is working well or is not working very well?

_____
_____
_____
_____
_____
_____
_____
_____

Topic 9: Decision Criteria for Selecting In-House v. Outsourced Maintenance

Who we want to meet with: Director/Deputy Director of Maintenance

Specific questions we want to answer: What criteria were used to make the decision to contract out this work rather than perform the work in-house?

Documents we need to collect: None

9.1 What criteria did you use to make the decision to contract out these maintenance activities rather than perform the work in-house?

_____
_____
_____
_____
_____
_____
_____

(NOTE: Or the interviewer will check the appropriate answers below)

Criteria		Used to make decision	Notes
9.1.1	Available budget	_____	_____
9.1.2	Available in-house workforce	_____	_____
9.1.3	Available contractors	_____	_____
9.1.4	Quality of contractors	_____	_____
9.1.5	Average Daily Traffic on the road	_____	_____
9.1.6	Political reasons or pressure	_____	_____
9.1.7	To increase the Level of Service	_____	_____
9.1.8	To address weather challenges	_____	_____
9.1.9	To achieve cost savings	_____	_____
9.1.10	Volume of work	_____	_____
9.1.11	Contract price (Dollar value)	_____	_____
9.1.12	Materials availability	_____	_____
9.1.13	Night work availability	_____	_____
9.1.14	Equipment availability	_____	_____
9.1.15	Available expertise	_____	_____
9.1.16	To achieve efficiency	_____	_____
9.1.17	To augment peak workloads	_____	_____
9.1.18	Legislative mandate	_____	_____
9.1.19	To encourage innovation	_____	_____
9.1.20	As a risk management strategy	_____	_____
9.1.21	Speed up project delivery	_____	_____
9.1.22	To increase responsiveness	_____	_____
9.1.23	To accomplish emergency work	_____	_____
9.1.24	Uniqueness of the work	_____	_____
9.1.25	Ability to develop a contracting industry	_____	_____
9.1.26	Enough contract price to attract contractors to bid	_____	_____

Topic 10: How Districts Bundle Activities

Who we want to meet with: Director/Deputy Director of Maintenance

Specific questions we want to answer: How did you bundle a variety of activities together into one contract? What criteria did you use to bundle the activities?

Documents we need to collect: None

10.1 How did you bundle a variety of activities together into one contract? For each set of activities identified below, label the set as an *Individual Activity Contract*, *Bundled Activities Contract*, *Asset Management Contract*, or some other contracting strategy.

Activity or Set of Activities	Individual Activity Contract	Bundled Activities Contract	Asset Management Contract	Other Contracting Strategy
10.1.1 Sweeping, mowing and litter pickup	_____	_____	_____	_____
10.1.2 Reshaping ditches and tree removal	_____	_____	_____	_____
10.1.3 Ditch cleaning and ditch shaping	_____	_____	_____	_____
10.1.4 All routine maintenance activities except unique/risky activities	_____	_____	_____	_____
10.1.5 Remove and replace concrete pavement and ACP shoulder	_____	_____	_____	_____
10.1.6 All routine and preventive maintenance activities for I-10	_____	_____	_____	_____
10.1.7 All roadside maintenance except Rest Areas and Picnic Areas	_____	_____	_____	_____
10.1.8 Spot painting and bead striping	_____	_____	_____	_____
10.1.9 Picnic area and landscape maintenance	_____	_____	_____	_____
10.1.10 Install and remove raised pavement markers	_____	_____	_____	_____
10.1.11 Rehabilitation of flexible base and two-course surface treatment	_____	_____	_____	_____
10.1.12 Cleaning and sealing cracks	_____	_____	_____	_____
10.1.13 Cleaning & sealing joints and cracks	_____	_____	_____	_____
10.1.14 Street sweeping & debris removal	_____	_____	_____	_____
10.1.15 Pavement Marking and pavement markers	_____	_____	_____	_____
10.1.16 Traffic Signals, Signs, and Delineators	_____	_____	_____	_____
10.1.17 Bridge Painting, and Bridge Restoration, delineation, and signing	_____	_____	_____	_____
10.1.18 Temporary Markings and Pavement Markings	_____	_____	_____	_____

10.2 What criteria do you use to bundle the activities?

_____
_____
_____
_____
_____
_____
_____
_____

Topic 11: How Districts Define Maintenance

11.1. How do you define "routine pavement maintenance"?

_____
_____
_____
_____
_____
_____
_____
_____

11.2. How do you define "preventive pavement maintenance"?

_____
_____
_____
_____
_____
_____
_____
_____

Appendix D: Example Workshop Package

Synthesis Study on Innovative Contracting Techniques for Routine and Preventive Maintenance Contracts
TxDOT Project 0-6388

Maintenance Delivery Methods Evaluation Workshop

Friday, November 20, 2009
1 PM – 5 PM

Classroom D
TxDOT Riverside Campus Building #200
200 E Riverside Drive
Austin, Texas 78704

Document List:

1. Workshop Agenda
2. Directions to TxDOT Riverside Campus
3. Brief Introduction to TxDOT Project 0-6388
4. Summary of Maintenance Delivery Methods
5. Maintenance Contracting Strategy Selection Framework
6. Instructions for Exercise 1: Evaluating the Influence of Maintenance Delivery Methods on the Achievement of Outsourcing Goals
7. Instructions for Exercise 2: Evaluating the Ability of Maintenance Delivery Methods to Accommodate Particular Circumstances that Result in Maintenance Outsourcing
8. Instructions for Exercise 3: Weighting Goals vs. Circumstances
9. Conclusion

Agenda

1:00 – 1:15 PM: Introductions and Background Information

1:15 – 1:30 PM: Review of typical maintenance outsourcing goals and Exercise 1 instructions

> NOTE: A pre-workshop exercise was conducted with the PMC to identify typical maintenance outsourcing goals

1:30 – 2:30 PM: Exercise 1: Evaluating the influence of maintenance delivery methods on the achievement of outsourcing goals

2:30 – 2:45 PM: Break

2:45 – 3:00 PM: Review of circumstances that result in maintenance outsourcing and Exercise 2 instructions

> NOTE: A pre-workshop exercise was conducted with the PMC to identify circumstances that result in maintenance outsourcing

3:00 – 4:30 PM: Exercise 2: Evaluating the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing

4:30 – 4:40 PM: Weighting relative importance of goals vs. circumstances

4:40 – 4:45 PM: Conclusion

Brief Introduction of TxDOT Project 0-6388

In the past decade, the Federal Highway Administration challenged state highway agencies to focus on preserving and maintaining existing highway system to prevent deterioration. To achieve this goal, many state highway agencies have shifted to greater outsourcing to augment their in-house personnel, bringing together in-house and contract staff to maximize cost, quality, expertise, and efficiency. While many reports suggest that contracting maintenance services has generally been successful and cost-beneficial, there are some indications that not all efforts have been successful because outsourcing goals have not been aligned with the appropriate contracting strategy. The conflicting results about the effectiveness of contracting strategies have created confusion among transportation agencies. Therefore, TxDOT wants to identify innovative maintenance contracting strategies that are being used by other state DOTs or other countries so that they can select efficient contracting strategies that might be implemented to help them achieve their maintenance goals.

This research aims to develop a decision method for selecting appropriate contracting strategies to outsource various maintenance activities.

The research team identified three components of a maintenance contracting strategy:

1. Delivery Method
2. Types of Contract Specifications
3. Pricing Strategy

Through a literature review and interviews with TxDOT and other state DOT experts, 13 delivery methods were identified, three contract specifications, and three pricing strategies were identified for potential use in TxDOT. Furthermore, decision criteria were identified for selecting a contracting strategy, and a *Maintenance Contracting Strategy Selection Framework* (see Figure 1) was developed.

Currently, the researcher team is working on a selection algorithm that will allow potential decision-makers to evaluate their outsourcing goals and particular maintenance circumstances in order to identify maintenance contracting strategies that will aid them in achieving their outsourcing goals and accommodating their circumstances. However, assistance is needed from a panel of experts to evaluate the potential influence of each maintenance delivery method on the achievement of maintenance outsourcing goals and accommodation of maintenance circumstances. ***You have been invited to participate on this expert panel because of your extensive knowledge of transportation maintenance processes.***

The goal of this workshop is to evaluate the influence of each delivery method on (1) the achievement of maintenance outsourcing goals and (2) the accommodation of maintenance circumstances. Thank you very much for your time and effort.

SUMMARY OF MAINTENANCE DELIVERY METHODS

Thirteen (13) maintenance contracting delivery methods are defined in the table below and were incorporated into a *Maintenance Contracting Strategy Selection Framework* (Fig. 1). These delivery methods will be used for developing a maintenance delivery method selection tool.

No.	Names of Delivery Methods	Definition
1	Individual Activity Contract Method	A single maintenance activity is outsourced, such as mowing.
2	Moderately Bundled Activities Contract Method	A few maintenance activities that are of a similar nature and have a compatible sequence of work are let out together, such as mowing, sweeping, and litter pick-up.
3	Significantly Bundled Activities Contract Method	*Nearly all* maintenance activities are let out together, other than a few activities that are special or unique. A method-based specification and unit price are required to implement this method. This contract method has also been called a General Maintenance Contract.
4	Partial Competitive Maintenance Contract Method	A certain percentage of the in-house workforce is retained to perform various routine maintenance activities, while the rest of the activities are bid out. In this method, in-house forces can competitively bid against contractors for the work. Often, the scope of work is large and may include all maintenance activities or a very large bundle of activities.
5	Jointly-Performed Maintenance Contract Method	A portion of a specific maintenance activity is performed by in-house personnel and the remainder of the activity is outsourced to a contractor, typically due to a lack of sufficient equipment or labor. For example, snow removal or small rehabilitation projects can be jointly performed.
6	Routine Maintenance Contract Method	*All* routine maintenance activities are outsourced together as one contract. If a performance-based specification and lump sum pricing are used, the method can be regarded as a Total Asset Management Contract Method. If a method-based specification and unit pricing are used, the method can be regarded as Significantly Bundled Activities Contract Method.
7	Kilometer (or Mile) per Month Contract Method	Applies essentially to a sub-network of paved roads which is in good to fair condition and is further expected to remain substantially in that condition over the next few years through routine maintenance activities alone, without any major strengthening or rehabilitation. This methods is used widely in Latin America but is not used in the United States. A performance-based specification and lump sum pricing are required to implement this method.

No.	Names of Delivery Methods	Definition
8	Total Asset Management Contract Method	A strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. In the context of contracting, Total Asset Management involves outsourcing operations, maintenance, upgrades to, and expansion of, a road asset. A performance-based specification and lump sum pricing are required to implement this method. Florida calls this method *Total Asset Maintenance Contracting* and Texas calls this method *Total Maintenance Contracting*.
9	Integrated Maintenance Contract Method	A combination of both routine and preventive maintenance activities are outsourced together as one contract. If a performance-based specification and lump sum pricing are used, the method can be regarded as a Total Asset Management Contract Method. If a method-based specification and unit pricing are used, the method can be regarded as a Significantly Bundled Activities Contract Method.
10	CREMA Contract Method	A Combined Rehabilitation and Maintenance (CREMA) Contract that requires contractors to rehabilitate and subsequently maintain a sub-network of roads under a lump sum contract for a total period of five years. This model originated in Argentina and is currently used in Latin America. In the U.S., this method has been used for traffic signal rehabilitation and maintenance, for example. A performance-based specification and lump sum pricing are required to implement this method.
11	Long-term Separate Maintenance Contract Method	A single maintenance activity is outsourced across many areas, regions, or even the entire county for a long duration, typically more than five years, often because it is unique or risky. For example, it is common to outsource rest area maintenance for up to ten years.
12	Multi-Agency Contract Method (also called Framework Contract Method in Europe)	Several contractors are pre-approved and receive nominal contracts that make them eligible for award of maintenance projects. The method is often called a Multi-Agency Contract (MAC) in the U.S. and is used widely by the military. It is called Framework Contract Method in Europe. Some states use this model for traffic control contracts.
13	Alliance Contract Method	A contractor is selected based entirely on qualifications and has the opportunity to gain or lose 15% of the contract value depending on performance. This model typically uses cost plus fee as the pricing strategy.

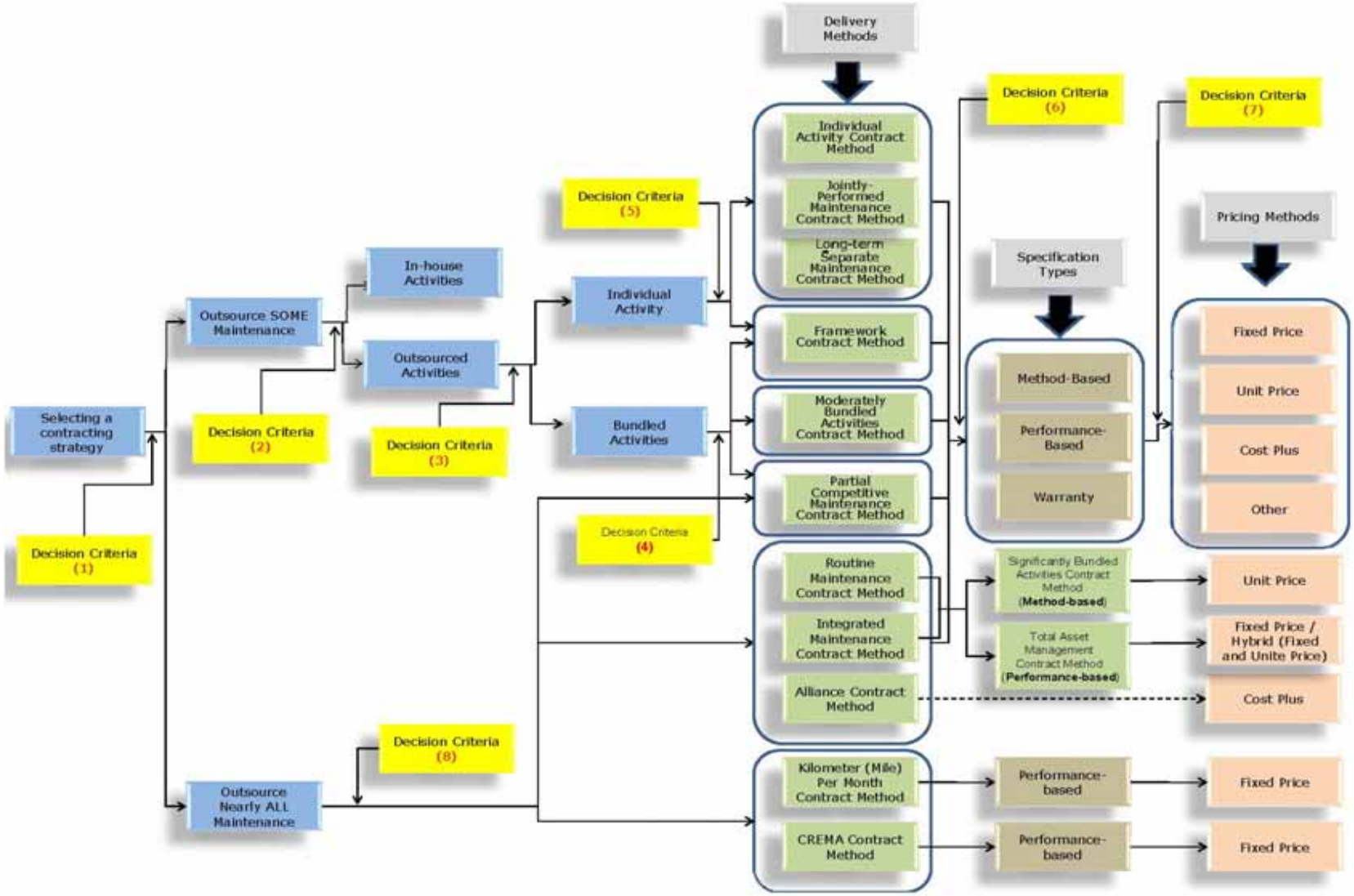

Figure 1. Maintenance Contracting Strategy Selection Framework

Instructions for Exercise 1: Evaluating the Influence of Maintenance Delivery Methods on the Achievement of Outsourcing Goals

As part of the research effort, the research team identified the major factors that DOTs consider when trying to decide whether to outsource maintenance activities or perform the work in-house. The following factors are typically considered when making this initial decision:

- the need to augment in-house resources (labor, equipment and expertise)
- the need to meet a legislative mandate for quantity of maintenance outsourced
- the level of flexibility and control needed in determining when and how to complete the work
- the desire to maintain in-house expertise while augmenting the workforce

Once the decision has been made to outsource some or all of the maintenance work, the DOT must consider what they want to achieve by outsourcing the maintenance work (referred to as "Outsourcing Goals"), and select the appropriate delivery methods to help them achieve their outsourcing goals.

One of the objectives of this workshop is to evaluate the influence of each maintenance delivery method on the achievement of outsourcing goals. Seven goals have been identified by the research team from the literature review, interviews, and input from the PMC. Please review the typical outsourcing goals encountered in DOTs.

No.	Outsourcing Goals	Reference
1	The DOT wants a long-term commitment from the contractor.	Maine DOT, Florida DOT
2	The DOT wants to reduce the amount of time for bidding and awarding projects	Pakkala (literature review)
3	The DOT wants to reduce contract administrative load by bundling activities together.	Houston District, Lubbock District, Florida DOT
4	The DOT wants to reduce the coordination effort among multiple maintenance contractors.	Houston District
5	The DOT wants to reduce conflicts between owners and contractors.	Pakkala (literature review)
6	The DOT wants to select a maintenance outsourcing strategy that fits its budget.	PMC
7	The DOT wants to make sure contractors achieve a certain level of quality.	PMC

The purpose of selecting a particular maintenance outsourcing delivery method is to achieve specific outsourcing goals. For example, if the goal is to "obtain a long-term commitment from the contractor" then the Long-term Separate Maintenance Contract Method will help the DOT achieve this goal. Hence, while many delivery methods might help to achieve outsourcing goals, some methods might be more effective than others. Therefore, the purpose of Exercise 1 is to evaluate how likely your district is to achieve each of the outsourcing goals identified above if a given delivery method is implemented.

The following categories define how likely your district is to achieve a particular outsourcing goal if a given maintenance delivery method is implemented.

Achievement Level	Description
Very Likely	My district is **very likely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.
Somewhat Likely	My district is **somewhat likely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.
Neutral	My district is **neither likely nor unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.
Somewhat Unlikely	My district is **somewhat unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.
Very Unlikely	My district is **very unlikely** to achieve the particular maintenance outsourcing goal if the given delivery method is implemented.

Specific Instructions for Filling Out the Worksheet

1. Review the first maintenance outsourcing goal ("The DOT wants a long-term commitment from the contractor.").
2. Review the definition of Individual Activity Maintenance Contract Method provided on the separate sheet of paper.
3. If you implement the Individual Activity Maintenance Contract Method, how likely are you to achieve your first maintenance outsourcing goal of achieving "a long-term commitment from the contractor"? Are you very likely, somewhat likely, neutral, somewhat unlikely, or very unlikely to achieve this goal? Check the box that best describes your answer.
4. Continue evaluating how likely you are to achieve each maintenance outsourcing goal if each of the maintenance outsourcing delivery methods is implemented.

No.	Outsourcing Goals	Achievement Level	Delivery Methods												
			Individual Activity Contract Method	Jointly-Performed Maintenance Contract	Long-term Separate Maintenance Contract	Multi-Agency Contract Method	Moderately Bundled Activities Contract	Partial Competitive Maintenance Contract	Routine Maintenance Contract Method	Integrated Maintenance Contract Method	Significantly Bundled Activities Contract	Total Asset Management Contract Method	Alliance Contract Method	Kilometer (Mile) Per Month Contract	CREMA Contract Method
1	The DOT wants a long-term commitment from the contractor.	very likely	☐	☐	☑	☐	☐	☐	☐	☐	☑	☑	☐	☑	☑
		somewhat likely	☐	☐	☐	☐	☑	☐	☑	☑	☐	☐	☑	☐	☐
		neutral	☑	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☐	☐
		somewhat unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		very unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	The DOT wants to reduce the amount of time for bidding and awarding projects	very likely	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
		somewhat likely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑	☐	☐
		neutral	☐	☑	☑	☐	☑	☑	☐	☐	☑	☐	☐	☑	☑
		somewhat unlikely	☑	☐	☐	☐	☐	☐	☑	☑	☐	☐	☐	☐	☐
		very unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Instructions for Exercise 2: Evaluating the Ability of Maintenance Delivery Methods to Accommodate Particular Circumstances that Result in Maintenance Outsourcing

A second objective of this workshop is to evaluate the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing. The maintenance outsourcing circumstances have been identified by the research team from the literature review, interviews, and input from the PMC. Please review the typical maintenance outsourcing circumstances encountered in DOTs.

No.	Maintenance Circumstances	Reference
Resource Constraints		
1	We were required to reduce our full-time employee (FTE) workforce, but we still have a significant amount of maintenance work to complete and not enough personnel.	Pennsylvania DOT
2	Budget limitations caused us to consider innovative contracting strategies that could help us complete the required maintenance work at a reduced cost.	Pennsylvania DOT
3	We have some in-house personnel who can perform some of the work associated with a particular individual activity but they cannot complete all of the work.	Pennsylvania DOT
4	We have some in-house equipment that is needed to complete the work of a particular individual activity, but we do not have enough pieces of that equipment to do it all in-house.	Pennsylvania DOT
5	A particular activity requires multiple pieces of equipment, and we only have one type of equipment. Hence, we need to outsource the remaining pieces of equipment and an operator to complete the remainder of the activity.	Lufkin District
6	We do not have any in-house personnel, equipment, materials, or expertise to perform a particular individual maintenance activity or a bundle of activities.	Maine DOT, Pharr District
Timing		
7	We want to award a long-term contract to a contractor who will commit resources to the maintenance work for at least 5 years.	Maine DOT
8	There are some unique or risky activities in our district that we would prefer to outsource rather than have our own personnel perform the work. There are also contractors willing to perform this work for a long duration, typically more than five years.	Pakkala (literature review)
9	We would like to reduce the amount of time for bidding and awarding specific maintenance work, select contractors quickly for urgent projects, and meanwhile	Pakkala (literature review)

	reduce overall administration time and costs.	
10	A fixed price long-term contract would allow us to establish a budget that covers a few years rather than just one year.	Literature review and interviews with DOT experts
11	We want to make full use of our personnel and equipment, while purchasing contracted maintenance service only when we need it.	Pennsylvania DOT, Lufkin District
Unique, Risky, or Emergency-type		
12	Only a few small highway sections need emergency repair work, so we would like to contract this work out.	Lufkin District
13	If all of the maintenance work associated with a specific interstate highway is contracted out together, our personnel can totally focus on county roads and secondary roads, while limiting their exposure to the risk of working on the interstate highway.	North Carolina, Waco District
14	For some unique activities, our district does not have equipment or expertise to perform the work in-house, and we do not have a contractor in our region that can do all of the activities together, so we must contract out each activity separately.	Literature review and interviews with DOT experts
15	It is difficult for our district to combine preventive maintenance with routine maintenance into one contract because contractors are not available to do this combination of work or because weather conditions make this combination inefficient.	Pakkala (literature review)
Contracting Issues and Contract Management		
16	We do not want to outsource all of our maintenance work, just some of it.	Lufkin District
17	We would like to pre-approve contractors, who will receive nominal contracts that make them eligible for award of maintenance projects, jobs, or tasks over a specified duration. This will reduce the time spent on bidding and awarding work.	Pakkala (literature review)
18	We want to reduce the number of maintenance contracts we need to manage.	Lubbock District
19	We have been required to outsource more of the maintenance work, but our in-house employees are opposed to more outsourcing. Thus, we need a compromise.	Literature review and interviews with DOT experts
20	There are numerous conflicts between our District and our contractors, so we would like to implement a contracting strategy that mitigates potential conflicts.	Pakkala (literature review)
21	Many maintenance activities are already outsourced, and the availability of contractors is plentiful, so we believe it is possible to outsource nearly all maintenance activities together as one contract.	North Carolina DOT

22	Contractors blame each other when something bad happens during the performance of maintenance work, and it is often difficult to figure out who was actually responsible. Hence, we need an outsourcing strategy that eliminates contractor conflicts.	Houston District
23	Our paved roads are in good condition now, and we would like to maintain them in that condition by outsourcing routine maintenance activities alone without any major strengthening or rehabilitation.	Liautaud (literature review)
24	We would like to integrate rehabilitation and routine maintenance contracts together in order to encourage contractors to increase the quality of rehabilitation.	Liautaud (literature review)
Efficiency		
25	Our district believes it is more efficient to bundle a few activities into one contract rather than award separate contracts in order to reduce administration, overhead, and inspection load, and thus relieve the impacts of a shortage of in-house personnel.	Lubbock District, Waco District
26	For some controlled access routes, we want one contractor to do most or almost all of the maintenance work in order to achieve efficient management of the work.	Lubbock District
27	We are seeking a contracting strategy that can help us reduce administrative load.	Florida DOT
28	We do not have the equipment and expertise to perform maintenance using in-house personnel, and individual contracts will be too inefficient for us.	Houston District
29	Traffic is interrupted repeatedly by different contractors when they perform their own work at different times. Hence, we need to implement a maintenance outsourcing strategy that better integrates the outsourced maintenance work.	Houston District
30	It is possible in our region to combine routine and preventive maintenance into one contract, and it would be more efficient to perform maintenance work through such a combined contract.	Literature review and interviews with DOT experts
Policy		
31	We were required by executive management or legislative mandate to implement a particular delivery method.	North Carolina DOT, Dallas District, Waco District

Another purpose of selecting a particular maintenance outsourcing delivery method is to accommodate a district's specific maintenance outsourcing circumstances. For example, if the circumstance is that a DOT has some labor, equipment, and expertise to complete an activity but not enough to complete all of the work, then the Jointly-Performed Maintenance Contract Method will help the DOT accommodate this particular circumstance. Hence, while many delivery methods might accommodate particular maintenance circumstances, some methods

might be more effective than others. Therefore, the purpose of Exercise 2 is to evaluate how likely a given maintenance delivery method will accommodate each of the maintenance circumstances identified above if the delivery method is implemented.

The following categories define how likely a given maintenance delivery method will accommodate a particular maintenance circumstance if the delivery method is implemented.

Accommodation Level	Description
Very Likely	The given maintenance delivery method is **very likely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.
Somewhat Likely	The given maintenance delivery method is **somewhat likely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.
Neutral	The given maintenance delivery method is **neither likely nor unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.
Somewhat Unlikely	The given maintenance delivery method is **somewhat unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.
Very Unlikely	The given maintenance delivery method is **very unlikely** to accommodate the particular maintenance outsourcing circumstance if the delivery method is implemented.

Specific Instructions for Filling Out the Worksheet

1. Review the first maintenance outsourcing circumstance ("We were required to reduce our full-time employee (FTE) workforce, but we still have a significant amount of maintenance work to complete and not enough personnel.").
2. Review the definition of Individual Activity Maintenance Contract Method provided on the separate sheet of paper.
3. If you implement an Individual Activity Maintenance Contract Method, how likely are you to accommodate your first maintenance circumstance of "We were required to reduce our full-time employee (FTE) workforce, but we still have a significant amount of maintenance work to complete and not enough personnel."? (In other words, will this delivery method help to improve your situation (by augmenting your personnel) or not?). Are you very likely, somewhat likely, neutral, somewhat unlikely, or very unlikely to accommodate this circumstance? Check the box that best describes your answer.
4. Continue evaluating how likely you are to accommodate each maintenance circumstance if each of the maintenance outsourcing delivery methods is implemented.

No.	Maintenance Circumstances	Accommodation Level	Delivery Methods												
			Individual Activity Contract Method	Jointly-Performed Maintenance Contract Method	Long-term Separate Maintenance Contract Method	Multi-Agency Contract Method	Moderately Bundled Activities Contract Method	Partial Competitive Maintenance Contract Method	Routine Maintenance Contract Method	Integrated Maintenance Contract Method	Significantly Bundled Activities Contract Method	Total Asset Management Contract Method	Alliance Contract Method	Kilometer (Mile) Per Month Contract Method	CREMA Contract Method
1	We were requeired to reduce our full-time employee (FTE) workforce, but we still have a sighificant amount of maintenance work to complete and not enough personnel.	very likely	☐	☑	☐	☐	☐	☐	☑	☑	☑	☑	☐	☐	☐
		somewhat likely	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☐	☑	☑
		neutral	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐	☑	☐	☐
		somewhat unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		very unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	Budget limitations caused us to consider innovative contracting strategies that could help us complete required maintenance work at a reduced cost.	very likely	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		somewhat likely	☐	☐	☑	☐	☑	☐	☑	☑	☐	☑	☑	☐	☐
		neutral	☐	☐	☐	☑	☐	☐	☐	☐	☑	☐	☐	☑	☑
		somewhat unlikely	☑	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐
		very unlikely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Instructions for Exercise 3: Weighting Goals vs. Circumstances

The researchers are developing a selection algorithm that uses the results of the workshop (i.e., the influence of maintenance delivery methods on the achievement of maintenance outsourcing goals AND the ability of maintenance delivery methods to accommodate particular circumstances that result in maintenance outsourcing). These two criteria have different effects on the appropriateness of a particular maintenance delivery method (i.e., the extent to which the maintenance contracting delivery method meets the needs of the district). Therefore, weights must be assigned to each criterion that will be used in the selection algorithm.

Please assess the relative importance of each criterion compared to the other and assign a specific percentage to each criterion that adds up to 100%. For example, do you think it is more important to achieve maintenance outsourcing goals? Or do you think it is more important to accommodate particular maintenance circumstances that result in outsourcing? How much more important is one than the other? If you think they are equally important, you should assign each a weight of 50%.

Please indicate how you weight the importance of maintenance outsourcing goals versus maintenance circumstances in the following section of your spreadsheet.

	Percentage
Criteria of Outsourcing Goals	
Criteria of Circumstances	
Total	**100%**

Conclusion

After completing each exercise, please turn in your worksheet to the researchers at the following e-mail or mail address:

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Thank you.