ISSUES AND PRACTICES IN PERFORMANCE-BASED MAINTENANCE AND OPERATIONS CONTRACTING

Requested by:

American Association of State Highway and Transportation Officials (AASHTO)

Prepared by:

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DISCLAIMER

TABLE OF CONTENTS

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LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AM	Asset Maintenance
AMC	Area Maintenance Contract
AMOTIA	Association for Management and Operations of Transportation Infrastructure Assets
AMPER	Asset Maintenance Contractor Performance Evaluation Report
DOT	Department of Transportation
FHWA	Federal Highway Administration
HMA	Hot Mix Asphalt
LOS	Levels of Service
MA	Maintenance Agents
MAC	Managing Agent Contractor
MTO	Ministry of Transportation of Ontario
NCHRP	National Cooperative Highway Research Program
PBMC	Performance-Based Maintenance Contracting
PPTA	Public and Private Transportation Act (of Virginia)
QA	Quality Assurance
QC	Quality Control
RFI	Request for Information
RFP	Request for Proposal
SME	State Maintenance Engineer
TAMS	Turnkey Asset Management Services
TMC	Term Maintenance Contractors

ABSTRACT

This report summarizes the research performed under NCHRP Project 20-24(61) to document the views and experiences of senior highway agency officials with performance-based maintenance and operations contracting and to develop a strategy for advancing the state-of-the-practice in this area. This research effort conducted a critical evaluation of the state highway agency experiences with performance-based contracting services through survey questionnaires, literature review, on-site interviews and teleconferences. The survey of agency practice in the United States and Canada indicated that a growing number of state agencies continue to implement or show interest in performance-based contracting. According to the survey, twelve of the thirty-seven responding agencies have tried performance-based maintenance contracting (PBMC) and wished to continue its use, while another fifteen of the respondents were interested in this approach or learning more about it. The remaining agencies expressed no interest in PBMC at this time. The research team also reviewed literature on domestic as well as international experiences. Either on-site interviews or teleconferences were conducted with the fifteen state agencies in the U.S and Canada. The survey also included the contracting community, who provide PBMC services, to get the private sector perspective.

This report presents a compilation of experiences and insights obtained from in-depth interviews with nine state agencies that have "hands-on" experience as well as six agencies that have shown interest to pursue PBMC. These interviews along with the literature search provided background and support material for the executive forum on performance-based maintenance and operations practices that was held in the spring of 2009. A total of 28 invitees attended the forum, including 11 representatives from state Departments of Transportation (DOTs) and 1 Canadian province and 9 representing contractors/consultants. The forum provided the group with a common level of knowledge of PBMC, time for discussion and input, and an opportunity to establish group consensus. The key outcomes of the forum include the strategies for advancing the state of practice in PBMC and information/knowledge transfer on the current state of practice.

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EXECUTIVE SUMMARY

State departments of transportation (DOTs) are confronted with both growing needs and increased public expectations. At the same time, most are faced with limitations and, in many cases, reductions in the levels of funding and personnel resources needed to manage and maintain a highway system which continues to grow in lane-miles, number of structures, and the sophistication and complexity of underlying technologies in materials and equipment. Most DOTs are responding by increasingly outsourcing key activities. The outsourcing approaches used for a highway agency's maintenance and operations activities traditionally are "method" based contracting, where the agency specifies techniques, technologies, types of materials, and quantities of materials to be used, together with the time period during which the maintenance work is to be performed. Method-based contracts are intended to require that contractors adhere to the DOT's own practices, defined in considerable detail, and therefore tend to be highly prescriptive for each individual work activity.

In 1988, the Canadian province of British Columbia initiated a new approach to outsourcing in the form of performance-based maintenance contracting (PBMC). "The hallmark of PBMC is to pay a contractor based upon the results achieved, not the methods for performing the work. PBMC provides disincentives, incentives, or both to the contractor to achieve performance standards or targets for measurable outcomes and sometimes outputs. Measures of performance often are expressed in terms of "levels of service" (LOS) represented by specific rating scales corresponding to the condition of different assets achieved or to the outcomes of a particular type of maintenance service. Measures also may be expressed in response times" (Hyman, 2009).

The use of PBMC is growing worldwide. It has become the mainstay of maintenance and operations contracting in Australia, New Zealand, the United Kingdom, Finland, Uruguay, and Argentina. By 2005, 35 countries were using PBMC, and by early 2006, approximately 15 more were exploring and adopting this approach (Hyman, 2009). In the United States and Canada, there are a number of examples of PBMC, although it is not the most common approach in most DOTs. The major leaders are the Virginia and Florida DOTs, with additional applications in Texas and the District of Columbia. More recently, North Carolina has begun PBMC pilot projects for maintaining multiple activities in segments of highways. Illinois, Kentucky, Maryland, Michigan, Nevada, and Utah are using PBMC for maintaining specific activities or assets in a region. Therefore, it was readily evident from a survey of literature that the application and interest in PBMC continues to grow.

To better assess the current state-of-the-practice with regard to PBMC, the research team conducted a survey of agency practice in the United States and Canada. Select agencies were also interviewed. In all, 12 of the 37 of the responding state transportation agencies (or 32%) have tried PBMC and wish to continue its use. Another 15 of the responding agencies (or 41%) were interested in trying this approach or learning more about it. Two of the responding agencies have tried or considered this method and have made a decision to not pursue it any further and the remaining agencies expressed no interest in PBMC.

Furthermore, based upon responses received to a survey conducted by the research team on this project, states including Arizona, California, Colorado, Connecticut, Georgia, Hawaii, Idaho, Louisiana, Massachusetts, Mississippi, Missouri, New York, Pennsylvania, and Wyoming are considering or are interested in learning more about this approach. Georgia DOT, for instance, is considering a 5-year contract for 125 centerline miles of interstate in the Atlanta metro area that the agency intends to put in place once funding becomes available.

The application of and interest in PBMC among state DOTs continues to grow. The research team reviewed literature about both domestic and international experiences and conducted interviews with agencies in the US and Canada to better assess the current state of practice and the agencies' perspectives on PBMC. On-site interviews were conducted with the DOTs in Virginia, Florida, Texas, Oklahoma, and North Carolina, and teleconference interviews were conducted with those of California, Georgia, Kentucky, Maryland, Michigan, Mississippi, Missouri, Nevada, Ontario and Pennsylvania. Surveys also were sent to the contracting community to get the private sector perspective. The results of the interviews and surveys are shown in chapter 3 and provide background and support material for the executive forum on performance-based maintenance and operations practices that was held in the spring of 2009.

The interviews indicate that the primary motivating factors for pursuing PBMC are:

- Augmenting in-house capacity where shortfalls exist.
- Responding to expressions of interest and support from legislative bodies, chief executives, and top management within the agency.
- Reducing costs and improving efficiency.
- Raising the level of service (LOS) provided to customers.
- Shifting risk and liability from the state to the private sector.

On the other hand, the barriers that work against the use of PBMC include:

- State government philosophy opposing outsourcing.
- Opposition by front line employees and their unions, who may see it as a threat to jobs.
- Operational managers and technical staff who perceive a loss of control over operations and methods.
- Local contractors vested in current contracting procedures who feel they will lose work.
- Loss of agency capacity, not just for routine but for emergency response to natural or man-made conditions (storms, fires, catastrophic crashes, security threats, and the like).

The literature indicates a potential for cost savings of as much as 15 percent on domestic projects as a primary motivating factor; however, the agencies interviewed were skeptical about the validity of comparisons and the magnitude of savings claimed, although some did agree that there were savings. Some pointed to the difficulty of making true cost comparisons of all direct and indirect expenditures between public and private sector organizations in the absence of a universally acceptable cost comparison model. They also noted that the scopes of work and levels of performance between contract and in-house work were rarely the same, thus making valid comparisons difficult to achieve.

Performance-based contracts typically evolve within an agency over time. For instance, Ontario and Virginia are in their third generation of PBMC contracts and have made changes with every new generation. Briefly, the process begins with a policy-level "reality check" of the political/institutional feasibility of considering PBMC and, where feasible, it is followed by an analysis of the legal and financial issues, such as contractor prequalification and selection, bonding, and so on. Other essential steps include defining the road network or assets to be contracted out, ensuring the availability of or conducting an up-to date asset inventory and condition assessment, selecting and defining performance indicators and how they are going to be measured and monitored, analyzing the life cycle costs and benefits of various levels of service, determining the term of the contract and renewal options, establishing optimal performance targets and cost estimates, and defining how payments including incentives and disincentives will be linked to performance.

Chapter 3 presents information obtained from nine in-depth interviews with those having "hands–on" experience with PBMC. The research team captured the essence of the statements made in the compilation of "lessons learned" and the "pitfalls" to avoid for newcomers to the PBMC process. A few of these are shown below, and the complete lists are provided in chapter 3:

Planning for a PBMC Approach

- "Plagiarism" is a good thing when agencies emulate the successes of others. Learning from other experienced agencies is invaluable if contemplating PBMC.
- While these contracts provide nice planned spending, it is advisable to budget some discretionary funds for out-of-scope emergencies.
- Keep employees informed of the process. Get them on board early in the development process.
- An initial condition assessment is essential for both the DOT and the contractor. If the contract is for routine maintenance only, the initial assessment can be used to help define the scope of work for replacement and restorative contracts.

Procurement and Contracting

- Contract timeframes need to be of sufficient length to allow contractors to recover the costs of equipment and mobilization. The contract duration should be at least 5 years, preferably 10.
- Consider the possibility of the project not going as planned. Plan out and specify what would happen in such instances.
- Don't "over engineer"—too much restriction in the way of specifications and standards limits contractor flexibility to innovate.
- Establish clear language in the contract scope that allows for changes to performance measures/standards to be consistent with statewide practices that are updated during the contract period.

Standards and Performance Measures

- When developing performance standards, it is important to consider how they will be measured or evaluated. Specify who will collect and pay for the information collection,

if specialized equipment is required, how frequently performance will be evaluated, and the consequences if the performance standard is not met.
- Be reasonable with performance targets.

Contract Administration
- Contract administration staff must be trained on PBMC ahead of time.
- In contract administration, it is important to recognize that this is not a traditional, method-based, quantity and unit price contract and that the contractor has flexibility in how the performance requirements are met. Care for the final product and not the steps needed to get there.
- Contract administration costs should not exceed those for conventional contracts..

Contractors who provide PBMC services, responding to a survey questionnaire, offered the following suggestions to make contracts more cost-effective. Again, full details are provided in chapter 3.

- For roadway projects:
  - Include "fence-to-fence" maintenance and operational responsibility.
  - Project size greater than 100 centerline miles.
  - Minimum contract value of about $1M annually.
- For structure projects:
  - Include total structure, maintenance, inspection, and limited rehabilitation responsibility.
  - Size project such that all structures within a district or division are included.
  - Minimum contract value of about $2.5M annually.
- For facility projects:
  - Include total facility maintenance and limited rehabilitation responsibility.
  - Size project such that all facilities within multiple districts or divisions are included.
  - Minimum contract value of about $3M annually.

In general, contractors recommended a 5-year term as the minimum duration. Other contractor suggestions include the following:

- Require annual bond requirements which provide protection for the agency and minimize potential barriers to entry for smaller contractors (50 percent of annual payment amount).
- Use partnering process either expressed or implied.
- Use disincentives that are fair and reasonable and that promote timely corrective action.

It is beneficial to the outcome of this research to better understand the interests, needs, and motivations of the group of respondents who have not tried PBMC but are interested in this approach. Therefore, the research team conducted teleconference interviews with five of these states—California, Georgia, Maryland, Missouri, and Pennsylvania—selected based on their relatively high inventory of state maintained roadways and their practice of contracting out 20 percent or more of these maintenance activities. A summary of their responses is included in chapter 3.

When asked what they would need to reduce their sense of risk in trying PBMC, states that were still in the process of considering the viability/applicability of PBMC indicated that their decisions would be influenced by evidence of improved performance from experience of other states and evidence that cost would decrease or stay the same. States that said they had already made the decision to pursue PBMC noted that they needed help with developing tools, such as specifications and contract language, and they welcomed "mentors." A number of states indicated their concern with losing direct control over critical activities like emergency response and winter operations because of the significant consequences of system failure. All respondents indicated that top management interest and support was key to initiating PBMC.

It is important to recognize that most of the information presented on PBMC also applies to agencies considering performance-based maintenance using in-house forces. Thirty-three of the 37 states that responded in our survey already have performance standards for in-house maintenance activities, and this information can be used for maintenance accountability and budgeting. Agencies that already are using and tracking performance-based management practices for in-house maintenance forces are best prepared to incorporate PBMC. In comparing costs and benefits of in-house versus outsourced performance-based maintenance, the best comparison is with in-house activities using a performance-based approach, including target LOS, performance metrics, inspection regimes, and incentives/disincentives where possible (recognizing that the form of rewards and penalties for public employees might have to be different from those that can be included in outsourced contracting). Such side-by-side comparisons of in-house versus outsourced approaches, when performed on a level playing field, encourage engagement by in-house staff and optimization of the mix of in-house and outsourced resources.

While the use of PBMC is growing, the following appear needed to help advance the state of practice and rate of deployment:

1. Development of training programs on PBMC concepts for both public and private sector personnel.
2. Development of and access to model procurement documents that are updated on a regular basis.
3. Willingness of key peer personnel from states with good experience to serve as mentors to other states.
4. Allaying the fears and concerns of key stakeholders—front line employees, operational and technical managers, and local contractors vested in current practices.
5. Development of a widely accepted, systematic methodology for comparing public sector versus private sector costs on an equitable basis.
6. Continuous, coordinated efforts on improving performance measures, measurement protocols, performance standards, LOS, and valuation of tradeoffs when raising or lowering standards.
7. Continuous improvement through identifying and deploying innovative strategies that have advanced the state of practice in performance-based maintenance applications, whether in-house or by contracting.
8. Consideration and application of innovative deployment strategies that have been used for other transportation products/processes to performance-based maintenance.

An executive forum on PBMC was conducted on April 22 and 23, 2009, in Tampa, Florida. A total of 28 invitees attended the forum, including 11 representatives from state DOTs and 1 Canadian province and 9 representing contractors/consultants. The group was large and broad enough to meet the criteria set to achieve valid input to strategies. The forum provided the group with a common level of knowledge of PBMC, time for discussion and input, and an opportunity to establish group consensus. The primary outcomes of the forum were several strategies for advancing the state of practice in PBMC. A secondary outcome was information/knowledge transfer on the current state of practice.

Seven PowerPoint presentations added greatly to achieving both the primary and secondary outcomes of the forum. The presentations highlighted both successes and issues that had to be addressed and listed "lessons learned." The presenters were selected because of their particular experiences with PBMC that was determined through the survey and interviews. These presentations are shown in a stand-alone report on the executive forum.

Detailed results of the facilitated group discussions and breakout sessions are captured in chapters 4 and 5 of this report. The entire group was engaged throughout the discussions, and strengths and weaknesses of PBMC were listed and discussed. Twenty-one members of the group (12 owner agency and nine industry representatives) prioritized the top 10 strengths and weaknesses based on their significance to moving the PBMC forward. Next, the group identified and discussed significant challenges, building upon the results of the previous exercise. Twelve challenges were listed, and the top six were prioritized. There was considerable consistency between the owner agency and industry representatives in how they viewed and rated these challenges.

To achieve the primary outcome of the forum, the group was split into two breakout groups (by owner agency and industry) to identify strategies to address the challenges determined previously. The breakout groups reconvened into one group and consolidated the strategies into the following four areas:

1. Establish PBMC as a long-term, sustainable approach.
2. Address impact on employee morale (cultural change).
3. Develop agency guidelines and performance standards.
4. Determine actual costs and valuation of performance levels.

A detailed discussion of each strategy and possible implementation mechanisms is provided to give a better understanding of the group's intent and possibly encourage an individual or group to "champion" one or more of these efforts.

CHAPTER 1: BACKGROUND

The development and use of performance-based management of transportation systems by state DOTs has become more refined and widespread over the last two decades. Advances during this period include:

- The use of measurable and meaningful metrics (e.g., scorecards and dashboards) that clearly define expectations to the transportation organization and its people and to the stakeholders including highway system users.
- Direct linking of funding to performance expectations and achievements.
- Performance-based maintenance contracting for selected services that DOTs traditionally have provided using in-house personnel and equipment or contracted out using method-based unit price contracts. Several states, including Virginia, Florida, and Texas, have used the PBMC strategy to maintain segments of their highway system.

The definition of PBMC is provided in National Cooperative Highway Research Program (NCHRP) Synthesis 389 (Hyman, 2009):

> The hallmark of PBMC is to pay a contractor based upon the results achieved not based on the methods for performing the work. PBMC is an approach to contracting that provides disincentives, incentives, or both to the contractor to achieve performance standards or targets for measurable outcomes and sometimes outputs. Measures of performance are often expressed in terms of "levels of service" (LOS) represented by specific rating scales corresponding to the condition of different assets achieved or to the outcomes of a particular type of maintenance service. Measures may also be expressed in response times.

In an arena where method specifications and payments are made based on units of work completed, the use of PBMC represents a departure from the norm. PBMC contracts typically define the minimum and/or graduated performance and service levels of highway assets as contractual requirements with payments linked to contractor performance achievements. In the purest form of PBMC, how to do the work is not specified, and the contractor is given the opportunity, within specified constraints, to select when and where various activities are done to achieve specified performance levels.

The use of metrics and a mindset of continuous improvement have enabled agencies to achieve higher performance levels over time. While significant advances have been made in the application of PBMC processes, DOT officials generally agree that opportunities remain for further improvement and refinement and for more widespread application of this concept.

NCHRP Project 20-24 (61), "Executive Forum on Performance-Based Maintenance and Operations Practices," was the result of a determination by the American Association of State Highway and Transportation Officials (AASHTO) that research is needed to take stock of what has been learned in maintenance and operations outsourcing through performance-based approaches and to determine what AASHTO could do to most effectively encourage further advances in performance-based management.

The objective of this research was to convene an executive forum for senior DOT officials as well as industry participants to share views, assess experiences with performance-based maintenance and operations contracting, and develop strategies for further advancing the state of the practice in this area. The objective was to be achieved through accomplishment of the following tasks:

Task 1. Conduct a critical review of transportation-agencies' experience with contracting for maintenance and operations services. This task was divided into the following subtasks:

- Task 1.1 – Literature review and insights from literature review.
- Task 1.2 – Survey questionnaires and insights from responses to the questionnaires
- Task 1.3 – On-site or telephone interviews and insights from actual experiences of the agencies that practice PBMC and perspectives of those agencies wishing to explore or pursue PBMC.

Task 2. Prepare interim report documenting the critical review conducted in Task 1.

Task 3. Organize and hold an executive forum on performance-based contracting for maintenance and operations services at a location approved by NCHRP. The forum shall include approximately 30 public and private sector invited participants selected by AASHTO. Provide the revised interim report to participants prior to the meeting, along with other materials prepared to support discussion of strategies for advancing the state of the practice. Provide necessary support for forum logistics and reporting on discussions.

Task 4. Prepare a final report documenting all work on the project. The report shall include an assessment of strategies for advancing the state of practice, giving consideration to discussions at the executive forum.

CHAPTER 2: LITERATURE REVIEW

The development of PBMC in roadway management and maintenance dates back to the late 1980s and early 1990s. The first performance-based contract in roadway maintenance was introduced in British Columbia, Canada. In the United States, Virginia was the first to let a performance-based road asset management and maintenance contract.

Much has been written on the subject of PBMC and its evolution over the last two decades; see Hyman (2009) for a synthesis of practice. The focus of this research is to develop and implement an executive forum for the expressed purposes of educating on benchmark practices and of assisting in developing strategies for further advancing agency management practices in this area. The literature search, surveys, and interviews are intended to take stock of the current state of practice as a foundation for participants to build upon as they discuss strategies to advance the state of the art in PBMC.

State DOTs confronted with growing needs and limited resources for maintaining the highway system increasingly are leveraging department work forces by outsourcing key activities. NCHRP Synthesis 246 reported that one-third of the functions in a typical DOT were outsourced (Witheford, 1997). States such as Virginia, Florida, and Texas have chosen to outsource almost all maintenance responsibilities on certain sections of key highways. Traditionally, the method of outsourcing used in maintenance is method-based maintenance contracting, where the agency specifies techniques, technologies, materials, and quantities of materials to be used, together with the time period during which the maintenance works should be executed (Stankevich et al., 2005). However, Virginia, Florida, and Texas have executed performance-based contracts for maintaining key segments of their roadway network, where they specify performance indicators and thresholds that the contractor is required to meet or exceed while offering a great deal of latitude on exactly how these performance targets are to be achieved. Others with experience in PBMC, although not as extensive as that of the aforementioned states, include the District of Columbia, Illinois, Kentucky, Maryland, Michigan, Nevada, North Carolina, Oklahoma, Tennessee, and Utah.

The concept of PBMC is being introduced in a number of countries. Performance-based contracts in other parts of the world are known by different names, including:

- Performance-Based Road Management and Maintenance Contract
- Performance-Based Maintenance Contract
- Performance-Based Contract
- Performance Contract
- Asset Management Contract
- Asset Maintenance Contract
- Total Asset Management Contract
- Turnkey Asset Maintenance Services
- Area Maintenance Contract (Ontario, Canada, Finland)
- Managing Agent Contract (United Kingdom)
- Contract for Rehabilitation and Maintenance (Argentina)

Performance-based contracts shift the focus from traditional quantity or unit price-based contracts to performance and service standards defined in the contract, as the contractors are paid based on the levels of performance and service achieved through the execution of contracts. Therefore, performance-based contracting allocates higher risk to the contractor than other traditional arrangements but allows space for cost savings by shifting or sharing risk with the contractor (Zietlow, 2004).

Factors that motivate an agency to pursue PBMC may include some or all of the following:

- Improve overall road condition and road user satisfaction.
- Provide transparency to all stakeholders regarding performance targets to which the highway system is to be maintained.
- Political interest in furthering private sector involvement and emulating private sector practices.
- Top management interest in improving efficiency.
- Expenditure stability (under multi-year "fixed price" contract).
- Insufficient in-house resources.
- Ongoing pressure to reduce maintenance costs through application of innovative, efficient, and effective work procedures.
- Shifting or sharing risk with the contractor.

The literature indicates that agencies that have introduced PBMC have done so gradually, starting with one or two pilot projects in a focused geographical region or highway corridor or for only a few maintenance activities in order to gain experience with this non-traditional contract arrangement.

Among the reasons for pursuing this type of contracting is cost savings. Unfortunately, there is no widely accepted protocol for determining total costs associated with highway maintenance and operations if done by the highway agency itself. While raw labor, equipment, and material costs can be ascertained readily, there are issues with what constitutes overhead costs. Overhead costs can include employer-paid taxes, pensions, workers compensation insurance, unemployment insurance, health and life insurance for the employee and family, benefits for retirees, other employee benefits, rent, utilities, computers and software costs, furniture, support staff, supplies, and more (ACEC, 2005).

NCHRP Project 14-18, "Determining Highway Maintenance Costs," is seeking to develop a process for determining an agency's costs associated with performing highway maintenance. Furthermore, the project calls for the process to be flexible enough that it can be applied to any maintenance activity. Upon conclusion of this research, it is hoped that practitioners will be able to make non-controversial evaluation of costs that will aid in their decision making. Ribreau (2004) concludes that "the body of audit materials and reviews—from state auditors and legislative audits in particular—are an excellent learning tool that should be consulted by anyone desiring to consider or implement an outsourced program." Interestingly, while the literature includes many examples of cost savings using PBMC (Hyman, 2009), many of the experts interviewed for NCHRP Project 20-24 (61) indicated that factors other than cost were the primary reason motivating them to pursue PBMC. In particular, insufficient in-house resources,

top management interest in improving efficiency, and political interest in furthering private sector involvement and emulating private sector practices stood out as generally more important.

Performance-based contracts typically evolve within an agency over time. For instance, Ontario and Virginia are in their third generation of PBMC contracts, and they have made changes with every new generation. Because the status of PBMC is changing constantly within an agency, it often is suggested that researchers and analysts refer to an agency's request for proposals (RFP) or invitation for bidding for PBMC services by logging on to the agency's website or contacting the SME.

Briefly, the process begins with a policy-level "reality check" of the political/institutional feasibility of considering PBMC and, where feasible, it is followed with an analysis of the legal and financial issues, such as contractor prequalification and selection, and bonding. Other essential steps include defining the road network or assets to be contracted out, ensuring the availability of or conducting an up-to date asset inventory and condition assessment, selecting and defining performance indicators and how they are going to be measured and monitored, analyzing the life cycle costs and benefits of various LOS, determining the term of the contract and renewal options, establishing optimal performance targets and cost estimates, and defining how payments including incentives and disincentives will be linked to performance.

Brief Overview of Domestic Experience

Virginia

Virginia's Public and Private Transportation Act (PPTA), enacted in 1995, opened the door for PBMC in the US. The law stated that a private entity could submit proposals to any responsible entity in the state to design, construct, finance, and operate facilities for any mode of transportation (Hyman, 2009). In 1996, Virginia implemented the first outcome-based asset management maintenance contract when the DOT awarded a $131.6 million contract to VMS, Inc., for an initial term of 5.5 years to maintain a 20 percent portion of its interstate highway system. It included parts of I-95 and I-81 and all of I-77 and I-381, for a total of 251 centerline miles and approximately 1250 lane miles.

Under the contract, VMS was responsible for managing and maintaining the following features to pre-established outcomes: pavement, roadside assets, drainage system, bridges, vegetation & aesthetics, traffic services, emergency response services, and snow and ice control. Within each feature there were a series of functional activities. For example, the pavement group included activities such as pothole patching, base repair, pressure grouting, and asphalt resurfacing. Each asset had been assigned an acceptable tolerance level that VMS was expected to meet or exceed. For example, potholes were not acceptable if larger than 3 inches by 4 inches and more than 1 inch deep. VMS guaranteed services to meet agreed upon standards and performance measures and backed this guarantee with performance bonds. The performance outcomes were developed jointly between the DOT and VMS during contract negotiations and provided measurable standards that were monitored on a quarterly basis (Zietlow, 2007).

Under the contract, VMS also was responsible for traffic control and assistance to the Virginia State Police and to local police and fire authorities (Zietlow, 2007).

This was a lump-sum contract. There were no deductions for failing to meet performance targets and no liquidated damages expressed in terms of LOS (Hyman, 2009). The recourse for poor performance was that the Virginia PBMC contract could have been terminated (or threatened to be terminated) for cause. Current contracts in Virginia have built-in disincentives.

Table 1 presents the annual report card for Virginia's performance-based maintenance contract. The evaluation was performed by in independent third party. The report card shows that the contractor received a grade of A for shoulders, roadside, and drainage-related maintenance on all mainline sections and received a couple Bs and a C regarding traffic. In contrast, control sites that Virginia DOT maintained generally received Bs and Cs (Hyman, 2009).

Over the years, the performance-based contracting procedure has evolved into Turnkey Asset Maintenance Services (TAMS) contracts, which include "routine" ordinary maintenance services and exclude capital improvements to pavements and bridges. These are contracted separately, as needed. About a dozen TAMS contracts were in place in April 2009, with mileage for a contract ranging from 67 to 241. The initial term for many of these contracts is 5 years with two 2-year renewal options that may be requested on a case-by-case basis. Some have an initial term of 3 years with two 3-year renewal options (Prezioso, 2009). The services are procured through a combined two-step low bid process: evaluation of technical bid and selection on the basis of price of the lowest qualified bidder.

Table 1. 2005 Report Card for Virginia DOT Performance-Based Maintenance Contract.
Source: Hyman (2009)

Sites	Sections of Interstate	Shoulders		Roadside		Drainage		Traffic		All Groups	
		Grade	Confidence Level	Grade	Confidence Level	Grade	Confidence Level	Grade	Confidence Level	Grade	Confidence Level
VMS Sites	I-95 Mainline (Section 1)	A	95%	A	95%	A	95%	B	95%	A	95%
	I-81 Mainline (Section 2)	A	95%	A	94%	A	95%	A	95%	A	95%
	I-77 Mainline (Section 3)	A	95%	A	94%	A	95%	A	95%	A	95%
	I-381 (Section 4)	A	95%	A	95%	A	95%	A	95%	A	95%
	I-95 Ramps (Section 1)	A	95%	A	95%	A	95%	C	95%	B	95%
	I-81 Ramps (Section 2)	A	95%	A	95%	A	95%	A	95%	A	95%
	I-77 Ramps (Section 3)	A	95%	A	95%	A	95%	B	95%	A	95%
	All VMS Sites	A	95%	A	95%	A	95%	A	95%	A	95%
VDOT Control Sites	I-95 Mainline (Section 5)	A	95%	A	95%	A	95%	C	95%	B	95%
	I-81 Mainline (Sections 10 & 12)	A	95%	B	94%	C	95%	A	95%	B	95%
	I-65 Mainline (Section 6)	A	95%	B	95%	A	95%	B	95%	A	95%
	I-64 Mainline (Sections 7, 8 &9)	A	95%	B	94%	B	95%	B	95%	B	95%
	I-581 Mainline (Section 11)	A	95%	A	95%	C	95%	A	95%	B	95%
	All VDOT Control Sites	A	95%	B	94%	B	95%	B	95%	B	95%

Contracts are monitored for performance annually for asset condition and throughout the contract term for timeliness compliance with monetary consequences for failure to perform. Continued failure to meet contract requirements may cause the contractor to be declared in default of the contract.

The contracts are lump sum (divided into equal monthly payments) and provide the advantage of consistent budget obligation. The agency, however, is challenged by unplanned budget restrictions. This has necessitated renegotiating the PBMC and correlating contract price reductions with service reductions (Prezioso, 2009).

Florida

The Florida DOT followed Virginia's lead in executing long-term performance-based contracts for asset management (the term asset management was changed to asset maintenance a few years ago under the new SME). Florida DOT developed and awarded its first asset maintenance contract to Infrastructure Corporation of America (ICA) in 2000. This award was for 7 years and valued at $73.5M, and it was followed by several more contracts and the development of a multi-year program for the statewide use of the asset maintenance concept.

Florida uses four types of asset maintenance contracts:

- Road corridor contracts centered around a core roadway.
- Facility contracts including rest areas, weigh stations, and welcome centers.
- Geographic contracts with multiple transportation facility types.
- Fixed and moveable bridge contracts.

In-house forces and traditional contracts complement asset maintenance contracts. Traditional contracts are let to perform specific maintenance activities and may be work order driven or performance-based. Traditional contracts normally are smaller in scope.

Florida's Office of Maintenance has developed a web-based asset maintenance scope customization system to allow Districts to develop a standardized scope of services that addresses specific District needs. The RFP process is used for contractor selection, with the technical proposal accounting for 60 to 70 percent of total score and the cost proposal accounting for 30 to 40 percent. Each RFP features a chart showing the percentage of total contract amount to be paid to the contractor for each month of the contract term. The contract length is generally from 5 to 10 years, and the total length of all renewals is no longer than the original contract length. If the District and the contractor elect to renew, the renewal lump sum amount is "negotiated" and can be positive, negative, or zero

Maintenance rating scores are calculated using the Maintenance Rating Program handbook, with ratings being performed three times per year. The level of inspection of asset maintenance contracts is left to the discretion of the managing District and is based on the performance of the contractor. Florida DOT has an asset maintenance monitoring plan which calls for the Districts to conduct a quality assessment review of each of their asset maintenance contracts every 6 months. Each quality assessment review is summarized on the standardized "Asset Maintenance Contractor Performance Evaluation Report (AMPER)" which analyzes a variety of contractor performance indicators and ultimately generates a single numerical score (or grade) of contractor performance. These AMPER scores are recorded over time and can be used to help evaluate contractors during the selection process for future asset maintenance contracts. Poor scores, reflecting poor contractor performance, can trigger declaration of a contractor as non-responsible (suspended for bidding new jobs) or in default of current contract. The monitoring plan also calls for the Office of Maintenance to annually review the District's AMPERs and the District's overall administration of asset maintenance contracts. The DOT has a maintenance dispute review board whose role is to provide specialized expertise to assist in resolving disputes in a timely and equitable manner.

Since inception, Florida has executed 32 asset maintenance contracts totaling $898 million, or about $126 million annually.

Oklahoma

In September 2001, following direction from newly elected Governor Keating that privatization be embraced, the Oklahoma DOT entered into two 5-year contracts that covered routine maintenance, snow and ice removal, sign repair, and litter pick-up, but not major items such as pavement preservation or bridge repair. The service area included 2,576 lane miles of highway in the Tulsa and Oklahoma City area. The 5-year value of the contracts was approximately $36 million (Ribreau, 2004).

Unlike other PBMC experience to date, such as in Virginia and Florida, the Oklahoma approach included all state highways in the two metropolitan areas as opposed to focusing on specific highway corridors such as designated interstate highways.

These contracts were cancelled in May 2002, just months after their commencement. Problems with performance appeared early. By the third month of the contract the DOT began withholding contractor payments for performance shortfalls. By the sixth month of the contract, the payment holdbacks totaled almost $1M in the Oklahoma City area and over $100,000 in the Tulsa area. Then, in March 2002, a 7-inch snowstorm hit, problems ensued, and the contractor faced severe public and civic criticism for its performance. There is agreement among those who have written about Oklahoma's experience that a well-written performance-based contract with strong reporting and monitoring provisions is essential to success (Ribreau, 2004; Hyman, 2009).

Texas

The Texas DOT, as a consequence of legislative direction to increase maintenance contracting, embarked on two total maintenance contracts and developed a performance-based contracting program for its rest areas (Graff, 2001). The first of the total maintenance contracts involved 120 miles of I-35 in the Waco District, and the second involved 60 miles of I-20 in the Dallas District. These contracts involved routine and preventive maintenance and were awarded based on low bid with a 5-year term and two possible 1-year extensions. The LOS for routine maintenance was satisfactory, but there was some concern that the pavement periodic maintenance was not to the level desired. These contracts were re-worked after the 5-year term and were re-advertised with modified specifications. The pavement periodic maintenance work was added as a unit cost item to the lump sum contract, with work to be accomplished at locations specified by the DOT.

Texas developed detailed specifications, such as performance measures and standards, with the assistance of a large number of stakeholders, including headquarters maintenance personnel, District, and potential bidders. This part of the process was essential to achieve consensus and to ensure that the procurement documents would attract bidders (Hyman, 2009). The DOT developed a maintenance assessment program—TxMAP—an LOS rating system to assess the performance of contractor and in-house staff.

Besides the benefits of lower bid costs than anticipated, Texas found that less inspection was required, less documentation of quantities applied was needed because of the lump sum nature of

the payment, and the contractor was encouraged to be innovative because it was not tied to method specifications (Graff, 2001). Since the Dallas and Waco pilot projects, the PBMC concept has expanded to toll facilities around Dallas, and the program continues to evolve and include more geographic regions.

The Texas DOT also entered into four 2-year performance-based contracts, valued at $6 to $8 million each, in each quadrant of the state to upgrade and maintain the rest areas. Upgrades involved new construction, reconstruction, major renovations, and possible conversion of some to truck parking. To measure performance, the DOT developed rating guides that provided pictures of acceptable and unacceptable conditions for every component of these facilities. Each contractor was required to submit an enhancement plan explaining the repairs or improvements necessary to bring each component up to an acceptable level. The DOT established an evaluation process, a rating system, and a combination of incentive and disincentive payments to make sure conditions improved and goals and standards were met.

The DOT conducts formal, unannounced inspections to keep subjectivity to a minimum. Rating scores can range from 0 to 100 percent. At the beginning of the program, rest areas had scores that averaged 73 percent and ranged from 15 to 99 percent. The DOT established a goal of increasing the average score across the state to 85 percent. Facilities with lower scores failed. If a contractor scored more than 92 percent, each day it received a 15 percent incentive payment of the normal daily pay until the facility's score fell below 92 percent in another evaluation. Incentives and disincentives were based on a rest area's overall score. Conversely, contractors that scored 84.49 percent or lower received deductions in daily pay according to declining thresholds. Failure to meet the rest area maintenance standards for two consecutive evaluation periods could result in an additional fine of $5,000 per day (Hyman, 2009).

After the first year of these contracts, the Texas DOT had paid incentives and assessed disincentives and deductions of nearly an identical amount of about $246,000. Average statewide ratings of facility conditions increased from 73 percent before the performance-based maintenance contracts to 91 percent at the end of the first year (Hyman, 2009).

District of Columbia

In 1998, the District of Columbia entered the first urban, performance-based contract in the United States. This $69 million contract was to preserve and maintain approximately 75 miles of National Highway System roads with the assistance of the Federal Highway Administration (FHWA) (Michael Baker Jr., Inc., 1999). This 5-year initiative included the maintenance of highway assets such as tunnels, bridges, curbs, gutters, sidewalks, and retaining walls (Focus, 2004). Contract selection was based on best value. Payments to the contractor included incentives and disincentives which depended on achievement of performance standards.

Five LOS were defined for roughly 170 maintenance elements grouped in various categories. Performance measures reflected both LOS for assets and operations and response times to address needed work. Performance targets or standards were set between levels 3 and 4 and transformed to a scale of 0 to 100. The contractor was responsible for monitoring its own performance daily based on its quality control (QC) plan.

In addition, each month an independent third party, in the presence of District and contractor staff representatives, inspected each maintenance element. The third party inspection provided a rating of "poor," "fair," or "good" for each element, and then a composite score was calculated. This complementary grading system was developed to facilitate communication with stakeholders regarding the outcomes that were being achieved. Poor performance received a score of 0, fair performance received a 50, and good performance received 100. If the contractor equaled or exceeded all performance standards, then its score would be 100 (Robinson et al., 2005).

In the first year of the contract execution, the road conditions were improved from the high 20s before outsourcing up to the low 80s. Having improved the condition of the infrastructure through using PBMC, the District of Columbia currently performs roadway maintenance with in-house personnel while contracting out maintenance of items like street lighting, signals, and tunnels.

North Carolina

The North Carolina DOT executed its first performance-based contract for maintenance activities in 2007. Legislation in 2005 provided the agency the opportunity to do two pilot projects, so the DOT did an analysis and selected a project and location in an area that was understaffed and having difficulty in recruiting new hires, but showed plentiful contracting opportunity. The project included approximately 700 lane miles of Routes I-85, I-485, I-77, and I-277. The contractor for this 5-year performance-based contract was selected using a two-step "best value" process. The agency received responses to a request for information (RFI) from seven pre-qualified teams. Bids were then requested from four short-listed teams.

In early 2009 it became evident that significant differences were arising between the agency and the contractor on the PBMC over the performance targets and assessment criteria for several elements of the contract. A series of negotiations led to the bilateral decision to revise the contract completion date from July 2012 to July 2009 and to terminate the contract at the end of year two.

The North Carolina DOT is in the process of revising the PBMC based on lessons learned from its first project. The new contract was advertised on October 15, 2009. Meetings with all levels of management, from the project-level contract administrator to the Chief Engineer, have helped to better define targets and condition assessment methods. This extensive review has led to a more detailed and thorough contract document. To reduce contractor risk, the mowing and litter specifications have been changed from performance-based to unit-based pay items in the second contract.

Washington State

The Washington State DOT published a synopsis report after reviewing the performance of highway maintenance outsourcing programs in five states and British Columbia. This report drew lessons learned from the review and suggested ways for future improvement in outsourcing programs (Ribreau, 2004).

This report intended to examine a number of sources to determine whether anticipated benefits had been verified by retrospective evaluation. The author conducted a review of various projects that undertook privatization program in highway maintenance. Among the report's conclusions were the following:

- The audits and other after-the-fact reviews of the outsourcing programs indicated that the projected claims of cost savings and service benefits were difficult to substantiate in some cases and demonstrably overstated. Use of inadequate and inefficient cost analysis methods was cited as a possible reason for unsubstantiated claims.
- A sound financial plan is necessary for performing cost analysis to establish the comparative advantages of procurement procedures. The following factors should be taken into consideration for cost analysis:
  - Direct costs of the vendor's services.
  - Costs from termination of in-house service.
  - Cost implications of publicly owned facilities and equipment.
  - Full administrative costs of the supply chain.
  - Employee displacement, re-training and out-placement costs.
  - Long-term asset management costs from handbacks.
  - Secondary and incidental costs of loss of existing skill/knowledge base.
  - Risks of service disruption from strikes and other labor harmony issues.
- In preparing any future contract agreements, state agencies should incorporate the views of legislative and state audit reports from other states.

Segal and Montague (2004) wrote a critique of the Washington DOT synopsis with counter-arguments to the DOT's claims. In this rejoinder, the authors dismissed many of the state's observations as unfounded, misinformed, and inaccurate. However, the authors agreed that performance standards and potential areas of conflict should be addressed prior to the commencement of work, emphasizing the need for a sound contract agreement.

In general, the DOT's review and Segal and Montague's critique underscore the need for further refinement of this contractual framework with an accepted cost accounting and comparison protocol.

Alaska

Another application of PBMC is for tunnel maintenance. Fifty miles southeast of Anchorage, near Portage Glacier, the Anton Anderson Memorial Tunnel—the longest highway tunnel in North America—connects the port city of Whittier on Prince William Sound to the Seward Highway and south-central Alaska. In June 1998, the Alaska Department of Transportation and

Public Facilities (DOT & PF) awarded a tunnel reconstruction contract to Kiewit Construction Company, who then selected the firm of Hatch Mott MacDonald to design the project. The project consisted of more than 50 separate design and construction tasks, and construction began in September 1998.

As part of the design-build team, Kiewit selected VMS, Inc. to be the operator and maintainer under the 2-year contract terms. Staffing and operational employees for the PBMC were interviewed and selected from a local workforce, and the converted World War II rail tunnel opened to vehicular traffic on June 7, 2000. Following the initial 2-year term, the Alaska DOT & PF advertised the operations and maintenance contract, and VMS, Inc. was again selected to perform the operations, tolling, and maintenance under a 6-year contract. This successful contract is being re-advertised for another term.

Brief Overview of International Experience

Increasingly, the concept of performance-based contracting is being introduced in countries throughout the world. The development of performance-based contracting in roadway management and maintenance dates back to the late 1980s and early 1990s. The first performance-based contract in roadway maintenance was introduced in British Columbia, Canada (Zietlow, 2004).

Shortly afterwards, the first major performance-based maintenance contract occurred in **Argentina** in 1995 and is known as CREMA—Contrato de REcuperacion y MAntenimiento (Contract for Rehabilitation and Maintenance, in English). The initial CREMA was structured to first rehabilitate part of the network; simultaneously, maintenance under performance-based specifications began on the other sections under the CREMA contract and then was expanded to the rehabilitated sections of the road. Today, performance-based maintenance contracts cover 44 percent of Argentina's roadway network (Hyman, 2009; Stankevich et al., 2005).

In 1996, the Ministry of Public Works started a program to introduce performance-based contracts for the maintenance of the national road network of **Uruguay**. Basically, there were two types of contracts. One contract concerned just routine maintenance, and the other involved initial rehabilitation followed by periodic and routine maintenance (Zietlow, 2007).

The first type of contract was developed to give employees of the Ministry of Public Works an opportunity to form their own private enterprises and to reduce the Ministry's staff at the same time. To provide additional incentive, the staff was given the opportunity to return to the Ministry during the first year of the contract in case the system failed. None of the contracts failed, and more people wanted to join the new systems than the new contracts could absorb (Zietlow, 2007).

The second type was introduced as a pilot project and rapidly went beyond this stage as the system was producing excellent results in a fairly short time-period. By January 2000, 42 percent of the national road network was being maintained by performance-based road maintenance contracts. Key to the success was careful planning and implementation of contracts. Due to legal restrictions, contract duration is limited to 5 years (Zietlow, 2007).

Several other countries in Latin America, including **Brazil, Chile, and Colombia,** have started similar contracts, and **Ecuador, Guatemala, and Peru** are planning to do so. Most of these contracts include partial rehabilitation to bring roads to maintainable conditions. Today more than 40,000 kilometers of roads in Latin America are being maintained under performance contracts (Zietlow, 2007).

Australia started its first performance contract in 1995 covering 459 kilometers of urban roads in Sydney (Frost and Lithgow, 1996). Since then, several new contracts have been implemented in New South Wales, Tasmania, and Southern and Western Australia, some of them as so-called hybrid contracts, where some of the works are being paid based on quantities and unit prices and others based on performance criteria (Zietlow, 2007).

In 1998, **New Zealand** let its first performance contract for the maintenance of 406 kilometers of national roads. Presently, 10 percent of New Zealand's national roads are maintained using the new contract scheme (Zietlow, 2007).

Area management contracts (AMC) cover 60 percent of the provincial road network in the **Ministry of Transportation, Ontario (MTO)**. The remaining maintenance work is contracted through conventional methods**.** Through personal communication with MTO representatives, it was determined that they are embarking on the third generation of performance-based contracts. The decision to using PBMC was motivated by factors such as the desire to improve efficiency, reduce costs, reduce oversight efforts, top management interest, and shifting risk to the contractor. MTO also has a long-term vision of asset management and sees PBMC as the right step in that direction. MTO's selection of contactors in their third generation contracts is based on a pass/fail evaluation of technical/quality factors and then on the low bid among those who passed the technical evaluation. While older contracts required at least 30 percent of the work to be performed by the prime, the third generation contracts have no such requirement for work done directly by the prime.

The contracts include all routine maintenance such as pothole repair, vegetation management, bridge maintenance and cleaning, electrical work, and line painting plus in-scope capital work. Other types of work addressed include winter maintenance, patrolling to conduct visual inspections, and emergency assistance to deal with accidents and spills. Maintenance performance standards include both outcome and time-based performance criteria. Interestingly, with winter maintenance being a significant part of contractor services, MTO has a number of applicable performance criteria for this activity. Failure to meet the standards can result in penalties. There is an initial consequence and a subsequent consequence for non-conformance. For specific assets, contracts have 3- to 5-year terms and AMCs have 8- to 10-year terms. MTO's new generation contracts do not allow extensions. Lump sum (annual value) is adjusted yearly, through the Consumer Price Index, and there is monthly compensation for fuel price changes as well as asphalt adjustment.

A unique aspect of MTO's new generation contracts is the requirement that contractors' quality management systems be registered under the ISO 9001-2008 and ISO 14000 standards with third party verification.

In summarizing the evolution of highway maintenance outsourcing in **Alberta**, Bucyk and Lali (2006) stated:

> In 1995, Alberta Transportation and Utilities took its first steps of many to outsource the highway maintenance work. This work covered all summer and winter maintenance of the provincial highway network. The department overcame many challenges as it changed its role from delivering the service to managing the delivery of the service by private sector. From day one, the industry and the department began to work together on forming a relationship of understanding from each other's point of view. This relationship was referred to as 'partnering' and it would prove to be beneficial for day to day operations and in the future contracts. Following the outsourcing and prior to the next round of tendering, the department along with the industry conducted a major reengineering of the existing maintenance process. The group undertook a thorough review of all the maintenance specifications and contract requirements in an effort to identify the risk and allocate it where it could be best managed. During this period the department also sold its maintenance shops and increased its responsibility by assuming approximately 15,000 km of secondary highways from local municipalities. All of these changes were incorporated into the contracts prior to the second round of tendering. As a result of these changes, there were significant savings. The department is now about to embark on its third round of tendering. Maintaining a level playing field for all contractors, creating a competitive bidding atmosphere, dealing with increased public expectation and issues on environment and insurance are just a few of the items that were reviewed and addressed in this round.

In the **United Kingdom**, highway maintenance traditionally was performed by managing agents (MA) and term maintenance contractors (TMC). The MA was responsible for performing all design work, asset inspections, network maintenance management, and supervision of the TMC, while the TMC performed all routine, cyclical, and winter maintenance, as well as small capital maintenance and improvement works up to a specified limit.

In 1996, the highway agency introduced a new form of contract, utilizing a managing agent contractor (MAC), which combined the separate roles of the MA and TMC into a single operating company. The MAC carries out a range of operational and routine maintenance services and delivers improvements on the motorways and trunk roads. A network board, which consists of appointed representatives from the MAC and the agency, has the executive authority to provide strategic leadership, set performance standards, monitor continuous improvement and ensure delivery of the service in addition to steering the contract partnering. The first MAC contract came into operation in Northamptonshire in 2001.

The contracting practices of several transportation agencies are presented in Table 2 (Pakkala, 2005). Table 2 indicates that the contractual criteria differ widely from country to country, and even within a country. The agencies use a wide range of contract periods and selection criteria in implementing performance-based contracts. The reported cost savings of performance-based contracts over traditional contracts range from 10 to 40 percent (between 10 and 15 percent in the US).

Table 2. Comparison of Performance-Based Contracting for Highway Maintenance (Pakkala, 2005).

Location	Type of Contract	Contract Duration	Contractor Selection Criteria	Activities Included	Cost Savings, %
Alberta, Canada	Output Based	5 Years	78% Price 22% Other	Mostly all except Resurfacing & Rehab.	About 20%
British Columbia, Canada	Output & Performance Based	8 Years	40% Price 60% Other	Mostly all except Resurfacing & Rehab.	Some, might be in the order of 10%
Ontario, Canada	Output & Performance Based	9 Years (7+2)	90% Price, 10% Other	Mostly all except Resurfacing & Rehab.	About 10%
Estonia	Output & Performance Based	5 Years	70-80% Price, 20-30% Other	Mostly all except Resurfacing & Rehab.	20-40%
Finland	Output & Performance Based	3, 5 & 7 Years	75% Price, 25% Other	Mostly all except Resurfacing & Rehab.	About 20-35%
Norway	Output & Performance Based	4-6 Years	100% Price	Mostly all except Resurfacing & Rehab.	About 20-40%
Sweden	Output & Performance Based	3-6 Years	98% Price, 2% Other	Most all except Resurfacing & Rehab.	About 30%
Australia	Performance Based	10 Years	50% Price, 50% Other	All	10-40%
England	Performance Based	7 Years	30-40% Price, 60-70% Other	All	10% min.
New Zealand	Performance Based	10 Years	Quality Price Trade Off	All	About 20-30%
USA, (VA)	Performance Based	5 Years (5+5)	50% Price, 50% Other & (Negotiated)	ALL except Rehab.	10-15%
USA, (FL)	Performance Based	7 Years (7+7)	50% Price, 50% Other & (Negotiated)	ALL except Resurfacing &Rehab.	10-15%

The performance-based contract is used for all maintenance activities except rehabilitation and resurfacing of pavement assets. The performance-based contracts cover a wide range of maintenance services such as pavement surface maintenance (surface treatment, joints/cracks sealing, etc.), drainage maintenance (maintenance for drains, ditches, inlets, etc), winter maintenance (snow removal, ice control, etc.), roadside maintenance (vegetation control, litter collection, fencing maintenance, sidewalk maintenance, etc.), traffic service maintenance (traffic control service, maintenance for guardrail/signs/lighting etc.), structure maintenance (bridge and structure cleaning, bridge deck/joint/bearing maintenance etc.), emergency maintenance (flood control, emergency response, etc.), and inspection (highway inspection, bridge inspection, etc.).

For a successful implementation of PBMC, it is vital for an agency to define the complete asset inventory accurately and determine its existing conditions and clearly establish the performance indicators for each asset in the contract. A "SMART" approach can be used in defining performance indicators: they must be Specific, Measurable, Achievable, Realistic, and Timely to schedule (Stankevich et al., 2005). The following criteria should be taken into account in selecting and defining performance indicators:

- Road user needs.
- Affordability, or that the needed levels of funds are available.

- The expectation of the client to have assets at contract completion at the same or better performance level than they were before being contracted out.

The agency also should devise a sound methodology to measure performance indicators for each contracted service objectively. Stankevich et al. (2005) also recommended that the contract performance be evaluated at three levels within the comprehensive PBC: management, long-term, and operational. Management performance indicators drive the planning, management, and implementation aspects of the contract. They usually incorporate plans for quality, traffic, health, safety, and reporting requirements. Long-term (or key) performance indicators relate to the overall condition of the pavement, roughness, skid resistance, texture, rutting, surface life, structural conditions, and so on. These drive the contractors' maintenance and rehabilitation interventions. Operational performance indicators apply to daily serviceability of the road network being maintained and include conditions of the pavements.

In general, the contractual language of performance requirements and payment conditions should be simple, clear, and comprehensive to avoid ambiguity and potential disputes. Table 3 presents a typical example of performance standards used in Latin America (Zietlow, 2008). Factors such as response times and reporting procedures also should be defined clearly in the contract documents. For instance, the State Highway Professional Services Contract Proforma Manual of Transit New Zealand provides response time requirements for various performance indicators, as shown in Table 4.

Consequences of not meeting the performance requirements must be defined clearly and distinctly in the contract.

Table 3. Examples of Performance Standards Applied in PBC in Latin America.

Asset Class	Component	Performance Standard
Pavement	Potholes Roughness (asphalt) Roughness(bituminous treatment) Rutting Cracks	No potholes IRI < 2.0 (Argentina), IRI < 2.8 (Uruguay) IRI < 2.9 (Argentina), IRI < 3.4 (Uruguay) < 12mm (Argentina), < 10mm (Uruguay, Chile) Sealed
Gravel surfaces	Potholes Roughness Thickness of gravel layer	No potholes IRI < 6 (Uruguay), IRI < 11 (Chile) 10 cm (Chile, Uruguay)
Shoulders	Potholes Cracks Joints with pavement	No potholes Sealed Vertical alignment < 1cm (Chile, Uruguay), sealed (Peru)
Drainage system	Obstructions Structures	No obstructions. Should allow for free flow of water (Chile, Uruguay) Without damages and deformations (Chile, Peru)
Road signs and markings	Road signs Road markings Reflectivity of road markings	Complete and clean (Argentina, Chile, Peru) Complete and visible (Argentina, Chile, Peru) 160 mcd/lx/sqm. (Argentina) 70 mcd/lx/sqm. (Uruguay)
Right of way	Vegetation Foreign elements	< 15cm height (Argentina, Uruguay) No foreign elements allowed

Table 4. An Example of Response Time Requirements for Contractors in the State Highway Professional Services Contract Performance Manual of Transit New Zealand.

Feature	Contract Standard	Response Time
Potholes on highways with > 10000 vpd	Not more than 3 potholes with a diameter greater than 70mm on any 10km section	48 hours
Potholes on all highways	No potholes greater than 150mm in diameter	48 hours
Depressions and Rutting	No ponding greater than 30mm in depth at any location	6 months
Edge Break	No more than 2m of edge break within any continuous kilometre greater than 0.5m	1month
Lined Channels	No lined channels with more than 10% of the cross-sectional area obstructed, and free of vegetation	1 week

Once the contract is executed and work commences, contractor personnel routinely perform QC work and owner personnel periodically monitor work for performance and achievement of outcome targets. If the owner or owner's representative determines that an achievement target is not met, there is an initial consequence of a warning or retainage in payment and then a subsequent consequence for continued non-conformance.

Most contracts are lump sum with a "fixed" portion paid on a monthly basis.

Many contracts call for formal partnering on projects to encourage good communications between the contractor and owner personnel and to resolve any differences informally, as much as possible.

The advantages and disadvantages of using PBC are summarized by Pakkala (2002) and Stankevich et al. (2005) and are as follows:

Advantages

- Cost savings
- Fully integrated client services
- Transferring risks
- Innovation
- Better asset management
- Better level of service
- Partnering potential
- Developing a new industry
- Benefits of economy of scale
- Supplement in-house resources

Disadvantages

- Costly tendering for PBC
- Longer tendering period for PBC
- Reduction of competition (social justice), usually for large contractors
- Uncertainty of long-term relationships
- Lack of some performance standard and level of service
- Loss of control & flexibility
- Sustainability over the longer term

Lessons Learned

There are several lessons learned from the literature review of past experiences of PBC implementation in highway maintenance. The recommendations for future planning, contracting, and management of PBC are as follows (Zietsman, 2004; Zietlow, 2008; Robinson, 2008):

- It is necessary to have clear, simple, and consistent performance standards and measures.
- Include only "maintainable" roads and do not put too many risks on the contractors.
- Performance standards need to be developed and improved further.
- It is critical to have proper performance monitoring and strict application of penalties for noncompliance, as well as a dispute resolution mechanism.
- Well-qualified contractors and inspectors are keys to the success.
- Maintain good communication links with contractors.
- Whenever circumstances permit, performance contracts should be longer than 5 years and should include periodic maintenance in order to maximize the potential benefits.
- PBC might not result in cost savings immediately.
- Take advantage of the experience of others—don't start from scratch.
- Work with the FHWA, as some of the contract might be eligible for Federal funding.
- Specify how innovative methods/technologies will be approved if they are different from the standard specifications.
- Plan out and specify what happens if the project doesn't work.
- Getting reviews/approval/buy-in upfront from the offices that will be impacted is very important.
- Make incentives achievable (and worthwhile).
- Include disincentives to push performance.
- While including disincentives is appropriate, realize that you are going to pay for the risk up front.
- Test the standards in the field before advertising RFP.
- If sampling (to measure performance), choose samples randomly. Resist the temptation of only looking for problems.
- Most of this information also applies if you are considering performance-based in-house maintenance.

CHAPTER 3: SURVEYS OF STATES/PROVINCES/CONTRACTORS

Given that one of the primary purposes of this project is to develop strategies to advance the state of practice of PBMC, state DOTs are a primary target audience. Therefore, it is important to determine the experience and opinions of DOT officials. Accordingly, a short questionnaire was developed and distributed to survey states and Canadian provinces to get feedback on their familiarity and experience with the use of PBMC. The survey also sought to gauge their level of interest in learning more about PBMC concepts and/or in pursuing the use of PBMC in one application or another. Additionally, the survey assessed interest in participating in the executive forum that was designed to stimulate discussion on both successes and failures with PBMC. The ultimate purpose is to learn from these experiences and opinions and to develop a strategy or strategies for further advancing agency management practices in performance-based maintenance and operations.

A review of the responses to this general questionnaire provided the research team a list of organizations with "hands-on" experience that could be surveyed in greater detail.

The questionnaire, included in this report as appendix A, was sent electronically to the states and provinces through AASHTO's electronic survey tool. A total of 37 agency responses were received—one from Canada and the rest from the US. The detailed survey responses and graphically presented summaries may be viewed on-line at: http://desktop.vovici.com/analysis/generatepublicreport.aspx?esid=258780&subaccountid=30839.

To facilitate review and analysis of the responses, respondents were split into four categories:

- Category A – those who have tried PBMC and wish to continue or expand its use.
- Category B – those who have tried or considered PBMC and have no interest in pursuing it at the present time.
- Category C – those who have not tried PBMC but are interested in trying this approach or in learning more about it.
- Category D – those who have not seriously considered PBMC and have no interest in pursuing this approach at the present time.

Category A

- Florida
- Illinois (*)
- Kentucky
- Maryland
- Michigan
- Nevada
- North Carolina
- Ontario Province
- Tennessee (*)
- Texas
- Utah
- Virginia

Note: (*) indicates interest in specific activities or assets.

Category B

- Oklahoma
- South Carolina

Category C

- Alabama
- Arizona
- California
- Colorado
- Connecticut
- Georgia
- Hawaii
- Idaho
- Louisiana
- Massachusetts
- Mississippi
- Missouri
- New York
- Pennsylvania
- Wyoming (*)

Category D

- Arkansas
- Iowa
- Indiana
- Kansas
- Minnesota
- Ohio
- Vermont
- West Virginia

Figure 1 shows the percentages of the respondents that fell into each of these four categories.

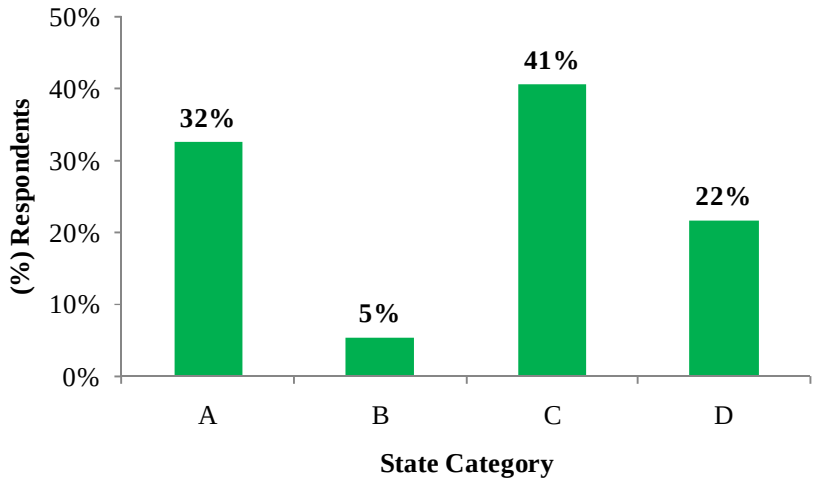

Figure 1. Percentage of Respondents by Category.

Table 5 shows the state of practice in broad terms. It includes comments made by the respondents (some of the responses are paraphrased to fit the format).

The questionnaire responses were evaluated, and respondents from categories A, B, and C were selected for additional interviews. In-depth interviews were conducted with nine of the states with experience with PBMC. On-site interviews were conducted with Florida, North Carolina, Oklahoma, Texas, and Virginia, and teleconference interviews were conducted with Kentucky, Michigan, Nevada, and Ontario. The questionnaire used for these interviews is included in this report as appendix B. Consolidated responses to the questions used in the interviews are shown starting on page 22.

Additional teleconference interviews were conducted using a somewhat abbreviated questionnaire with six states that expressed interest in pursuing PBMC: Missouri, Maryland, Pennsylvania, Mississippi, Georgia, and California.

Table 5. Responses to General Questionnaire.

State	PBMC Exp?	PBMC for Specific Assets	PBMC Multiple Activities in Corridor?	Have In-House Work Standards?	Comment
Alaska	No	No	No	No	Developing PBMC for striping.
Arizona	No	No	No	Yes	
Arkansas	No	No	No	Yes	
California	No	No	No	Yes	
Colorado	No	No	No	Yes	CDOT contracts with several local entities to maintain portions of the highway system. None of these contracts are PBMC.
Connecticut	No	No	No	Yes	
Florida	Yes	Yes	Yes	Yes	
Georgia	No	No	No	Yes	Seriously considering PBMC. Issues several non-PBMC contracts.
Hawaii	No	No	No	Yes	
Idaho	No		No	Yes	Bridge painting contracts.
Illinois	Yes	Yes	No	No	PBMC is standard practice for rest areas.
Iowa	No	No	No	Yes	
Indiana	No	No	No	Yes	
Kansas	No	No	No	Yes	
Kentucky	Yes	Yes	No		Roadway lighting with payment based on percentage of lights working.
Louisiana	No	No	No	Yes	Considered PBMC but concerned about value
Maryland	Yes	Yes		Yes	Issued PBMC for pavement markings & signing & roadway corridor maintenance.
Massachusetts	No	No	No	Yes	
Michigan	Yes	Yes	No	No	PBMC for preventive maintenance items.
Minnesota	No	No	No	Yes	Traditional maintenance contracts.
Mississippi	No	No	No	No	
Missouri	No	No	No	Yes	Considered PBMC but did not pursue because of cost/budget issues.
Nevada	Yes	Yes	No	Yes	PBMC for graffiti abatement, striping, and weed abatement.

Table 5. Responses to General Questionnaire, continued.

State	PBMC Exp?	PBMC for Specific Assets	PBMC Multiple Activities in Corridor?	Have In-House Work Standards?	Comment
New York	No	No	No	Yes	
North Carolina	Yes	Yes	Yes	Yes	PBMC for fence-to-fence activities for 131 miles.
Ohio	No	No	No	Yes	
Oklahoma	Yes	Yes	Yes	No	Tried PBMC. It did not work. See detailed write-up.
Ontario	Yes	Yes	Yes	Yes	PBMC is standard practice.
Pennsylvania	No	No	No	Yes	Would like more information on PBMC.
South Carolina	No	No	Yes	Yes	Cost/budget concerns and concerns over value of tool.
Tennessee	Yes	Yes	No	Yes	Issued performance-based striping contract.
Texas	Yes	Yes	Yes	Yes	TxDOT has had PBMC for rest areas for several years. PBMC doesn't save money, but it gets the work done.
Utah	Yes	Yes	No	Yes	PBMC for rest areas is standard practice.
Vermont	No	No	No	Yes	Developing performance measures for maintenance and cannot consider PBMC until that has been accomplished.
Virginia	Yes	Yes	Yes	Yes	
West Virginia	No	No	No	Yes	With the current salary scale for in-house personnel and the requirements for wages personnel, contracting is not cost-effective.
Wyoming	No	No	No	Yes	Interested in PBMC for rest areas and welcome centers.

Insights from the General Survey

Of the 37 survey respondents, 13 have had some experience with PBMC. The range of experience is wide, from those who are just starting out to those who are in their third generation of PBMC contracts.

Fifteen states that currently do not use PBMC are interested in learning more about this approach or in pursuing the use of it.

One state has tried PBMC and it did not work. They do not wish to pursue it any more. Another state considered PBMC and does not wish to pursue it at this time because of cost/budget concerns and concerns over its value as a tool.

Eight states without PBMC experience have indicated no interest at this time.

Although there are many advantages cited in the literature and surveys that motivate organizations to undertake PBMC, there also are several reasons for not using PBMC:

- A significant change in culture is required by the contracting agency and the contractors who are not familiar with this approach.
- Adjustments are required to go from method to performance specifications.
- Lack of experience with PBMC or a negative experience on the first try.
- Lack of training.
- Lack of legal authority.
- Challenges in estimating in-house and contractor costs.
- Loss of quality sometimes observed in the first years of a long-term contract.
- Insufficient contractor capacity.
- Inability to achieve sufficient competition.
- Potential bonding or warranty requirements, including those established by state law.
- Incomplete or inaccurate asset inventory and condition data.
- Concern over loss of control over methods, equipment, and material used.
- Concern that life cycle costs will increase.
- Fear that privatization will result in large numbers of staff having to leave government.
- Concern of union members that PBMC will undermine wages, benefits, work conditions, and job security that government provides.
- The need to secure substantial funds through the budgetary process for large, multiyear contracts.
- Concerns about the contractor's ability to effectively handle reactive maintenance such as snow and ice control, repair of traffic control devices, and incident and emergency response.
- The challenges of reassuming the responsibility for maintenance if the contractor fails to perform, especially if the contracting agency sells off its equipment and lays off maintenance staff.

Insights from In-Depth Interviews

This summary is provided in a question and answer format, and an attempt is made to capture highlights of the interviews. All personnel interviewed were cooperative and candid and approached the interviews in the spirit of advancing knowledge on the subject through their experiences, positive or negative, and perceptions.

1. What factors motivated your organization to pursue PBMC, and how important were they?

In reviewing Table 6, key motivating factors appear to be a push from the legislature through legislative action and/or top management interest within the agency to pursue this approach.

The next key reason cited was to augment in-house resources to raise the LOS provided to customers. For example, Texas was able to improve LOS substantially at rest areas; Virginia was able to augment its forces doing non-interstate work by shifting in-house resources normally doing interstate work to non-interstate.

Survey respondents also pointed to reducing costs, improving efficiency, and sharing or shifting risk to the contractor as other motivating factors.

Ontario pointed to the agency's long-term vision of asset management, and they see PBMC as a step in that direction.

2. Did you have to obtain legislation to implement PBMC?

For six of the nine agencies, no change in legislation was needed. North Carolina changed bonding criteria to allow for longer term bond, Florida modified legislation for contractor selection, and Michigan allowed for warranties on pavements.

3a. What actions were taken by agency to address maintenance employee concerns, if any?

Agencies took a variety of actions, a sampling of which are described below.

North Carolina held meetings with the workforce in the two affected divisions and gave them the background details. They also let the workforce help define the content of the contract. The division engineers in the two affected divisions made presentations at statewide maintenance meetings. The agency also used employee newsletters and press releases to disseminate information.

Virginia communicated PBMC as a method to supplement state workforce and as a way to deliver the same or higher LOS in the wake of decreasing in-house staff. Virginia also communicated it as a concept that could be used for interstate maintenance with in-house forces then concentrating on the non-interstate system.

Nevada included statewide maintenance forces in the decision making on which activities remained in-house and which contracted; they had "buy-in" from within. Maintenance force preferences, experience, and efficiency versus activities that could be outsourced easily were the primary factors in the decision making.

Table 6. Factors and Their Importance in Motivating Organizations to Pursue PBMC.

Factors Motivating PBMC	**__Very__**	**Somewhat**	**Little/None**
Insufficient staff resources	VA,NV,KY(1),FL,MTO*	NC	TX
Improve efficiency	FL,MTO	VA	
Reduce costs	OK,FL		VA
Improve management control	MTO		VA
Top Management Interest	VA,OK, TX (2)	NC	
External Political Interest	NC(3),VA,OK,MI,FL(4)		
Expenditure stability		VA	
Shifting or sharing risk with contractor	MTO	VA, FL	
*Other factors – List Below Reduction in oversight effort. (MTO) Long-term vision of asset management a driving factor is to take steps in the direction of asset management (MTO)			

(1)This agency has half of the employees they had 35 years ago. Agency wanted to improve performance of highway lighting and of roadways.

(2) Directed by Commissioner

(3) PBMC in the agency was initiated by legislation in 2005 The agency took a positive approach and determined that they were going to do their best to make it work. Their legislation allowed them to do two pilot projects. Secondary drivers were: a) the interest of top management and b) Insufficient department force resources in certain areas. The agency did an analysis and selected the project and location in an area that was most understaffed and had difficulty in recruiting new hires. They also looked for activities that were for the most part already being contracted out like mowing and striping. The agency selected segments of interstates that overlapped two districts. They concentrated on achieving a higher level of service/performance. The agency was already using internal performance measures for Department forces.

(4) In 1990, the new Secretary of Transportation for the agency instructed the State Maintenance Office to raise the Maintenance Rating Program target from the existing 68 in 1990, to be 80 by 1992. This was basically achieved by the 1992 target date through the greatly expanded use of Activity Based Contracts. Although additional funding was provided for the increased performance requirement, no new Maintenance Employee positions were authorized to assist in meeting this goal. Some time later (around 1998?), the Governor directed all agencies, including this agency to reduce the existing employee level by 25%. At this point, the agency initiated an asset management program that outsourced the planning, administration, management and inspection of all routine maintenance on clearly defined limits of highway corridors and facilities, including rest areas, weigh stations, welcome centers and fixed and moveable bridges. The agency retained the responsibility for monitoring compliance with contract provisions through periodic daytime and nighttime quality control inspections.

3b. What actions were taken to address contracting community concerns?

In almost all instances, each agency consulted with the association representing local contractors communicating how these contracts worked. Furthermore, the selected contractor typically did outreach to smaller contractors. Overall, respondents felt contractors were cooperative and that contractor issues, if any, were not insurmountable.

3c.What actions were taken to address elected officials' concerns, if any?

Generally, the program was communicated to legislative transportation committees and commissions, local legislators, local city officials, and law enforcement personnel with face-to-face meetings, as needed. Again, no significant issues were noted.

4. Did pursuit of PBMC result in employee reductions?

In most cases, there was no reduction. When reductions did occur, it was through attrition. Interestingly, employee reduction led to the pursuit of PBMC by one agency. They used PBMC to supplement the remaining workforce to meet the needs.

5. Were there any agreements necessary with the unions when implementing PBMC?

In almost all cases, no, because most states interviewed do not have unions that were strongly opposed to PBMC.

6. What was the contractor selection process for PBMC?

The responses from the states are shown below. Readers are advised that this is time-sensitive information, and that a state's practice is likely to change for contracts of different complexities and as PBMC evolves over time within the agency. To learn more about the most current practices, please review the state's contract documents.

North Carolina recently initiated PBMC and used a two-step design/build "best value" process. They already had legislation in place to allow them to bid this way. They prequalified design/build teams and had seven responses to the request for information, of which four teams were short-listed. Bids had to be within 10 percent of the engineer's estimate. They had to readjust and rebid to get within this 10 percent level due to the newness of the process on both the owner agency and contractor sides. They had a weighted quality score in four categories which was used to adjust the bid cost.

Virginia uses a two-step procurement process: evaluation of technical bid and selection of lowest price qualified bidder. Price proposals of bidders with a score of less than 75 out of 100 points are not opened. The contract was issued by the contract procurement office, not the construction office.

A lump sum contract using the low bid process was used by Oklahoma.

Nevada's selection is based on low bid. The agency has a prequalification process in place for each project for the prime based on licensure and experience, as do Texas, Michigan, and Kentucky.

Florida's selection for major asset management contracts is based on best value. Technical proposals have weights in the range of 65 to 70 percent. Smaller contracts are performance-

based and generally are low bid contracts; however, the agency is moving towards best value for these also. Any special prequalification requirements become part of the RFP.

Ontario uses an RFP and pass/fail evaluation of proposals for technical/quality aspects followed by selection based on low bid among all proposers which passed.

7. What is the minimum work to be performed by the prime contractor in PBMC?

The answers ranged from 0 percent allowing the prime the flexibility to sub-contract as much or all as he deems necessary to 50 percent of the work. Interestingly, for the new generation of contracts, Ontario does not require any percentage of work to be performed by the prime and in their previous generation of contracts required the prime to do at least 30 percent of the work. MTO believes that this stepwise progression in contracting helped the industry develop the component of management, supervision, and delivery of work.

8. What are the contract duration terms and renewals?

Some agencies want a short initial term in case the contractor fails to perform or to be in line with budget realities. Other agencies desire the initial period to be at least long enough so that contractors can fully depreciate their equipment and can, therefore, offer a lower price (Stankevich et al., 2005).

There are many issues involved in determining a good pattern of renewals. One is to provide an incentive to the contractor to meet or exceed the performance targets in the first term. Contract renewal brings with it the benefits of continuity. Another reason is to provide for the possible replacement of the contractor under the threat of competition. Periodically re-issuing RFPs is also an opportunity to assess the competitive environment and the capacity of contractors to ensure downward pressure on bid prices. The province of Alberta has found this periodic tendering process and stocktaking valuable (Bucyk & Lali, 2006).

There was a wide range of responses in the interviews on this issue and, even within a state, it was clear that the state's position was not rigid with respect to the term or renewal. With time and experience, states are likely to alter their newer generation contracts. For specific assets, such as rest areas, welcome centers, etc., the range was from annual to 5-year contracts with zero to multiple renewal options.

The contract term and the renewal for multiple maintenance activities in a corridor or for a group of state roads in an area tended to be longer. In most instances, they were 5- to 10-year contracts with similar length renewal. Interestingly, in their third generation of area maintenance contracts, Ontario has 8- to 10-year terms with no extensions. This action was taken in response to industry's preference of a clear set term, both from the current contractor and from those who wish to prepare for proposing or bidding on the next contract.

9. Do PBMC contracts encourage innovation? If so how?

Hyman (2009) reported that 80 percent of the respondents believe that PBMC fosters creativity and innovation on the part of the contractor(s) because they are generally free to achieve the performance targets or standards in any manner they choose. Information gathered through the interviews indicated that agencies generally expect contractors to follow current specifications and contracts. However, these contracts typically have a process and language to promote innovation and call for the contract manager to approve innovation. If the innovation is safe and does not cost more, it usually is approved.

10. Do PBMC contracts address price fluctuations? If so, how?

Three of the nine respondents allow price adjustment for fuel and asphalt. Three states have an annual price adjustment based upon the Consumer Price Index, and the rest adjust at contract renewal times.

11. Do PBMC contracts address changes in material quantities? If so, how?

Generally, the contractor assumes all risk for materials during the term of the contract, with Ontario being an exception. Because winter maintenance is such a big part of their contract, the province shares risk for high-cost, high-usage materials such as sand and salt. Materials used in relatively small quantities are not risk shared.

12. How is payment linked to performance?

States monitor performance and achievement of outcome targets for the most part with in-house staff. There are consequences if an outcome target is not met. In some cases, there is an initial consequence followed by a subsequent consequence for non-conformance within a prescribed timeframe. Only Texas and Kentucky indicated that they provide incentives other than renewing contracts for exceeding contract requirements.

North Carolina pays the full amount of bid dollars if the contractor meets all of the targets. If they are not met, there is a price adjustment scale in the contract to reduce payment. The contractor is rated every 6 months. If they fall below a 10 percent deviation, they get no payment for that element.

Virginia has significant timeliness disincentives. Maintenance Rating Program failures cause retainage for the following year. If contractor performance again fails to meet or exceed contract requirements, retainage is lost. Contracts have no incentive payments.

Texas's contract specifications for rest areas allow both incentives and disincentives. The state's experience showed that incentive and disincentive payments generally balance out.

Florida, which historically has had reduced payments for inadequate performance, is in the process of piloting a small performance-based contract with incentives.

13. Is formal partnering required?

Agencies universally see value in partnering. Six of the nine agencies call for formal partnering. Those that do not require it still philosophically approach the contract as a partnership and contribute for mutually beneficial initiatives.

14. What are agency and contractor training requirements for PBMC contracts?

Again, states see considerable value in training and certification. Virginia has annual review sessions on the Maintenance Rating Program. Florida requires certification for rest area security personnel, and Nevada brings experts from both the DOT and the contractor sides to discuss issues and expectations, typically a week or two before work starts.

15. Are pavement surface improvement contracts that go beyond restoring the function of the existing system and add strength/capacity included?

Six of the nine states do not include them. Virginia included them in the past and excludes them now and bids them separately. Texas also included them in original contracts but now allows separate payments for these items on unit cost basis. Ontario includes estimated quantities with set unit prices for capital improvement work in the tender. The capital funds are kept separate in contract administration.

16. What is the scope of work in asset maintenance type contracts?

Asset maintenance contractors generally are responsible for all maintenance activities within a corridor or geographic area. Contractors typically are required to perform routine maintenance and minor repair activities that are associated with roadway, drainage, structures, roadside, vegetation and aesthetics, traffic services, and incident management.

State DOTs practicing PBMC generally have other types of contacts in place, as well. For example, Texas has a full blend of work types, from total rest area maintenance to asset maintenance for all functions in a corridor to selected asset maintenance contracts for roadside maintenance to bundled contracts with unit cost bidding. The state's specifications allow payment to be made for pavement work, such as removal and replacement, at unit costs. In such instances, work locations are determined by agency personnel.

17. Are snow and ice control, incident management, and emergency response handled by PBMC forces? If so, how is payment handled for these items?

For Ontario and Texas, it is part of the lump sum amount. For Virginia, it is part of the lump sum amount, as it is included in all contracts. Three Virginia contracts issued recently do not include snow/ice control, which is being handled separately. In their contract, North Carolina initially bid snow and ice as an alternate and decided not to include this item when bids came in at prices that were about 10 times their estimated costs. While snow and ice control is not a normal maintenance activity for Florida, the contractor is responsible for all incident management support and for all events where the government has not declared an "emergency."

18. How is loss in asset condition as a result of "force majeure" events, such as, earthquakes, hurricanes, etc. handled?

Typically, the contractor is held harmless for events beyond his control and receives amounts obtained through Federal reimbursements. Virginia pays for rest area repairs that are above $500.00, and Texas pays for rest area repairs when they exceed a $50,000.00 threshold. Texas's experience indicates that the impact of events is more on rest areas when compared with corridor maintenance because often the rest areas call for around-the-clock staffing and additional sanitary facilities to accommodate stranded travelers. North Carolina requires the contractor to assume responsibility for damages up to the first 20 percent of the contracts annual payment. Therefore, for a $5M/year contract, the contractor pays for the first $1M before agency funds kick in, similar to a deductible in an insurance policy.

19. Is the contractor required to collect baseline information as part of the project?

Typically, prospective bidders are provided with all available data on inventory, feature condition, etc. for informational purposes, and the contractor is responsible for verifying accuracy. Agencies provide as much information as possible for the contractor to be efficient and clearly understand expectations.

20. What are typical performance criteria for maintaining assets?

These criteria typically are found in the invitation for bid documents. Appendix C shows the criteria Virginia used in the invitation to bid for TAMS, issued August 12, 2008. Criteria for a selected sample of assets are shown in Table 7.

In the US, a concerted effort is being made by AASHTO's Subcommittee on Maintenance to compile and compare maintenance performance standards. Appendix D provides performance standards comparison (2007) for the following items:

- Shoulders and Ditches.
- Drainage.
- Roadside Appurtenances.
- Roadsides.
- Traffic.
- Pavements.
- Bridges.
- Tunnels.
- Rest Areas.
- Snow & Ice, Incident Response.

As an example, Table 8 presents a compilation and comparison of the standard for guardrail/ cable rail. It is important to note that the performance measures shown in this table are for example purposes only and used to facilitate discussion. The data have been taken from actual contract documents which may have been modified since the date shown in each column. Readers are advised to contact each agency for current contract measures.

Table 7. Sample Performance Criteria for Assets (Virginia).

ASSET	OUTCOME	TARGET,%	TOLERANCE & CRITERIA	UOM
ROADWAY & SHOULDER ASSET GROUP				
Asphalt Surface	Safe Durable Smooth	95	• No potholes/pavement failures. • Patches <1/4" higher or lower than surrounding pavement. • No pavement failures that present a safety hazard. <u>Timeliness Requirement:</u> • Temporary repairs to pavement failures 6"x6"x1 ½" or equivalent deep or larger shall be repaired immediately upon notification or discovery. All others within 2 days of notification or discovery. • Permanent repairs to pavement failures shall be completed within 30 days of notification or discovery during seasons when asphalt plants are operating or within 30 days of asphalt plants opening for the season. • Pavement obstructions that present a safety hazard shall be mitigated immediately.	Sq.Ft
Paved Shoulders and Rumble Strips (Asphalt)	Safe Smooth Functional	90	• No potholes/pavement failures. • <105 linear feet edge drop-off or low > 1½ " • <105 linear feet separation > ½" wide • No false ditch or build up on shoulder that causes water to stand on shoulder or drain onto the travel lanes. <u>Timeliness Requirement:</u> • Temporary repairs to potholes > 6"x6"x1½" or equivalent deep shall be completed within 2 days of notification or discovery. • Permanent repairs to potholes shall be completed within 30 days of notification or discovery during seasons when asphalt plants are operating or within 30 days of asphalt plants opening for the season.	Sq.Ft

Table 8. Sample Maintenance Performance Standards Comparisons.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
3. Roadside Appurtenances						
a. Guardrail/ Cable Rail	• 95% of guardrail/ barrier free of structural defects per 100' section • all guardrail posts, offset blocks, panels and connection hardware in good condition and in place • cables taut and properly secured (according to standard)	• Damaged guardrail that will no longer function as designed shall be repaired or replaced within 1 week, remove debris and install warning signs immediately • Damaged, but functional, guardrail shall be replaced or repaired within 1 month • If, in the opinion of the engineer, they are required for access control, the contractor shall install new post and cable fence	• Contractor to respond to all failures, which include site mitigation and repairs. • No dents that decrease structural integrity. • Badly damaged guardrail must be repaired/ replaced within two (2) days following notification or discovery. • Damaged but functional guardrail must be repaired/ replaced within seven (7) days following notification or discovery. Mitigate immediately upon notification or discovery.	• Contractor to respond to all failures, which include site mitigation and repairs. • No dents that decrease structural integrity. • Badly damaged guardrail must be repaired/ replaced within two (2) days following notification or discovery. • Damaged but functional guardrail must be repaired/ replaced within seven (7) days following notification or discovery. Mitigate immediately upon notification or discovery.	• Each single run of guardrail will function as intended. Any guardrail function as intended. Hits will be mitigated immediately to ensure 90% of guardrail/barrier will be free of damages that impact motorist safety. 1. Permanent repairs will be made of structural defects and set at the proper height for each single section. 2. Guardrail posts, offset blocks, panels and connection hardware will be in good condition and in place. • Cables will be taut and properly secured in accordance with standards.	• Present, clean and without any significant damage or corrosion

21. How are PBMC contracts typically monitored?

On Virginia contracts, the contractor is required to furnish an annual work plan that describes the initial and proposed work efforts and manner in which the contractor plans to achieve the work. In addition, the contractor is required to furnish a weekly work plan, traffic control plan for asset maintenance services, incident and emergency response plan, and public information plan. The Virginia DOT uses the services of Virginia Tech University in monitoring the performance of the contractor. The monitoring criteria rely heavily on the Maintenance Rating Program. There are 45 contract monitors statewide.

Nevada's in-house regional construction personnel are deployed to monitor statewide work (pavement preservation), and local maintenance supervisors monitor weed abatement/graffiti work weekly. The state is considering incentives and bringing in DOT personnel from another geographical area to do the assessment in order to neutralize possible biases that in-house personnel may have.

Texas's TxMAP determines an LOS rating. This rating is performed by its Austin crew annually. The agency conducts formal unannounced inspections to keep subjectivity to a minimum.

Florida has developed a monitoring plan and Asset Maintenance Grading Plan. Monitoring is performed at the contractor, District, and Central Office levels. Rating scores less than 70 are considered deficient. Meetings on performance (or lack thereof) are conducted with the contractor when deficiencies occur for two or more quarters. The Central Office performs quality assurance (QA) review of each District annually. One-on-one training is provided based upon the findings of this review. The agency also meets quarterly with asset maintenance contractors to discuss a variety of issues.

In Ontario, in-house staff performs the QA review. The province's third generation contracts call for contractors to have quality management systems in place that are registered under the ISO 9001-2008 and ISO 14000 standards. Ontario expects that this will improve the overall quality and will transfer some of the QA efforts from the DOT to the contractor.

22. How do PBMC costs compare with in-house costs and traditional contracted work?

True comparisons are hard to make, primarily because of factors like requiring different levels of performance for the compared items and elements considered in the costing. As an example, North Carolina spends $4300/lane mile for the roadway system they contracted out under PBMC. The contract added a higher level of performance by the contract than is the standard for DOT forces in certain areas, so it is difficult to make a true comparison. Nevada finds performance-based contracts to be cost-effective in supplementing DOT resources. Kentucky believes that the lighting contract is costing slightly more, but the level of service has increased substantially from 60 percent of the lights working to 90 percent. Florida's experience is similar—a 2 to 2.5 percent increase over traditional contracting resulted in a substantial increase in the condition of the assets. Florida stated that they were not losing money with the PBMC. Studies are underway for Texas and Virginia to make true "apples-to-apples" comparisons.

Because equitable cost comparisons are so difficult, the relative cost issue has many differing opinions.

23. What do you see as the primary advantages of PBMC?

The advantages cited by most respondents were improved level of service, risk transfer to contractor, augmentation of staff capabilities, and economies of scale. Ontario also cited potential reduction in costs, building a new industry, more innovation, and that PBMC provides opportunities to examine different oversight models, with potentially different costs.

24. What do you see as the primary disadvantage of PBMC?

The disadvantage cited by most respondents was loss of control on how work gets accomplished and entrusting somebody else to provide the service, especially services critical to mobility like winter operations and emergency response. This is a major cultural change for agencies. The handling of unanticipated events and services that are above and beyond what is specified in the contract can be challenging at times. Costs and the need for additional personnel and special skill sets to administer these types of contracts were also cited.

25. What were the lessons learned (both successes and failures) through use of PBMC? What pitfalls should those who use this tool avoid?

The responses have been grouped in the following categories:

<u>Planning for a PBMC Approach</u>

- "Plagiarism" is a good thing when agencies emulate the successes of others. Learning from other experienced agencies is invaluable if contemplating PBMC.
- Need to assess existing conditions up front to get the best bids and establish a valid baseline.
- Market and explain the purpose of PBMC within one's own agency and with industry.
- The ideal size of a project is about 100 centerline miles, or 400 lane miles, to take advantage of economy of scale.
- One agency attributed its success to a mindset of "let's do the best we can to be successful."
- Several agencies were definitive about their ability to achieve a higher LOS through PBMC than they were able to achieve otherwise.
- While these contracts provide nice planned spending, it is advisable to budget some discretionary funds for out-of-scope emergencies.
- Keep employees informed of the process. Get them on board early in the development process.
- Recognize that if the contract requirements are significantly higher than what the DOT's workforce is providing, there will be additional costs for the higher LOS. If a higher level of service is desired, consider performance requirements that maintain at current condition with a 5 to 10 percent improvement per year until desired performance levels

are met. Incrementally raise the LOS towards the desired target, as opposed to trying to achieve a large improvement in LOS all in the first year.
- An initial condition assessment is essential for both the DOT and the contractor. If the contract is for routine maintenance only, the initial assessment can be used to help define the scope of work for replacement and restorative contracts.

Procurement and Contracting

- Contract timeframes, which began with 5-year typical time periods, need to be of sufficient length to allow contractors to recover the costs of equipment and mobilization.
- The contract duration should be at least 5 years, preferably 10.
- Contractors generally perform well in routine maintenance functions (roadside, incident response, mitigation of safety issues, etc.). Besides the ultimate consequence of finding the contractor in default when there is failure in performance, the contract should include interim consequences for failure to meet milestone performance.
- Consider the possibility of the project not going as planned. Plan out and specify what would happen in such instances.
- Specify how requests for innovative methods/technologies that are different from the standard specifications will be handled.
- Don't "over engineer"—too much restriction in the way of specifications and standards limits contractor flexibility to innovate.
- Provide both incentives and disincentives to motivate achieving target LOS.
- Don't include work under a PBMC that is reimbursable by the Federal government when natural disasters occur. Execute a separate quantity/fee-based contract for the specific work.
- Establish clear language in the contract scope that allows for changes to performance measures/standards to be consistent with statewide practices that are updated during the contract period.
- Consider incremental steps towards performance-based contracting. Perhaps start with bundled bids (e.g., combining spraying with mowing), followed by contracts on a small scale before launching a large-scale total asset maintenance contract.
- Avoid subjective performance requirements.

Standards and Performance Measures

- The importance of measuring the condition of the system at the outset and at various intermediate points cannot be overstated. One state is developing a maintenance management system for this very reason.
- When developing performance standards, it is important to consider how they will be measured or evaluated. Specify who will collect and pay for the information collection, if specialized equipment is required, how frequently performance will be evaluated, and the consequences if the performance standard is not met.
- Be reasonable with performance targets.
- There is a need for practical and proven performance measures and standards.
- Look for opportunities to improve and refine existing measures and standards and to develop new measures and standards that will be helpful to the agency and the entire maintenance community.

Contract Administration

- Strong managers and inspection staff that are knowledgeable, experienced, consistent and fair enhance the chances of success.
- Contract administration staff must be trained on PBMC ahead of time.
- It has been a challenge to align all resources/mindsets of staff in adapting to PBMC, particularly the cultural change from "standards and specifications" mindsets to performance and outcome.
- Use technology (such as tablet PCs) to reduce costs of performance assessments.
- Experience indicates that construction personnel are particularly adept at administering contracts of this type, perhaps because of their experience with project documentation on typical construction contracts.
- Performance assessments affecting compensation should be based on random, unannounced inspections.
- In contract administration, it is important to recognize that this is not a traditional, method-based, quantity and unit price contract and that the contractor has flexibility in how the performance requirements are met.
- Although issues need to be dealt with according to contract specifications, the contract should be approached as a partnership and in a non-adversarial manner.
- The performance-based contract should include a dispute resolution process to handle issues before they rise to the level of a claim.
- Ensure that enough attention is given to oversee the performance of the contractor, particularly if there are incentives/disincentives.
- There is a certain level of expertise needed to administer the contract successfully. Use your best in-house staff, accordingly.
- Allow time for adjusting to the new contracting approach.
- Contract administration costs should not exceed those for conventional contracts.
- Do not let contracts with the intent of hunting for what is deficient.
- Don't go with the expectation that everything will be at 100% performance.
- Don't let contractors grade themselves as a basis for compensation.
- Allow the PBMC contractor to do his job. Don't micro-manage or over-inspect.
- Care for the final product and not the tiny steps needed to get there.

Survey of States Interested in Learning about or Pursuing Performance-Based Maintenance & Operations Contracting

Fifteen of the 37 respondents to the initial survey (41 percent) indicated that they had not tried PBMC but that they were interested in learning more about or pursuing PBMC in various applications. It is beneficial to the outcome of this research to better understand the interests, needs, and motivations of this group of respondents. Therefore, the research team conducted teleconference interviews with representatives from California, Georgia, Maryland, Missouri, Mississippi, and Pennsylvania. These states were selected based on their relatively high inventory of state-maintained roadways and on their practice of contracting out 20 percent or more of these maintenance activities. A summary of the responses to the 10-question follow-up survey is given below. This information was helpful both in designing the executive forum

format so as to benefit this group and to better achieve a comprehensive strategy for advancing the state of practice.

1. *What would be the key motivations for your organization to pursue performance-based contracting for maintenance and operations?*

   Responses indicated that "insufficient staff resources" was the most prevalent reason for pursuing PBMC. Additionally, the possibilities of reducing the costs to maintain the same level of performance or improving the LOS were cited. One highly unionized state indicated that PBMC would be considered only in areas where the union has already agreed to outsourcing.

2. *Does your organization currently bundle contracts, e.g., mowing with spraying and other roadside activities, pavement markings with raised and recessed pavement marker maintenance, etc.?*

   A number of states indicated that they already were bundling activities into one contract. For instance, mowing and litter pick-up are included in one contract in several states, as are area-wide pavement markings and raised pavement marker maintenances.

3. *Has your agency used any performance measures/warranties in maintenance contracts?*

   The answers to this question were mixed. Two states use multi-year performance-based (retroreflectivity) contracts for line striping maintenance. One state is doing and another considering doing a similar contract for area-wide sign maintenance. Still another state has a multi-year performance contract for application and maintenance of preformed tape centerline striping on the Interstate. A number of states have used performance-based contracts for rest area and welcome center maintenance. Several states have performance-based/warranty contracts for structural hot mix asphalt (HMA) overlay construction contracts.

4. *Is your primary interest in performance-based contracting to manage and maintain specific assets? Multiple activities? Other?*

   Most of the responses here were single activity-based criteria or bundled activities so state personnel resources could be used more effectively. Three respondents were contracting out regionally for rest area and welcome center maintenance, and one was developing a multi-year performance-based statewide contract for a statewide roadway weather information system installation and maintenance. Comments here suggest that states want to start with these simpler contract scopes first to build experience and confidence before ultimately trying a "fence-to-fence" type contract on a corridor.

5. *Does your agency have information on inventory and condition of the existing assets?*

   Most answered affirmatively to this question for primary assets like bridges and pavements, shoulders, drainage structures, signs, etc. Most do some sort of cyclical condition

assessment, trending and reporting. Some did not have a complete inventory on appurtenances, striping, and guardrails by types.

6. *Does your agency establish and monitor performance goals for Department Force Maintenance Activities?*

   Most states had in place or were implementing performance goals and measurement tools that involved a numeric rating for department force maintenance activities. These included some very detailed QC and third party QA efforts that measured asset condition and workforce performance trends over time.

7. *What would you need in reducing your sense of risk in trying performance-based contracting?*

   The states that were still in the process of considering the viability/applicability of PBMC indicated that evidence of improved performance from experience of other states and that cost would reduce or stay the same would influence their decisions. States that said they had already made the decision to pursue PBMC noted that they needed help with developing tools to apply it. A number of states indicated concern with losing direct control over critical activities like emergency response and winter operations because of the significant consequences of system failure.

8. *What actions/events will cause your agency to initiate performance-based contracting?*

   All responded that top management interest was the key to initiating PBMC. Secondary reasons for considering PBMC were interest by Operations Managers and external political interest. This latter initiator was sort of a "double-edged sword" in that if the political interest came in the form of a legislative requirement, skepticism and push-back may occur in the agency. One state questioned the availability of general overview information on PBMC that executive management of a state DOT could take to legislative transportation committees.

Survey of Contractors who Provide PBMC Service

To gather a fuller perspective of the state of the practice of PBMC, several of the primary contractors and management consultants were surveyed. The contractor questionnaire was sent to six members of the Association for Management and Operations of Transportation Infrastructure Assets (AMOTIA). Four PBMC contractors responded. Following is a summary of their responses.

1. *Within the past 5 years, has your firm provided Performance-Based Contracting services for maintenance for any of the following:*

   All of the primary contracting firms who responded participated in all of the following activities (except that one had not participated in tunnel maintenance):

- Pavements.
- Roadside.
- Roadside appurtenances.
- Rest areas, welcome centers, weigh stations.
- Drainage.
- Shoulders & ditches.
- Structural items.
- Tunnels.
- Snow and ice and incident response.

2. *Within the past 5 years, has your agency provided performance-based contracting services for highway operations?*

   Each of the respondents participated in all of the highway operations activities listed below:

   - Long line pavement markings.
   - Words and symbols.
   - Pavement markers (raised and recessed).
   - Signs.
   - Overhead signs, including lighting.
   - Roadway and interchange lighting.
   - Object markers and delineators.
   - Intelligent transportation system equipment (roadway weather information system, variable message signs, etc.).

3. *In the past 5 years, has your firm seriously considered providing performance-based contracting services and elected not to pursue?*

   Only one firm answered affirmative to this question and cited the following reasons:

   - Duration of the contract.
   - Size of contract (too small).
   - Excessively risky in relation to reward.
   - Poor experience with earlier PBMC contract.

4. *Has your firm provided PBMC for multiple maintenance activities in a specific highway corridor or for a group of state roads in a county?*

   All respondents answered affirmatively.

5. *Is there a dollar value and/or length of contract below which PBMC method of contracting would not be cost effective? If so, please specify:*

All of the respondents agreed on the following two statements:

- The dollar value and its cost-effectiveness would vary from contract to contract depending on the scope and set of requirements.
- A 5-year contract term is the minimum length.

The following are some generalizations for various types of work:

For Roadway Projects:

- Include fence-to-fence maintenance and operational responsibility.
- Size greater than 100 centerline miles.
- Value about $1M annually.

For Structure Projects:

- Include total structure, maintenance, inspection and limited rehabilitation responsibility.
- Size such that all structures within a district or division are included.
- Value about $2.5M annually.

For Facility Projects:

- Include total facility maintenance and limited rehabilitation responsibility.
- Size such that all facilities within multiple districts or divisions are included.
- Value about $3M annually.

The dollar amount and length of the contract are only two of the determinants in the making the decision to pursue a PBMC. The owner agency should solicit input from the industry for the specific project through a draft RFP.

6. *Indicate how PBMC contracts can be made most cost-effective.*

Over a dozen suggestions were received from each of the respondents. Following is a compilation of these responses:

- Use the best value selection process that evaluates a contractor's qualifications (experience/technical proposal) along with price. (2)
- Define specific reasonable/attainable performance requirements. (3)
- Establish clear, consistent methods and procedures for evaluating performance (3) (minimum of biannual assessments).
- Allow the contractor the freedom to decide what to do, when, and how, so innovation is encouraged.
- Include a broad scope of maintenance/operational activities in the contract. (2)
- Provide accurate asset inventory information at pre-bid. (2)
- Provide clear understanding of baseline asset conditions at pre-bid. (2)
- Have appropriate size and length of the contract (not too large or too small). (2)

- Use monetary incentives to drive exceptional performance levels. (3)
- Require annual bond requirements which provide protection for agency while minimizing potential bar to entry for smaller contractors (50% of annual payment amount). (2)
- Use partnering process either expressed or implied. (2)
- Use disincentives that are fair and reasonable and sufficient to promote timely correction action. (2)
- Place limits on liability associated with incident/emergency response to reasonably share risk between the agency and contractor. (2)
- Allow contractor the ability to collect third party recovery from crashes and incidents that occur on the corridor
- Include reasonable provisions to deal with changes in agency policies and asset inventory that occur during the contract period.
- Allow contractor the ability to get some penalty money back by correcting deficiencies within a specified period of time.

7. *Should contracts separate snow and ice control from PBMC?*

   One respondent answered affirmatively and three respondents answered negatively to this question; however, two of these three respondents had these qualifiers/suggestions below:

   - Include snow and ice control in the lump sum with a cap on the maximum number of events and on the maximum size of individual events.
   - Reimburse on a fee basis for the number and size of events that exceed cap limits.
   - Allow contractor to purchase winter materials from the state contract.
   - Use reasonable performance standards/incentives/disincentives.
   - Contractor's difficulty pricing with regard to weather predictions and assumptions will result in high variability in pricing; therefore, the agency should use RFP process to consider contractor's experience, planning and weather assumptions made.
   - Weigh this item in favor of the technical proposal as opposed to price.

   The one respondent who answered affirmatively was concerned about the equitable allocation of risks and had these two comments:

   - Use a combination of fixed lump sum payments for routine maintenance work and unit prices for work such as snow and ice in the same contract, or
   - Issue separate unit price contracts for snow and ice related work.

8. *Please indicate how PBMC contracts can be made most cost-effective?*
   The response referred to AMOTIA white paper outlining their collective position on key issues associated with PBMC contracts.

9. *How should loss of asset condition caused by "force majeure" events, such as, severe weather, earthquakes, etc., be handled?*

   All respondents provided suggestions relative to this question:

- Clearly define contractor's responsibilities and requirements. (3)
- Cap or limit the contractor's responsibility in each 12-month period (25 percent of annual contract value or "x" dollars). (2)
- Agencies should bear the risk of occurrence for these events.
- Use separate emergency contracts for these events, thereby, streamlining the Federal reimbursement process for declared emergencies. (2)
- Include major snow and ice events.
- Issue contract change orders for this work.

10. *Would your firm be interested in participating in presentations/discussions at the Executive Summit scheduled in spring 2009, with the understanding that all expenses including travel and lodging will be borne by the firm and not Applied Research Associates?*

    All respondents indicated that they would be interested/willing to participate in the executive forum. It was suggested that background information on benchmark practices and the consensus building format of the forum be sent to the participants in advance of the meeting.

11. *If you have additional comments on any question in this survey or on Performance-Based Contracting for Maintenance and/or Operations in general, please feel free to provide them below, or on a separate page or Email.*

    Two respondents referenced AMOTIA's white paper (available at www.amotia.org) outlining the membership's collective consensus positions on these various issues. There are other significant issues on which the member firms were unable to reach a consensus position; hence, one of the respondents noted the importance of an agency seeking individual comments through a draft RFP process.

Viability of PBMC

The literature, surveys, and interviews show that there are several variants of PBMC based upon scope and coverage. The scope refers to specific activities and assets included, and coverage refers to the amount of highway network or geographic area covered. Activities can be single, such as line striping within a geographical area, or they can include all maintenance activities in a corridor or within a relevant boundary. Within this broad range, contracts could use multiple activities like bundling of mowing and litter removal or a combination of unit prices for some activities and lump sum for all the remaining activities.

The respondents experienced in the use of PBMC see it as a viable tool to augment staff capabilities, improve LOS, enjoy economies of scale, and transfer risk to the contractor.

Concerns about pursuing PBMC included loss of control on how work gets accomplished, especially services critical to mobility of travelers, handling of unanticipated events and services not identified in the contract, and additional personnel and skill sets to administer these types of contracts.

The survey shows that agency experience varies from no experience to over a decade of experience in the use of this tool. The research team was advised by agencies with experience in PBMC that in areas in which PBMC is a new practice, perhaps the best approach is to first gain experience by contracting for maintenance for a single activity, a single asset or all maintenance activities at rest areas. Once the organization acquires the experience and wishes to move forward, it can expand the number of assets under contract and increase the coverage area and the period of performance.

Once an agency has determined to initiate/expand PBMC, it needs to obtain or develop generally accepted guidelines and documents (specifications, standards, contract language, etc.) for managing these contracts. These documents and standards exist in various stages of refinement and accessibility. Clearly, there is a need for synthesizing the available information and for a medium to access them easily in their most current form. This will take some time to develop, and the next chapter details suggestions on achieving this goal. Until this comes to fruition, it can be useful for an agency to develop a "mentor" relationship with an agency with PBMC experience.

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CHAPTER 4: EXECUTIVE FORUM ON PBMC

Overview

The focus of this project was to hold an executive forum with a primary outcome of developing strategies for advancing the state of practice in PBMC. A secondary outcome of the forum was information/knowledge transfer on the state of practice of PBMC.

To synthesize background information on PBMC and "set the stage" for forum participants, an interim report consisting of the previous three chapters of this final report was prepared and distributed. The literature search, general survey questionnaire sent to states and provinces, and telephone and face-to-face interviews also led to the identification of presenters and invited participants to the forum.

The format, agenda, participants, presenters and facilitators, and meeting location and logistics of the forum were considered and planned carefully. Based on unsolicited comments from the participants, their active engagement throughout the forum, and the strategies that evolved, the forum was deemed a success.

The project team agreed that having the right cross-section of participants was the most vital ingredient to success. It also was recognized that many of the potential participants from state DOTs were facing travel restrictions due to tightened revenues related to the current economic downturn. The project team set a minimum goal of 20 participants, at least 10 of which would represent state DOT owner agencies. A list of 50 tentative invitees was developed, and a letter of invitation from Dave Ekern, Commissioner of the Virginia DOT, was sent to each invitee. This larger number was invited recognizing that some of them would be unable to participate for various reasons. This list included representatives from both owner agencies and large PBMC contractors, agencies with actual experience and those without experience but genuinely interested in pursuing PBMC, executive decision-making level and operations level representatives within their agency, and representatives with both successful and less than successful experiences.

A total of 28 invitees participated in the executive forum. The attendance roster included 11 representatives from state DOTs and one Canadian province, 9 from PBMC contractors/ consultants, 1 each representing AASHTO and the FHWA, and 6 from the project team. As expected, it was very difficult to get attendees from the public agency side due to travel restrictions even with travel reimbursements available. Even so, the group was large and broad enough to meet the criteria set by the project team and to achieve valid input to strategies.

In developing the format and agenda for the forum, several objectives were established:

- Use appropriate presentations to "set the stage" and provide a common level of knowledge.
- Provide ample time and format for quality group discussions and breakout sessions.
- Provide opportunity to establish group consensus.

A session summarizing the information in the interim report and "charging" the participants with the forum objectives was held the evening before the workshop. During this time, considerable commenting and discussion took place among the group such that the group extended the exercise well over an hour past the scheduled closing time.

It was determined during agenda development to use two distinct sessions. The morning session focused on addressing the strengths and weaknesses of PBMC, and the afternoon session focused on identifying challenges and strategies to address those challenges. The identification of "weaknesses" in the morning session assisted the group in better articulating the key "challenges" during the afternoon. Both the morning and afternoon sessions included several pertinent and thought provoking presentations, followed by a question & answer period and then a group discussion session. The afternoon group discussion period also included breakout groups. Working through this agenda allowed the participants to identify four prioritized challenges and strategies, which will be discussed in detail in the final section of this report.

Discussion of Presentations

Seven PowerPoint presentations added greatly to achieving the objectives of the forum. An additional presentation scheduled for the forum but unable to be made was added after the fact. All these presentations are shown in the stand-alone report on the executive forum. The results of the general survey questionnaire to states and provinces and the individual interviews led to the identification of appropriate presenters.

Mr. Gary Hoffman provided an overview of the information in the interim report during the session the evening before the forum. Messrs. Rutledge, Prezioso, and Markow gave presentations during the morning session (strengths and weaknesses of PBMC), and Messrs. Lattner, Baker, and Ferragut gave presentations during the afternoon session (challenges and strategies). Descriptions of their presentations are provided below. Ms. Brandenburg was scheduled to present but was unable to attend the forum; her presentation was added to the stand-alone report on the executive forum.

PBMC Comprehensive Maintenance Contracting in Georgia**:** Mr. Terry F. Rutledge, State Maintenance Liaison Engineer for the Georgia DOT, gave a presentation on Georgia's comprehensive maintenance contracting experience. Georgia DOT began outsourcing maintenance activities with the maintenance resurfacing program. This expanded to statewide interstate mowing and welcome center maintenance contracts. Additional maintenance activities like shoulder sweeping and drain cleaning were bundled with mowing as a pilot on the Metro-Atlanta Interstates. A performance audit report by the Georgia Department of Audits in November 2007 resulted in a recommendation to continue with the pilot program if the contractors' bids indicated cost savings. The DOT has developed contract documents to be advertised later this year for continuation of the pilot. The asset inventory and baseline condition assessment within the limits of work on the pilot project proved to be the most challenging tasks. A few of the factors Georgia DOT considers in contract development are existing and proposed service levels, cost comparisons, and amount of available funding over the length of the contract.

PBMC in Virginia—the TAMS Model: Mr. Robert E. Prezioso, Acting State Maintenance Engineer for the Virginia DOT, gave a presentation on Turnkey Asset Maintenance Services.

Virginia DOT has awarded a dozen contracts covering over 1,700 centerline miles of Interstates in Virginia. The DOT is in the process of developing a TAMS contract for the Woodrow Wilson Bridge.

Mr. Prezioso listed the following advantages of TAMS or PBMC:

- Reduced owner-agency staff.
- Greater focus on priority asset conditions.
- Consistent annual budget obligations over the multi-year contract period.

The following challenges also were addressed:

- Agency staff transition and development into new functions.
- Baseline condition assessment.
- Balancing contractor risk and cost.
- Ability to address unplanned budget cuts in the program.

Comparing Costs – the Challenges**:** Mr. Michael Markow, of M.J. Markow, P.E. Consulting, presented an update on the status of work on NCHRP Project 14-18, "Determining Highway Maintenance Costs." The objective of this research is to develop a consistent process for determining an agency's cost associated with performing highway maintenance. This process should be flexible enough to be applied at the organizational level and at the specific maintenance activity level. Mr. Markow indicated that relevant practices on determining costs associated with maintenance had been collected from a number of highway agencies, industry and a literature search. This information will be analyzed and a process will be developed, tested, and demonstrated. A final report on the work is anticipated in 2010.

The results of NCHRP Project 14-18 are very important to meeting the challenges of equitably comparing PBMC costs to those costs for similar work done by the agency. Past attempts at making these comparisons have shown variations in how agency overhead costs are determined and included. These comparisons have, at times, been difficult because of the inability to get cost specificity to the activity/location level and the variation in achieved levels of service.

Florida's Asset Maintenance and PBMC Successes & Challenges: Next, Mr. Tim Lattner, P.E., Director of the Office of Maintenance for the Florida DOT, gave a presentation on asset maintenance and performance-based contracts for the Florida DOT. Mr. Lattner's presentation on Florida DOT's use of asset maintenance (AM) covered the following:

- Comparison of AM contract to traditional contract features.
- AM performance measures & evaluations.
- AM challenges.
- Best practices/lessons learned.
- Historical contract use 1994-present.
- Description of Florida's statutory Maintenance Rating Program.

Florida's maintenance program, covering about 42,000 lane miles of highway, has moved from a 60% / 40% in-house to traditional contract ratio in 1994 to a 21% / 44% / 35% split of in-house,

traditional contracting, and asset maintenance contracting in 2007. The 2009 goal is to get 40% AM contracting.

A few of the challenges to AM contracting noted in the presentation were:

- Equitable and consistent contractor evaluation (independent evaluators).
- Response to natural disasters (hurricanes).
- Consistency of contract scopes.
- Risk to both the agency and contractor.
- Loss of direct control by the agency.

Some of the best practices/lessons learned that were highlighted in the presentation were:

- Establish clear, objective performance measures.
- Use the existing Maintenance Rating Program (or LOS) wherever possible to be able to compare in-house and PBMC performance results.
- Require the contractor to self evaluate, keep and report performance results.
- Require performance measures to change as statewide practices are updated during the contract period.
- Contract documents should evolve and build on the successes of previous contracts.
- Carefully consider and stipulate how to handle emergency response and recovery.
- Give the contractor flexibility. Do not micro-manage.
- Carefully consider how to handle emergency response/recovery.

Ontario's Experience with PBMC: Mr. Jeff Baker, head of Maintenance Contracting for the MTO, gave a presentation on performance-based contracting for maintenance in Ontario.

The Ontario MTO has determined a philosophy to do 100 percent of maintenance by contract. Currently, the approximately 25,000 lane miles of highway and 2500 bridges are maintained by about 40 percent traditional contracting and 60 percent performance-based or area maintenance contracting (AMC). A shift is underway to do a greater percentage of performance-based asset maintenance contracting, and the MTO is now using a third generation of contract documents. This current contract requires ISO certifications (9000-2008 for quality and 14001-2004 for environmental). The first of this latest generation of contracts was tendered in November 2008, and a successful award was made in March 2009. Twelve more contracts are scheduled to be awarded over the next 5 years.

Because there are diverse opinions in the US on the inclusion of winter operations in PBMC contracting, Mr. Baker was asked to present MTO's successes in this regard. Winter maintenance operations are the largest cost and highest public visibility area for the MTO, so they have to get it right! They set numerous outcome and performance targets that have stipulated monetary consequences for non-conformance. A few of these cited outcomes and performance measures include plow route circuit times, equipment utilization, winter material application rates, LOS, and bare pavement within class standard 90 percent of the time (publicly reported).

The MTO considered the sustainability of the area maintenance contracting approach when it made its decision to go to 100 percent maintenance contracting and to now move beyond the 60 percent area maintenance contracting level. The agency is aggressive in maintaining a positive relationship with the industry. They recognize the need for a healthy, competitive and well-informed industry. A long-term funding commitment to the area maintenance model is vital to build and sustain the industry.

Some of the suggestions with which Mr. Baker closed his presentation are:

- The move to area maintenance contracting is a long and deliberate process, so implement gradually and incrementally.
- Talk to others to learn from their experiences.
- Ensure solid executive support and direction.
- Communicate and cooperate with the industry. Be open to their interests and input.
- Plan for the long-range future.

The AMOTIA Perspective: Mr. Ted Ferragut, Executive Director of the AMOTIA, gave a presentation describing AMOTIA, PBMC, and some challenges to having a successful PBMC contract and ways to address those challenges. The AMOTIA is an industry association to serve as the voice of industry in the field of private sector management and operations of transportation infrastructure assets. The AMOTIA also provides a forum for members to exchange ideas and to advocate policies and practices that help members work cooperatively and efficiently with infrastructure owners. AMOTIA's definition of PBMC is "an outcome-based contract focusing on meeting performance requirements for assets within a fixed corridor for a fixed time period and for a fixed price."

Some of the challenges to PBMC that were presented include:

- Effecting qualification-based contracts.
- Developing adequate performance specifications.
- Achieving realistic cost estimates.
- Developing equitable or comparable LOS.
- Appropriate contract lengths.
- Question of how to include emergency/disaster response services.
- Achieving a "partnership" relationship.

Mr. Ferragut closed with this statement: "AMOTIA supports balanced maintenance that includes DOT work force, unit price-activity specific private sector contracts, and PBMC private sector contracts."

Ms. Jennifer Brandenburg, Director of Maintenance for the North Carolina DOT, was scheduled to present at and participate in the executive forum but was unable to do so. She subsequently gave the presentation at the annual meeting of the AASHTO Subcommittee on Maintenance in Annapolis, MD, on July 21, 2009. Her PowerPoint presentation is also included in the stand-alone report on the executive forum because it has information on North Carolina's experiences with PBMC that is valuable to the objective of this work. Because there was disagreement between the DOT and the PBMC contractor over how at least one of the contracted performance

measures was being evaluated, the contract was terminated prematurely. A new contract with more explicit detail in the areas of concern has been developed and is in the process of being advertised. Some lessons learned include:

- Start early with the contract development process. It takes longer than you would think.
- Use an experienced "mentor" and field staff to assist with contract development.
- Be reasonable with the size, scope and timelines in the contract.
- Listen to the input from the contracting community.
- Communicate early and often with all levels of management and with the front line employees.
- Use technology to assist in recording and storing performance assessments.

Results of Group Discussions

Strengths and Weaknesses of PBMC

Mr. Hal Kassoff facilitated the morning discussion group session on the strengths and weaknesses of PBMC. The entire group was engaged in the discussion and developed the list of 41 strengths shown in Table 9.

After the list was posted and discussed, the group was asked to vote for their "top 10" strengths. Owner agency representatives and industry representatives were given green and blue stickers, respectively, so the results could be distinguished between these groups. There were 12 state and 9 industry representatives who voted during this prioritization exercise. Percentages of each group who voted for particular specific strengths were calculated and the percentage of the combined group of 21 representatives who voted for each specific strength also were determined. The top ten strengths were then identified and ranked in descending order of the combined percentages.

The group believed that the ability of PBMC to transfer risk to the contractor was the highest strength. Both the owner agency and contractor representatives had this as their number one strength. The strength ranked second was the fact that PBMC encourages outcome thinking and focuses on performance as the bottom line. Again, both groups scored this strength equally high. The third highest ranked strength was that PBMC promotes innovation because, with the focus on performance outcomes, it gives the contractor more flexibility in how to achieve the specified performance goals. "Defines LOS," "provides more efficient contract administration," "defines performance expectations," shifts night work to the contractor," and "transfers resource/people issues to the contractor" were those strengths ranked next highest.

Table 9. Strengths of PBMC.

	Owners		Industry		Combined	
	%	Rank	%	Rank	%	Rank
Risk transfer to contractor	75	1	89	1	81	1
Encourages "outcome" thinking	75	2	78	2	76	2
Promotes innovation	67	3	78	3	71	3
Defines LOS	67	4	44	10	57	4
More efficient contract administration	67	5	44	11	57	5
Defines performance expectations	58	7	44	12	52	6
Shifts night work to contractor	67	6	33	18	52	7
Transfers resource/people issues to contractor	58	8	44	13	52	8
Planned expenditures	50	9	44	14	48	9
Reduces governmental restrictions/constraints	42	15	56	6	48	10
Lower administrative/oversight costs	33	20	56	7	43	
Provides contractor flexibility	42	14	44	15	43	
Additional resources to toolbox	42	13	33	19	38	
Reduces owner costs	25	25	56	8	38	
Increases transparency/accountability & confidence	17	30	67	5	38	
Develops a sub-contracting industry	42	18	33	20	38	
Improves collection of third party claims	42	19	33	21	38	
Ability to focus on specific assets	42	12	22	26	33	
Improves response time	0	35	78	4	33	
Long-term security for contractors	33	22	33	22	33	
Fosters life cycle approach	33	23	33	23	33	
Promotes proactive management	50	10	22	25	33	
Realigns resources to match needs	50	11	11	32	33	
Forces owner to identify costs	42	16	22	27	33	
Improves ability to allocate resources	42	17	22	28	33	
Establishes alignment between owner & contractor	33	21	22	29	29	
Improves quality, timeliness & performance	8	32	33	24	25	
Provides long-term consistent outputs	0	38	56	9	24	
Targets improvement in DBE program	25	26	22	30	24	
Improves NBIS reactions to bridge deficiencies	0	46	44	17	20	
Encourages coordination/integration of activities	25	27	11	34	20	
Better understanding of risk	0	37	44	16	19	
Improves LOS	25	24	11	33	19	
Creates or enhances industry	17	28	0	40	10	
Positions the agency more strategically	17	29	0	41	10	
Allows different pricing mechanisms	17	31	0	42	10	
Provides innovation transfer to owner	0	45	22	31	10	

Note: Shaded cells indicate differences between owners and industry of more than 30% in voting results.

Table 9. Strengths of PBMC, continued.

	Owners		Industry		Combined	
	%	Rank	%	Rank	%	Rank
Improves flexibility of year to year maintenance outlays	8	33	11	35	10	
Levels playing field among contractors	0	34	11	36	5	
Reduces capital expenditures	0	36	11	37	5	
Agency flexibility to react to change	0	39	11	38	5	
Improves ability to use Federal Aid funds	0	43	11	39	5	
Improves customer awareness	0	40	0	43	0	
Establishes a better QC program	0	41	0	44	0	
Reduces labor burden	0	42	0	45	0	
Improves negotiations position with unions	0	44	0	46	0	

Note: Shaded cells indicate differences between owners and industry of more than 30% in voting results.

It is important to note that several of the listed strengths were perceived differently by the owners and contractors. The ranking of those strengths where the percentages of voters differed by more than 30% are shaded gray. The only one of these strengths having this high difference in vote percentage that occurred in the combined vote top ten is "shifts night work to the contractor." Two thirds of the owner representatives believed night work to be an important strength while only one third of the industry believed so. The most dramatic difference occurred with "improved response time" where about 80 percent of the industry representatives believed this was a strength, while none of the owner agency representatives voted for this as a priority strength. Also, over half of the industry representatives believed that "long-term consistent outputs" was a priority strength of PBMC, while no owner agency representatives thought so. It is as important to identify and consider these strengths with high percentage differences as it is for the top ten by combined vote percentage. Addressing these perceived differences is vital for the advancement of the state of the practice of PBMC.

The morning group discussion continued around the identification of weaknesses of PBMC. Table 10 lists the 35 weaknesses developed, again with active participation from the entire group.

The same process of having the 21 voting participants vote for their "top ten" strengths was used to identify the predominant weaknesses of PBMC. Again, the owner agency and industry representative votes were separated by using different colored dots. When ranking the weaknesses by the highest percentage of votes by the combined group, "lack of accepted agency guidelines & standards" was the highest. However, neither the owner agency nor industry individual groups ranked this as their highest (ranked 3rd and 5th, respectively). The owner agency group had "negative impact to employee morale" as the highest, and the industry group had "legal liability implications" (tort claim exposure) as their highest weakness.

Table 10. Weaknesses of PBMC.

	Owner		Industry		Combined	
	%	Rank	%	Rank	%	Rank
Lack of accepted agency guidelines or standards	83	3	67	5	76	1
Uncertainty of multi-year funding availability	67	8	67	4	67	2
Loss of agency experience & capability	83	2	33	10	62	3
Perception that LOS is driven by "bottom line"	75	5	44	8	62	4
Negative impact to employee morale	92	1	22	14	62	5
Concern for traditional contractor loss of work	67	7	56	6	62	6
Challenges in pricing/funding over multiple years	58	10	55	7	57	7
Legal liability implications	33	15	89	1	57	8
Lack of competition among contractors	75	4	22	12	52	9
Lack of direct control over work activities	25	21	67	2	43	10
Not as responsive to local politics	67	6	11	19	43	10
Lack of organizational framework to deal with PBMC	67	9	11	25	43	10
Contractor limited resources to react to major events	42	12	0	34	42	
Increased cost	58	11	11	20	38	
Lack of awareness/knowledge of PBMC	33	17	44	9	38	
Difficulty to assign/allocate tort liability	0	34	67	3	29	
Loss of familiarity with local customers and issues	33	19	22	17	29	
Insufficient money to budget up front	33	13	11	18	25	
Requires inventory & condition assessment info	25	20	22	13	25	
Impact of "force majeure" on contract	17	31	33	11	25	
Perception that only larger contractors compete	33	18	11	23	25	
Contract complexities	33	16	11	21	24	
Impact on public sector jobs in rural areas	33	14	0	27	20	
Decoupling of payment from work activity	17	27	22	15	20	
Lack of legal framework	17	29	22	16	20	
Potential for larger claims	25	24	11	24	20	
Resistance to political pressure	25	22	0	29	14	
Customers identify with owner, not contractor	25	23	0	31	14	
Loss of historical cost data by activity	17	30	11	22	14	
Perception that maintenance work is "free"	25	25	0	35	14	
Decreases opportunity for DBEs	17	26	0	26	10	
Lack of "fine tune" mechanism/adjustments	17	28	0	30	10	
Increased project oversight requirements	17	32	0	32	10	
Newness of process	0	33	0	28	0	
Challenges in siting maintenance flexibility	0	35	0	33	0	

Note: Shaded cells indicate differences between owners and industry of more than 30% in voting results.

It was evident that there was much greater disparity between the two groups when voting on weaknesses as compared to voting for strengths. This created some concern for the project team, which was looking ahead to the need for some consensus on challenges and strategies. Again, those weaknesses with greater than 30 percent difference in the vote between the two groups

were shaded gray in the rank columns. For instance, over 90 percent of owner agency representatives voted for "negative impact to employee morale," while only slightly over 20 percent of industry voted for this listed weakness. Conversely, only a third of the owner agency representatives voted for "legal liability implications" as compared to about 90 percent of industry representatives. Several other listed weaknesses ("lack of competition among contractors," "loss of agency experience & capability," "lack of responsiveness to local politics," and "increased cost") were ranked considerably higher by the owner-agency representatives than by the industry representatives.

Because there were such significant differences in the vote percentage, particularly in six of the top ten by the combined score, it may be most advantageous to address these. The second highest ranked weakness by the combined group was "uncertainty of available funding for a multi-year program." Some states' maintenance budgets do not roll over from year to year, making it difficult to encumber funds for a multi-year contract. Unanticipated economic downturn and substantial reductions in planned revenues also have created difficulty in funding sustainability for a multi-year project.

Challenges and Strategies

Mr. Kassoff continued facilitation of group discussion around identifying significant challenges to advancing PBMC. The previous group effort on identifying and discussing weaknesses helped them converge on the top six challenges of the 12 that they listed and discussed. Unlike the voting for the strengths and weaknesses, there was much more consistency in the voting for challenges between the owner agency and industry groups, as shown in Table 11. There were no challenges that had 30 percent or more difference in the voting between the two groups; however, two challenges would emerge if a 20 percent difference were considered. These two are "funding uncertainty over multi years" and "loss of agency experience and capability." The top six challenges were nearly identical for the two groups.

Table 11. Challenges of PBMC.

	Owners		**Industry**		**Combined**	
	%	**Rank**	**%**	**Rank**	**%**	**Rank**
Establish PBMC as a long-term, sustainable approach	92	1	100	1	95	1
Impact to employee morale/culture change	83	2	67	2	76	2
Lack of agency guidelines for PBMC	67	4	67	3	67	3
Determine costs & performance levels	75	3	56	5	67	4
Achieving executive level support	50	5	44	7	48	5
Funding uncertainty over multiple years	33	6	56	4	42	6
Legal liability implications	25	8	44	6	33	
Perception/customer desire driven by bottom line	17	10	22	8	19	
Lack of contractor competition	17	9	11	9	14	
Loss of agency experience & capability	25	7	0	12	14	
Pricing for multi-year contract	8	11	11	10	10	

Concern of in-state contractors losing work	8	12	11	11	10	

Clearly, the predominant challenge was "establishing PBMC as a long-term, sustainable approach." This challenge was ranked the highest by both groups. The second highest ranked challenge, again by both groups, was "addressing the negative impact to employee morale/and the difficulties with cultural change management." The "lack of agency guidelines and standards for PBMC" and the "difficulties in determining costs for various performance levels" and being able to equitably compare costs also ranked high on the list of challenges.

After the ranking of challenges was completed and discussed, breakout sessions were held where the owner agency representatives worked in one setting and the industry representatives in another. Messrs. David Gehr and Marshall Stivers facilitated the owner and industry groups, respectively. These two groups were tasked to suggest strategies that would advance the state of practice in PBMC in light of the ranked challenges. These two groups then reconvened, and a discussion resulted in the consolidation to the four strategies, as shown in Table 12.

Table 12. Strategies to Move PBMC.

	Consolidated Items	**Industry**
Establish PBMC as a long-term, sustainable approach	Achieve executive level support	Develop executive level documents & manuals in conjunction with industry
	Clarify/pursue Federal funding eligibility for PBMC	Have FHWA clarify the use of Federal funds for PBMC
	Implement a task force to assist States to move from traditional to PBMC	Develop a task force to assist States to move from traditional to PBMC
	Establish political support for maintenance as a priority	
	Establish a clear business case for PBMC	
	Develop "best practice" documents for PBMC in conjunction with industry	
	Develop and implement a change management plan	
	Use comprehensive stakeholder outreach to address concerns	
	Develop and implement a communication plan	
Address impact on morale (culture change)	Training to all levels of government	Develop training for all levels of government
	Involve employees in developing the PBMC approach for the agency	Use existing State documents to develop the PBMC program
	Develop programs to educate potential contractors about service culture and public expectations	Develop contract administration manuals
	Develop a communication plan that includes vision, transparency, and accountability	
	Develop an employee, equipment transition plan (retrain and other opportunities)	
	Move with dignity and respect for	

	individuals	

Table 12. Strategies to Move PBMC (continued).

	Consolidated Items	**Industry**
Develop agency guidelines & performance standards	Develop and publish a "best practice" guide to PBMC	Form a joint task force to develop guidelines to collect condition & performance standards
	Develop and publish contract administration manual/guide	Develop industry performance standards
	Share both positive and negative lessons learned	
	Establish clear end result performance measures and standards	
	Establish and maintain an information database	
Determine actual costs and performance levels	Utilize a joint task force to develop costs relative to various levels of performance	Implementation plan for outreach on NCHRP 14-18
	Establish an accounting protocol that attributes costs for both asset maintenance and service provision	
	Utilize a joint task force to compile industry performance standards	
	Implement an outreach program on the results of NCHRP 14-18	

CHAPTER 5: PROPOSED STRATEGIES TO ADVANCE PBMC

The forum participants developed and prioritized a list of strategies to address the previously identified challenges. In this chapter, these strategies are listed in order of the prioritized challenges that they address:

1. Establish PBMC as a long-term, sustainable approach.
2. Address impact on employee morale.
3. Develop agency guidelines and performance standards.
4. Determine actual costs and performance levels.

A detailed discussion of each strategy is provided to give a better understanding of the intent of the group and of possible mechanisms to implement the strategy.

Establish PBMC as a Long-Term, Sustainable Approach

The sustainability of the efficient and effective use of the PBMC tool is of primary concern among many owner agencies. A number of questions are driving this sustainability concern:

- Are there now enough—and will there continue to be enough—experienced and capable contractors to provide competitive bidding and reasonable bids?
- Is the projected demand for the PBMC tool large enough to keep contracting firms in business?
- What is the right mix of PBMC, conventional contracting, and owner agency workforce capability to ensure that all maintenance needs will continue to be met at an acceptable level of service?

The PBMC forum breakout discussion groups ranked these three questions as the highest priority of the top four challenges to advancing the PBMC tool. The following list contains suggested actions to address those challenges:

- Achieve executive level support.
- Clarify/pursue the eligibility of PBMC for Federal funding.
- Establish a clear business case for PBMC for use by executive decision-makers.
- Develop ‘best practice” or “model” documents and philosophies on the use of PBMC.
- Establish political support for maintenance as a priority.
- Develop and implement a change management plan for transition from the traditional to PBMC.
- Develop and implement a communication and stakeholder outreach plan to address concerns.

One strategy to address these proposed actions is to empanel a standing owner/contractor group that would meet on some regular cyclical basis. The group could include representation from academia and consultants experienced with PBMC. The group would have some status recognition and would provide direction and consensus on achieving the actions listed above.

The group also could be supported administratively by a contracted consultant, especially to offset the burden to public sector representatives providing free service.

Furthermore, consideration should be given for the development of an agency/contractor forum to meet quarterly to review, discuss, and resolve contract specifications/procedures/actions as may develop during program development and contract administration. The forum would allow the sharing of latest specifications, project length associated with the scope of the contract, performance standards, and QC/QA evaluation program guidelines. It is important that the performance measurement system be applied in a similar manner to both in-house work and contracted work to enable legitimate comparisons. The use of a third party independent evaluation team trained in maintenance evaluations would provide a clear picture of the level of maintenance being performed. The agency should develop a plan to retain competent functional capability within an operational sector or region. This action, along with industry competition, should keep the contract costs competitive.

Address Impact on Morale (Culture Change)

Another of the four top challenges identified by the forum participants is how to address the potential negative impacts the use of PBMC could have on the morale of an agency's workforce. These negative impacts could result not only in internal disruption to an agency but also external political and other stakeholder resistance. This is particularly true in agencies that have workforces covered by unions.

This challenge involves culture change within the organization and needs to be considered systematically and addressed during the planning stages of the PBMC implementation process. It is critical to communicate with and directly involve workforce representatives and other pertinent stakeholders early in the PBMC implementation process. Nevada, North Carolina, and Virginia all were aggressive in communicating with their workforces and solicited input from them in developing the contents of the PBMC. The North Carolina DOT made presentations, employed newsletters and press releases to the statewide maintenance organization, and held meetings with the workforces in the two affected maintenance divisions. The DOT also let the workforce in these two affected divisions help define the scope of the PBMC. The Virginia DOT communicated PBMC to the workforce as a method to supplement the already decreased maintenance workforce in order to deliver the same or a higher level of performance. Virginia stressed that PBMC could be used for Interstate maintenance, enabling in-house forces to concentrate on the non-interstate system. Nevada DOT included maintenance forces in the decision making process to determine which activities would remain in-house and which would be included in the PBMC.

Following is a list of actions to address this challenge as identified by the breakout groups:

- Provide training at all levels of government.
- Involve employees in developing the PBMC approach.
- Develop programs to educate contractors on service culture and public expectations.
- Develop a communication plan which includes agency vision, transparency, and accountability.

- Develop an employee and equipment transition plan (internal and external opportunities).
- Proceed with dignity and respect for all individuals.

To most effectively and consistently achieve this employee and stakeholder communication and input at the state DOT level, it is recommended that a guide or manual be developed for conducting these stakeholder workshops and forums. It also is recommended that an experienced group of facilitators be available to assist with individual state efforts. The guide or manual should be more than just meeting protocols, and it should include calculated documentation and case histories on optimizing a maintenance program across department force, traditional contracting, and PBMC resources.

The stakeholder forums to promote PBMC will address culture change issues and allow all stakeholders to become part of the program development process. The stakeholders could include all affected DOT District management staff, employee representation, and state and local government transportation officials.

In the unlikely event that agency workforce employees would be displaced as part of the PBMC implementation effort, it is suggested that measures be taken to address department employee relocations/training/private sector opportunities. It also is suggested that provisions be made for an "open house" or workshop with the local department employees and the contractors allowing each contractor to meet individually to discuss employment opportunities in the private sector operations.

Develop Agency Guidelines and Documents

One of the top three identified challenges to a broader use of PBMC is the lack of generally accepted agency guidelines and documents (specifications, standards, contract language, etc.). Once an agency has determined to initiate the use of the PBMC tool, these documents are a necessary part of the delivery process. The literature review, surveys, and interviews done as part of this study all show that these documents and standards exist, albeit in various stages of refinement and accessibility. There is a need to synthesize these requisite documents, identify "best practices," and develop and maintain a medium to access them easily in their most current form.

One of the four strategies that resulted from the PBMC forum was this development of broadly accepted agency guidelines and documents. The specific actions that were listed as part of this strategy are as follows:

- Develop and publish "best practices" guide to PBMC.
- Develop and publish contract administration manual.
- Share both positive and negative lessons learned from case histories.
- Establish clear end-result performance measures and standards or targets.
- Establish and maintain an information database.

There are a number of things that should be included to ensure the identification of "best practices" and broad acceptance, including:

- Include input/participation of experienced champions/stakeholders.
- Include representatives from both owner agencies and contractors.
- Use a systematic and on-going process for development and maintenance of standards.
- Ensure that the process is sanctioned by pertinent associations representing both the owner agencies and the contractors (AASHTO, AMOTIA, etc.).

Several mechanisms have been used successfully to deploy processes or technologies that cut across multiple stakeholder groups, as does PBMC. For example, at the conclusion of the research phase of the Strategic Highway Research Program (SHRP), one of the primary products ready for implementation was SuperPave, a new design process for hot mix asphalt paving. The implementation of SuperPave cut across a number of stakeholder groups including state and local owner agencies, paving contractors, hot mix suppliers, and materials suppliers. To effect the broad implementation of this technology, regional user/producer groups were established and maintained. In fact, the Northeast SuperPave User/Producer Group, which consists of mid-Atlantic and northeastern states, still exists and meets.

Another mechanism is the "lead state team," as established by the AASHTO Technology Implementation Group (TIG). The lead state team includes state DOT representatives who have experience with and want to champion the deployment of proven innovations. These teams also consist of industry and academia representing the innovation upon which the group is focused. For instance, an active TIG lead state team that is accelerating the deployment of precast concrete paving systems (PCPS) has 25 members. These members include representatives of state DOTs, contractor associations, pre-cast and materials associations, design consultants, and academicians who lead this technology. This team has developed and posted on the AASHTO website five standards and guideline documents that have been sanctioned by AASHTO.

Either of these mechanisms seems to be a good fit to promulgate generally accepted best practices for the PBMC tool.

Determine Costs and Value of Performance Levels

As noted earlier, the survey results and the interviews of state and industry representatives revealed concerns over equity of cost comparisons between the private sector and public sector maintenance work. Some pointed to the difficulty in making true cost comparisons of all direct and indirect expenditures between the public and private sector organizations in the absence of a broadly accepted cost comparison model or protocol. They also noted that the scopes of work and levels of performance between in-house and contracted work rarely were the same, thus making relative cost comparisons questionable. There is not much information on the value to the owner or the motorist of various LOS for any particular measure. Therefore, it may be difficult to say that an improvement of 50 percent in LOS, which may cost as much as 50 percent more to achieve, is of good value.

The objective of the on-going NCHRP Project 14-18, "Determining Highway Maintenance Costs," is to develop a flexible process for determine an agency's total costs associated with performing any of its specific highway maintenance activities. Part of the impetus for this work

is the difficulty in comparing costs of contracting and public-private partnerships to costs of doing the maintenance activity work with in-house forces. It is anticipated the research being done with NCHRP 14-18 may assist agencies in addressing some of these cost comparison issues as they relate to PBMC.

It is not surprising that one of the top four challenges identified by the breakout groups was determining costs and value of performance levels. Following is a list of actions identified by the breakout groups to address this challenge:

- Develop costs relative to various levels of performance.
- Develop an accounting protocol that attributes costs for providing both asset maintenance and service.
- Compile industry performance standards.
- Implement an outreach program on the results of NCHRP Project 14-18.

One strategy to address these actions is to initiate a follow-up research project to NCHRP 14-18 that takes the results of that work on the agency side and develops a protocol for comparison to contracted or public-private partnership work. This work should consider and evaluate the third party accounting analyses done by some public agencies. The work also should attempt to develop through user surveys the value to the public of various performance levels for some of the more prominent performance metrics.

Another strategy would be the creation of a Joint Task Force, possibly under the auspices of the AASHTO Performance Measures Committee, to address some or all of these activities. This Task Force should be supported with administrative assistance by a consultant.

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CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

The use of PBMC is growing worldwide. In the United States and Canada, there are a number of examples of PBMC, although it is not the most common approach in most DOTs. While performance-based contracting continues to expand for facilities maintenance and asset- or activity-specific scopes, its use in the fence-to-fence highway corridor maintenance application is limited to a handful of states. The major leaders in the US in this latter application are the Virginia and Florida DOTs. Texas and the District of Columbia DOTs also have applied PBMC on large-scale applications.

The stress that economic downturn has placed on the budgets of all DOTs has resulted in reevaluation of entire programs, including existing performance-based contracts. In Virginia, negotiations are underway to adjust the scopes and costs of PBMCs. In Florida, contract extensions are not being exercised in any contracts, including PBMCs, with the hope of achieving lower costs by rebidding. Future PBMC contract language must consider and account for these real possibilities.

In all, 12 of 37 states that responded to a general survey have had some positive experience with PBMC, and an additional 15 are interested in trying this approach or learning more about it. Two states have tried this method or have considered it and have made a decision to not pursue it any further. The remaining respondents expressed no interest in PBMC.

The results of interviews with owner agencies in the US and Canada point to the primary motivating factors for pursuing PBMC as being:

- Augmenting in-house capacity where shortfalls exist.
- Responding to expressions of interest and support from legislative bodies, chief executives, and top management within the agency.
- Reduced costs and improvement in efficiency.
- Desire to raise LOS provided to customers.
- Shifting risk and liability from the state to the private sector.

The literature indicates the potential for cost savings of as much as 15 percent on domestic projects as a primary factor; however, the agencies interviewed were skeptical about the validity of comparisons and the magnitude of savings claimed, although some did agree that there were savings. Some pointed to the difficulty of making true cost comparison of all direct and indirect expenditures between public and private sector organizations in the absence of a universally acceptable cost comparison model. They also noted that the scopes of work and levels of performance between contract and in-house work were rarely the same, thus making comparisons questionable. Still another issue is the lack of objective data on the valuation of varying levels of performance to the users.

Performance-based contracts typically evolve within an agency over time. For instance, Ontario and Virginia are in their third generation of PBMC contracts and have made changes with every new generation. Briefly, the process typically begins with a policy level check of the political/institutional feasibility of considering the approach, an analysis of the legal and

financial issues, such as contractor prequalification and selection, bonding, and so on. Other essential steps include defining the road network or assets to be contracted out, ensuring the availability of or conducting an up-to date asset inventory and condition assessment, selecting and defining performance indicators and how they are going to be measured and monitored, analyzing the life cycle costs and benefits of various levels of service, determining the term of the contract and renewal options, establishing optimal performance targets and cost estimates, and defining how payments including incentives and disincentives will be linked to performance.

Survey and interview respondents who were interested in PBMC indicated that top management interest was the key to initiating PBMC. When asked what they would need to reduce their sense of risk in trying PBMC, states that were still in the process of considering the viability/applicability of PBMC indicated that evidence of improved performance from the experiences of other states and that cost would reduce or stay the same would influence their decisions. States that said they had already made the decision to pursue PBMC noted that they needed help with developing tools, such as specifications and contract language, and they welcomed "mentors" from other state agencies. A number of states indicated their concern with losing direct control over critical activities like emergency response and winter operations because of the significant consequences of system failure.

It is important to recognize that most of the information presented on performance-based maintenance and operations contracting also applies to agencies considering performance-based maintenance using in-house forces. Thirty-three of the 37 states that responded in our survey already have performance standards for in-house maintenance activities, and this information can be used for maintenance accountability and budgeting. Agencies that already are using and tracking performance-based management practices for in-house maintenance forces are best prepared to incorporate PBMC. In comparing costs and benefits of in-house versus outsourced performance-based maintenance, the best comparison is with in-house activities using a performance-based approach, including target service levels, performance metrics, inspection regimes, and incentives/disincentives where possible (recognizing that the form of rewards and penalties for public employees must be different from those that can be included in outsourced contracting). Such side-by-side comparisons of in-house versus outsourced approaches, when performed on a level playing field, encourage engagement by in-house staff and optimization of the mix of in-house and outsourced resources.

The underlying premise of PBMC follows existing trends in surface transportation funding, resource allocation, project development, and operations and maintenance—namely that performance outcomes, rooted in objectivity and rational, analytical processes, and assessed through quantifiable measures of success, help agencies to achieve desired results and be accountable to the traveling public and other stakeholders. The question is what has been learned from PBMC experiences to date and what improvements and refinements are needed to help advance the state of practice. It is with these thoughts in mind that the following recommended actions and considerations are offered:

- Development of awareness and training programs on PBMC concepts for both public and private sector personnel.
- Development of and access to model procurement documents that are updated on a regular basis.

- Engagement of key peer personnel from states with good experience to serve as mentors to other states.
- Development of a generally accepted, systematic methodology for comparing public sector versus private sector costs on an equitable basis.
- Continuous, coordinated efforts on improving performance measures, measurement protocols, performance standards, LOS, and valuation of tradeoffs when raising or lowering standards.
- Continuous improvement through identifying and deploying innovative strategies that have advanced the state of practice in performance-based maintenance applications, whether in-house or by contracting.
- Consideration and application of innovative deployment strategies that have been used for other transportation products/processes to performance-based maintenance.
- Application of performance-based principles and practices to in-house maintenance activities and encouragement of pilot programs with facilities such as rest areas, park and ride lots, and truck inspection stations.

All of these actions are encompassed by the four strategies that emerged from the executive forum and are listed below:

- Establish PBMC as a long-term, sustainable approach.
- Address the impact on employee morale.
- Develop agency guidelines and performance standards.
- Determine actual costs and valuation of performance levels.

These strategies were detailed in chapter 5, along with possible implementation mechanisms. The state of the practice of PBMC and the deployment thereof can be advanced by the implementation of these strategies. It is recommended that "champions" be identified for each of these along with the appropriate authorizing agency or agencies. Development of action plans and the necessary resources and support to carry them to completion are needed.

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APPENDIX A GENERAL SURVEY: PERFORMANCE-BASED CONTRACTING FOR MAINTENANCE & OPERATIONS

SURVEY:

Performance-Based Contract for Maintenance (PBCM)

NCHRP Topic 20-24 Task 61 Executive Summit on Performance-Based Maintenance and Operations Practices

State/Province Survey
Due by Friday, November 14, 2008

Introduction

The traditional way of contracting out maintenance activities is based on the amount or units of work being measured and paid for on agreed rates for specific items of different work Items. By contrast, Performance-Based Contract for Maintenance (hereafter referred to as PBCM) defines minimum conditions or targets of road, bridge and traffic assets that have to be met by the contractor. Call-out and response to emergencies are also included in some of these contracts, and the contractor is given the flexibility in work selection, design and delivery to achieve the targeted results. Payment with incentives/disincentives and warranties may also be linked to achievement of results.

The National Cooperative Highway Research Program (NCHRP) has engaged Applied Research Associates, Inc. (ARA) as a subcontractor to Parsons Brinkerhoff to develop and implement an Executive Summit on PBCM for the expressed purposes of educating on benchmark practices and assisting in developing a strategy or strategies for further advancing agency management practices in this area. This effort was initiated by the Subcommittee on Maintenance and includes:

• Conducting a critical review of transportation agencies' experience with contracting for maintenance and operations services.
• Determining how agencies have defined and measured performance targets and standards, and possibly linked payment to performance.

Among the main sources of state-of-the-practice information for this project are State DOTs and key maintenance contractors. The attached brief screening survey is designed to identify which DOTs and contractors have had experience with the PBCM approach, or at the least, have seriously investigated whether to become involved in that approach.

The draft AASHTO transportation glossary defines maintenance as "the preservation of the entire highway, including surface, shoulders, roadside, structures and such traffic-control devices as are necessary for its safe and efficient utilization." (For the purpose of this project, this includes routine and preventive maintenance activities/treatments that restore the function of the existing system and extend service life without increasing capacity or strength).

Please complete the survey on the following pages and submit it upon completion. It will be made available to the Principal Investigator: Gary Hoffman, ghoffman@ARA.com Phone: 717-691-7625 Cell: 717-448-7601 Fax: 717-691-8211

(Survey PDF format is not for submission but for review before you complete and submit online)

---

1 **1) Identify your organization.**

Select One

If you selected other, please specify:

1 **2) Name and title of respondent**

1 **3) Has your agency used Performance-Based Contracting for Maintenance (PBCM) and/or operations for highways?**

- Yes
- No

1 **4) Has your agency seriously considered Performance-Based Contracting for Maintenance (PBCM) and/or operations and elected not to pursue?**

- Yes
- No
- Not Applicable

1 **5) If you answered yes to the previous question (4.), what experience, studies, circumstances led to your decision? (choose all that apply)**

- ⌐ Cost/budget issues
- ⌐ Lack of bidders/contractors
- ⌐ Concerns over value of PBCM tool
- ⌐ Other (please specify)

If you selected other, please specify:

1 **6) Who is your principal contact for Performance-Based Contracting for Maintenance?**

Name (required)	
Email Address (required)	
Mailing address including street, city, state and zip code (optional)	
Telephone Number (optional)	
FAX (optional)	

1 **7) Has your agency issued PBCM for specific assets involving multiple activities, such as janitorial work, parking area maintenance, landscaping for any of the assets listed below? (choose all that apply)**

- ⌐ Rest Areas
- ⌐ Welcome Centers
- ⌐ Weigh Stations
- ⌐ Other (please specify)

If you selected other, please specify:

1 **8) Has your agency issued a PBCM for bridge assets? (choose all that apply)**

- ⌐ Bridge Cleaning/Washing
- ⌐ Debris Removal
- ⌐ Bridge Painting
- ⌐ Other (please specify)

If you selected other, please specify:

1 **9) Has your agency issued PBCM for multiple maintenance activities in a corridor or for all or a group of State Roads in a County?**

- Yes
- No

1 **10) Has your agency issued other types of PBCM that are performance-based? If yes, briefly describe other types in the space for comments.**

- Yes
- No

COMMENTS:

1 **11) Has your agency establish standards for agency maintenance forces?**

- Yes
- No

1 **12) If you answered "yes" to question 11, does your agency monitor and measure the performance of agency maintenance forces using these performance standards?**

- Yes
- No

1 **13) For the activities that are contracted out, has your agency established performance standards for the contractor?**

- ☐ Yes
- ☐ No
- ☐ Not Applicable

1 **14) If "yes" to question 13, does your agency monitor and measure the performance of contractor using these performance standards?**

- ☐ Yes
- ☐ No

1 **15) Relative to performance required of agency forces, the contractor performance measures and levels are generally at:**

- ☐ The same level
- ☐ A higher level
- ☐ A lower level
- ☐ Not Applicable

1 **16) Are there contract incentives (positive financial rewards, etc.) for exceeding performance targets or standards or response times?**

- ☐ Yes
- ☐ No
- ☐ Not Applicable

1 **17) Are there contract disincentives (reduced payment, liquidated damages, etc.) for not achieving targets or standards or for not meeting response time?**

- ☐ Yes
- ☐ No
- ☐ Not Applicable

1 **18) Does your agency have the capability to measure and compare the actual costs of maintenance activities done in-house and contracted out?**

- ☐ Yes
- ☐ No
- ☐ Not Applicable

1 **19) Is contract monitoring (inspection, sampling, testing, other quality measures) performed? (choose all that apply)**

- ⌐ Through In-house personnel?
- ⌐ Through Consultants contracted by your agency?
- ⌐ Through the contractor or his contracted consultant?
- ⌐ Not Applicable
- ⌐ Other (please specify)

If you selected other, please specify:

1 **20) What is your agency's current position regarding Performance-Based Contracting for a (choose the one that is most applicable for a specific activity and for multiple activities)?**

	It is a standard practice	Interested in trying or expanding its use	No interest in pursuing at the present time
Specific Maintenance Activity?	Specific Maintenance Activity? It is a standard practice	Specific Maintenance Activity? Interested in trying or expanding its use	Specific Maintenance Activity? No interest in pursuing at the present time
Region or Corridor Involving Multiple Activities?	Region or Corridor Involving Multiple Activities? It is a standard practice	Region or Corridor Involving Multiple Activities? Interested in trying or expanding its use	Region or Corridor Involving Multiple Activities? No interest in pursuing at the present time

1 **21) If you have any additional comments on Performance-Based Contracting for Maintenance in general, please provide them below.**

Thank you for your help and cooperation! Please submit this survey no later than November 14, 2008. For questions or more information about the contents of this survey you can contact Gary Hoffman at ghoffman@ARA.com or phone 717-691-7625; mobile: 717-448-7601; fax: 717-691-8211.

We appreciate your assistance in completing this PBCM survey. You can contact Marty Vitale if you have any difficulty with this form (mvitale@aashto.org; 202-624-5862).

Please enter your email address:

Submit PBCM Survey

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Online Survey Software powered by Vovici.

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APPENDIX B IN-DEPTH QUESTIONNAIRE ON PERFORMANCE-BASED CONTRACTING FOR MAINTENANCE & OPERATIONS

A. DECISION TO USE PERFORMANCE-BASED CONTRACTING FOR MAINTENANCE & OPERATIONS (PBMC)

1. What factors motivated your organization to pursue PBMC and how important were they?

Importance

Factors Motivating PCBM	**__Very__**	**Somewhat**	**Little/None**
Insufficient staff resources			
Improve efficiency			
Reduce costs			
Improve management control			
Top Management Interest			
External Political Interest			
Expenditure stability			
Shifting or sharing risk with contractor			
Other factors – List Below			

2. Did you have to obtain legislation to implement PBMC?

   - Yes
   - No

3. Briefly describe your agency's strategies in promoting/advancing the use of PBMC among:
   A. Maintenance Employees

_____

_____

_____

B. Your Contracting Community

_____
_____
_____

C. Elected Officials

_____
_____
_____

D. Other

_____
_____
_____

4. Did pursuit of PBMC in your agency result in employee reductions?
   - Yes
   - No

5. If yes to question 4, what was the percent reduction over what period of time?
_____
_____
_____

6. Do transportation employees in your State have union representation?
   - Yes
   - No

7. If yes, to question 6, were there any agreements necessary with the union?
_____
_____

8. If yes to question 7, what were the top (up to 3) challenges in developing such an agreement?
_____
_____
_____

CONTRACTING PROCEDURES & SCOPE

9. Briefly describe the contractor selection process. Include prequalification requirements, low bid versus best value, weights for technical, price and other components, etc.).
_____
_____
_____
_____
_____

10. Is PBMC contracting typically with:

    A. A contractor whose own labor force performs significant percentage of the maintenance and repair work?
    B. A ‘management” firm that serves as the prime contractor and performs all or most of the work through sub-contractors
    C. A firm that does both A and B depending on which provides the best value/results?
    D. Other

11. Does your agency require a minimum amount of work to be performed by the prime contractor, and if so, is it applicable to PBMC contracts?

    _____
    _____
    _____

12. Briefly describe selection procedures and experience with sub-contractors. Include prequalification requirements, selection (low bid versus other), willingness to bid for the PBMC prime contractor, etc.

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

13. What is the term of PBMC Contracts and provisions for contract extensions, if any for:

    A. Specific Assets (Rest Areas, Welcome Centers, etc)?

       _____

    B. Bridges (Cleaning, painting, debris removal)?

       _____

    C. Multiple maintenance activities in a corridor or for a group of state roads in a county?

       _____

    D. Other?

       _____

14. Do your PBMC contracts encourage innovation? If so, how?

    _____
    _____
    _____
    _____
    _____
    _____

15. Do your PBMC contracts address price fluctuation? If so, how?

_____
_____
_____

16. Do your PBMC contracts address changes in material quantities? If, so, how?

_____
_____
_____

17. Please briefly describe contract incentives/disincentives in your PBMC contracts.

_____
_____
_____

18. Do you require a formal partnering process? If so, please describe

_____
_____
_____

19. What are the agency as well as contractor training requirements in the implementation of PBMC?

_____
_____
_____

20. Do your surface improvement contracts include resurfacing/rehabilitation/reconstruction that go beyond restoring the function of the existing system and add strength or increase capacity?

- Yes
- No
- N/A

21. Briefly describe the scope of work for PBMC in your agency.

_____
_____
_____
_____
_____

22. Are snow and ice control, incident management and emergency response handled by PBMC forces? If so, how do you handle payment for these items?

_____
_____
_____
_____
_____

23. How is loss in asset condition as a result of “force majeure” events, such as, earthquakes, hurricanes, etc. handled in PBMC contracts?

24. Is the contractor required to collect baseline information as part of the project? If so, is this Inventory? Feature quality? Work quality? Or all of the above? How is this verified?

PERFORMING & MONITORING

25. Please provide details or reference material on performance specifications, performance measures, performance targets and measurement procedures for the activities contracted out. Indicate electronic addresses, where feasible.

26. Please provide information on QA/QC contract monitoring activities, such as. Inspection, sampling and testing. Indicate electronic addresses, where feasible.

27. Please provide information on cost comparisons of in-house and traditional contracted work versus PBMC work.

EXPERIENCE, GUIDANCE & SUMMIT

28. What do you see as the primary advantages of PBMC? (Please check)
    - Improved level of service
    - Potential reduction in costs
    - More innovation
    - Risk transfer to Contractor
    - Economies of scale
    - Building a new industry
    - Other (please specify)

29. What do you see as the primary disadvantages of PBMC? (Please check)

    - A reduction in competition
    - A longer procurement process
    - A more costly procurement process
    - Challenges in mobilizing
    - Challenges in transferring contract from one prime to another after contract expires
    - Other (please specify)

30. What were the lessons learned (both successes and failures) through your use of PBMC?

    _____
    _____
    _____
    _____
    _____
    _____

31. What pitfalls should those who use this tool for the first time avoid?

    _____
    _____
    _____
    _____
    _____
    _____

32. Would your agency be interested in participating in the Executive Summit on PBMC scheduled in spring 2009, to learn more about PBMC and help establish a framework to advance this practice?
    - Yes
    - No
33. Would your agency be interested in participating in presentations at this Summit?
    - Yes
    - No

34. Please provide copies of your procurement documents/contracts on PBMC or refer us to web addresses where they may be obtained.

_____

_____

_____

Thank you for your help and cooperation! For questions or more information about the contents of the survey, you can contact Gary Hoffman at ghoffman@ARA.com or phone 717-691-7625; mobile: 717-448-7601; fax: 717-691-8211.

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APPENDIX C VIRGINIA DOT PERFORMANCE CRITERIA FOR ASSETS
ATTACHMENT III – PERFORMANCE CRITERIA

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
ROADSIDE ASSET GROUP				
Mowing/ Vegetation Control	Healthy Growing Neat appearance Acceptable coverage Proper sight distance	90	• <10% of mowable area per 1/10th mile section to exceed 12" in height (unless otherwise noted). • All sight distances are clear. • Neat/trimmed around guardrail, headwalls, paved ditches, concrete barriers, curb and gutters, rock or median areas, signs, and other fixed objects. • <10% bare ground per 1/10th mile section. • No cut less than 4" in height. • No invasive species in mowable areas (Canadian Thistle, Kudzu Vine, Johnson Grass, Japanese Knotweed). • Litter pickup shall occur in advance of each mowing cycle. • Prevent the growth of unwanted weeds, grass, brush and trees. Timeliness Requirement: • Vegetation-affecting sight distance presenting a safety hazard shall be removed within 24 hours of notification or discovery. • All other vegetation deficient areas shall be corrected within 4 days of notification or discovery.	Acre
Brush & Trees	No hazardous trees Unobstructed sight distance Vertical clearance Structure inspection & repairs unobstructed Proper notification shall be provided to local owners before trimming trees	90	• No trees or brush affecting sight distance. • Vertical clearance of 20' over roadway (includes shoulders). • Vertical clearance of 7' over side walks. • No leaning or dead trees that present a hazard. • No brush or trees that affect the inspection or repair of bridges or other structures. • No brush or trees that affect utility company reading or inspection. • No trees within the clear zone or mowing areas. Timeliness Requirement: • Trees/brush affecting sight distance to regulatory signs and/or creating safety hazard shall be removed within 48 hours of notification. • All other tree issues shall be removed within 2 weeks of notification. • Safety issues shall be mitigated immediately.	Acre

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Debris & Road kill	Roadway free of debris & road kill No dump sites	100	• No dump sites on right-of-way. • Debris and Road kill promptly removed from the right-of-way and properly disposed. • Owner of household pets to be notified if identification is available. Timeliness Requirement: • If road kill is in roadway, Contractor shall respond immediately upon notification or discovery, 60 minute response time during normal work hours and 120 minute response time outside normal work hours. If not in roadway, Contractor shall respond within 24 hours.	Each
Litter	Right-of-way neat & attractive	90	• < 20 items per 1/10th mile section. Timeliness Requirement: • Contractor shall respond to locations of excessive litter with 24 hours of notification or discovery.	Acre
Landscaping, Wildflowers Beds, Bulb Beds, Ornamental Shrub Beds	Neat Attractive Growing	90	• <10% of bed contains weeds. • Beds will be mulched. • <10% of bed not growing. • Neat appearance and pruned. Timeliness Requirement: • Contractor shall insure compliance within 14 days of notification or discovery.	Acre
Illegal signs/ structures	Right-of-way free of illegal signs or structures	100	• No illegal signs on the right-of-way. • No illegal structures on the right-of-way. Timeliness Requirement: • Contractor shall remove illegal signs/structures within 3 days of notification or discovery. • Safety issues shall be mitigated immediately.	Each
Concrete Barriers	Safe Structurally sound	90	• Free of vegetation. • <10% joint material damaged or missing. • Weep Holes > 90% free of obstruction. Timeliness Requirement: • Damaged or misaligned barriers due to accidents/ incidents shall be mitigated immediately upon notification or discovery or before accident scene is cleared. • Repairs to barriers shall be completed within 10 days of notification or discovery. • Safety issues shall be mitigated immediately.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Sound Walls & Barriers	Structurally sound Functional	90	• Free of damaging vegetation. • <10% damage to surface materials. Timeliness Requirement: • Damaged or misaligned barriers or walls due to accidents/incidents shall be mitigated immediately upon notification or discovery or before accident scene is cleared. • A plan for repairs to barriers or walls shall be completed within 10 days of notification or discovery. • Safety issues shall be mitigated immediately.	LFT
Slopes	Stable No erosion	90	• <8” deep erosion. • No pattern of erosion that endangers the stability of the slope. • <105 feet greater than 2" lower than paved shoulder within .1 mile sample unit. • <105 feet greater than 2" higher than paved shoulder within .1 mile sample unit. Timeliness Requirement: • Any safety hazard that results from a sink hole, slide, high slope or low slope areas shall be mitigated immediately. • Repairs to sink holes and slides shall be completed within in 7 days of notification or discovery. • High and or low slope areas shall be repaired within 30 days.	LFT
Fence	Functional Structurally sound	90	• <10% fence in need of repair. • No damage that allows access. • Free of damaging vegetation. Timeliness Requirement: • Any damaged or fallen fencing that allows access shall be mitigated immediately and replaced/repaired within 7 days after notification or discovery. • Safety issues shall be mitigated immediately.	LFT
Crossovers/Police Parking Locations	Safe Functional	95	• Properly signed if open • Properly signed / blocked if restricted access • Free of potholes / pavement failures • Properly maintained driving surface (as constructed) Timeliness Requirement: • Damage crossovers/police parking locations shall be repaired within 30 days of notification or discovery. • Safety issues shall be mitigated immediately.	Each
Retaining Walls	Structurally sound Safe Clean Stable	90	• Free of damaging vegetation. • Weep holes open. • No damaged or missing parts. • Metal components free of rust. • Joints and joint material intact. Timeliness Requirement: • Damage to retaining walls shall be repaired within 30 days of notification or discovery. • Safety issues shall be mitigated immediately.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Pipes & Box Culverts (< 36 sq. ft.)	Structurally Sound Open & Drains Joints intact Functional Free of damage	90	• <10% diameter closed. • No separated joints. • No missing joint material. • <1' deep erosion at ends. • Free of damaging vegetation • End walls & end section intact and free of damage (includes load carrying grates). Timeliness Requirement: • Culverts or structures beyond 50% diameter closed shall be cleaned and opened within 7 days. • Culverts/structures structurally near collapse as determined by the VDOT Structure & Bridge Engineer shall be mitigated immediately. • Safety issues shall be mitigated immediately.	Each
Pipes & Box Culverts (>36 sq.ft.)	Structurally Sound Open & Drains Joints intact Functional Free of damage	90	• <10% diameter closed. • No separated joints • No missing joints material. • <1' deep erosion at ends. • Free of damaging vegetation. • End walls & end sections intact and free of damage (includes load carrying grates). Timeliness Requirement: • Culverts or structures beyond 25% diameter closed shall have a planned action for permanent resolution submitted for approval within 14 days of discovery with completion of repairs 30 days from notification or discovery. • Culverts/structures structurally near collapse as determined by the VDOT Structure & Bridge Engineer shall be mitigated immediately. • Safety issues shall be mitigated immediately.	Each
Ditches, Paved	Structurally sound Joints intact Open & Drains	90	• <2 inches settlement & joints intact. • No undermining or undercutting. • No obstructions impeding the flow of water. • <25% spalling of surface area. • <10% surface area cracking > ¼" wide. • No damaged or missing sections (includes energy dissipaters). Timeliness Requirement: • Open complete blockages and abate significant erosion immediately upon discovery or notification. • Clean debris or remove vegetation impeding flow to clear flow lines within 30 days from notification or discovery. • Damage to paved ditch should be repaired within 90 days of notification or discovery, unless flow is impaired. Refer to the above for timeframes. • Safety issues shall be mitigated immediately.	LFT

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Ditches, Unpaved	Open & Drains Minimal Erosion	90	• No water ponding. • No erosion > 6" deep. • No obstruction impeding the flow of water. Timeliness Requirement: • Open complete blockages and abate significant erosion immediately upon discovery or notification. • Clean debris or remove vegetation to clear flow lines within 30 days from notification or discovery. • Safety issues shall be mitigated immediately.	LFT
Under drains &	Structurally	90	• <10% damage or deterioration to outlet pipe.	Each
Edge drains	Sound Functional		• <10% blockage of pipe or end protection. • No damaged or missing end protection (includes rodent screen). Timeliness Requirement: • Conduct repairs within 90 days from notification or discovery. • Safety issues shall be mitigated immediately.	
Storm Drains & Drop Inlets	Structurally sound Functional	90	• No damage or missing parts (includes steps, grate, cover & throat). • No obstructions (<10% of opening) (includes top, throat & drop inlet). Timeliness Requirement: • Storm Drains and Drop Inlets beyond 25% closed shall be cleaned within 14 days. • Storm Drains and drop Inlets beyond 50% diameter closed shall be cleaned and opened within 7 days. • Safety issues shall be mitigated immediately.	Each
Curb & Gutter, Curbing Raised, Concrete Median	In line Draining Structurally sound	90	• No obstruction which impedes the flow of water. • <25% of surface area spalling. • No damaged or missing section. • No separation > ½" from asphalt surface. • Joints and joint material intact. Timeliness Requirement: • Open complete blockages and abate significant erosion immediately upon discovery or notification. • Clean debris or remove vegetation impeding flow to clear flow lines within 30 days from notification or discovery. • Damages should be repaired within 90 days of notification or discovery unless flow is impaired (refer to the above for timeframes). • Safety issues shall be mitigated immediately.	LFT

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Storm Water Management Ponds	Safe Structurally sound Functional	90	• No damage to stem pipes, weirs, grates, drainage tubing or debris racks. • Free of debris (stem pipes, weirs, grates, drainage tubing & debris racks). • No vegetation that affects the function (mowed, sprayed). • No fence missing or damaged (if present at start of contract). • Conduct inspections at least once every six months. Timeliness Requirement: • Inspection once every six months and after every significant storm event (documentation shall be maintained according to applicable state regulations). • All deficiencies reported or discovered shall be corrected within 45 days. • Safety issues shall be mitigated immediately.	Each
TRAFFIC ASSET GROUP (Verify with Operations)				
Signs (static) – Post Mounted	Meets Reflectivity Standards Clean & Clear Free of Damage	95	• Meets current reflectivity standards (Type VIII sheeting or better), as updated (replacements). • Reflective at 120’ day or night. • Surface clean & legible. • <10% Damage to surface of sign (scratches, dents, bullet holes, etc.). • No down or missing signs. • Mile markers are 60” in height to achieve uniform appearance. Timeliness Requirement: • Damaged Regulatory/Warning signs shall be mitigated immediately upon notification or discovery. • Damaged Regulatory/Warning signs shall be repaired or replaced within 2 days of notification or discovery. • Damaged lane use informational signs shall be repaired or replaced within 10 days of notification or discovery. • All other signs repaired or replaced within 30 days of notification or discovery.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Cable Locating: Electric, Fiber, Communications	Maintain Cable Facilities	100	• No errors per cable markings • < 2 linear ft. tolerance from actual cable plant. • Must maintain any and all cable infrastructure as as-built drawings. • Excavators are not to begin until all underground utilities have been marked including those that might be maintained by Miss Utility. • Contractor will mark all VDOT cables, contractor responsible for Miss Utility for work done under the contract Timeliness Requirement: • All cable marking requests must be logged and accomplished within 72 hrs of request. • All emergency cable marking requests must be accomplished within 4hrs. Emergency situations are defined as "a sudden or unexpected occurrence involving a clear and immediate danger, demanding immediate action to prevent or mitigate loss of, or damage to life, health, property or essential public services." • Damaged facilities due to mis-marked cables must be repaired or replaced within 8 hrs.	
Junction Boxes	Maintain Junction Boxes	100	• All junction or pull boxes shall be free from damage or missing parts. • Boxes, frames, and covers shall be watertight except for approved weep holes. • Must maintain any and all junction boxes infrastructure as as-built drawings. • Covers shall be fitted with gaskets and secured with approved securing screws. Timeliness Requirement: • All cable junction boxes and or pull boxes must be repaired within 7 days discovery or notification.	
Signs (static) Overhead and Bridge Mounted	Structurally Sound Meets Reflectivity standards Free of Damage	90	• Meets current reflectivity standards (Type VIII sheeting or better), as updated (replacements). • Reflective at 120' day or night. • Surface clean & legible. • <10% Damage to surface of sign (scratches, dents, bullet holes, etc). • No damage or missing parts. • Structure & support areas kept free of dirt & debris. • VDOT Structure Report shall be used for other maintenance needs. Timeliness Requirement: • Damaged sign structures shall be mitigated immediately upon notification or discovery. • Damaged sign structures shall be repaired within 60 days of notification or discovery. • Damaged Regulatory/Warning signs shall be mitigated immediately upon notification or discovery and shall be repaired or replaced within 2 days of notification or discovery. • Damaged lane use informational signs shall be repaired or replaced within 10 days or notification or discovery. • All other signs shall be repaired or replaced within 30 days of notification or discovery.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Pavement Markings	Present Reflective	90	• <10% damaged or missing due to incidents, or patching operations. • <10% covered by debris. • All markings to be VDOT approved durable, high quality materials per specifications. Timeliness Requirement: • Damage to pavement markings shall be corrected within 5 business days.	LFT
Pavement Markers (Raised & Recessed)	Present Reflective	90	• <30% missing or damaged within a tenth mile section. • Meets reflectivity standards. • Missing pavement marker lenses shall be repaired or replaced. Timeliness Requirement: • Pavement markers that present a hazard shall be removed immediately upon notification, discovery or inspection. • Inspections will be conducted every 30 days and within 48 hrs after use of snow plows. • Units will be repaired or replaced within 10 days.	Each
Pavement Messages	Present Reflective	90	• <10% damaged. • <10% covered by debris. • Meets reflectivity standards. • All markings to be VDOT approved, and must be durable and high quality materials.	Each
Lighting - Roadway	Operational Structurally sound	90	• Conventional Lighting (single bulb structure): Functional at all times. • High Mast Lighting: >75% of bulbs per structure functional at all times. • No damaged or missing parts. • VDOT Structure Report shall be used for other maintenance needs. • Daytime burning lamps and circuits shall be repaired within 24 hrs. of notification or discovery. Timeliness Requirement: • Damaged or non-functional lamps and structures shall be repaired or replaced within 7 days of notification or discovery. • Daytime burning lamps and circuits shall be repaired within 24 hrs. of notification or discovery.	Each
Lighting – Sign	Operational Structurally sound	90	• No damaged or missing parts. • VDOT Structure Report shall be used. • Daytime burning lamps and circuits shall be repaired immediately upon discovery or notification. • 90% of lamps shall be functioning properly at all times, per structure, during functional conditions. Timeliness Requirement: • Damaged or non-functional lamps and structures shall be repaired or replaced within 7 days of notification or discovery. • Daytime burning lamps and circuits shall be repaired within 8 hrs. of notification or discovery.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Lighting -Under Deck or Tunnel	Operational Safe	90	• No damaged or missing parts. • VDOT Structure Report shall be used. • 90% of lamps shall be working properly at all times, per structure, during functional conditions. Timeliness Requirement: • Damaged or non-functional lamps shall be repaired or replaced within 7 days of notification or discovery. • Damaged or non-functional structures shall be repaired or replaced within 7 days of notification or discovery. • Daytime burning lamps and circuits shall be repaired within 8 hrs. of notification or discovery.	Each
Impact Attenuators	Functional Undamaged	100	• No damaged or missing parts. • Properly maintained. Timeliness Requirement: • Damaged attenuators shall be mitigated and area protected immediately upon notification or discovery. • Damaged attenuators shall be repaired within 7 days of notification or discovery. • Attenuators to be cleaned Quarterly	Each
Guardrail	Functional Undamaged	100	• No damage or rust that affects the structural integrity, no missing damaged post. • No loose or missing parts. • No cables loose or improperly secured. • Meets NCHRP 350 standards. • If W-Beam Guardrail(GR-2. GR-8) runs more than 60% damaged the contractor shall upgrade the entire run to current standards. All fixed objects attachments when damaged shall be repaired with current standards. Timeliness Requirement: • Non-functional guardrail shall be mitigated immediately upon notification or discovery. • Non-functional guardrail shall be repaired or replaced permanently within 3 days of notification or discovery. • Damaged but functional guardrail shall be repaired or replaced within 7 days of notification or discovery.	LFT
Object Markers & Delineators	Present Reflective Functional	90	• <10% missing or damaged parts. • Post mounted delineator height shall be 4 ft (+/-) 6 inches to achieve uniform appearance) mileage markers are at least 60” high to achieve uniform appearance. • Meets reflectivity standards. Timeliness Requirement: • Damaged object markers & delineators shall be repaired or replaced within 7 days of notification or discovery.	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Glare Foils	Present Functional	90	• <10% missing or damaged. • Properly mounted. • Uniform in appearance. Timeliness Requirement: • Damaged glare foils shall be repaired or replaced within 14 days of notification or discovery.	Each
ROADWAY & SHOULDER ASSET GROUP				
Asphalt Surface	Safe Durable Smooth	95	• No potholes / pavement failures. • Patches <¼" higher or lower than surrounding pavement. • No pavement failures that present a safety hazard. <u>Timeliness Requirement</u> : • Temporary repairs to pavement failures 6" x 6" x 1 ½" or equivalent deep or larger shall be repaired immediately upon notification or discovery. All others within 2 days of notification or discovery. • Permanent repairs to pavement failures shall be completed within 30 days of notification or discovery during seasons when asphalt plants are operating or within 30 days of asphalt plants opening for the season. • Pavement obstructions that present a safety hazard shall be mitigated immediately.	Sq. Ft
Paved Shoulders and Rumble Strips (Asphalt)	Safe Smooth Functional	90	• No potholes / pavement failures. • <105 linear feet edge drop-off high or low >1 ½". • <105 linear feet separation >½" wide. • No false ditch or build up on shoulder that causes water to stand on shoulder or drain onto the travel lanes. • <10% of rumble strips needs to be sealed. <u>Timeliness Requirement</u>: • Temporary repairs to potholes >6" X 6" X 1½" or equivalent deep shall be completed within 2 days of notification or discovery. • Permanent repairs to potholes shall be completed within 30 days of notification or discovery during seasons when asphalt plants are operating or within 30 days of asphalt plants opening for the season with a product listed on the VDOT approved patching material list.	Sq. Ft.

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Unpaved Shoulders	Safe Smooth	90	• No potholes / pavement failures. • <105 linear feet edge drop off high or low >1 ½". • No false ditch or build up on shoulder that causes water to stand on shoulder or drain onto the travel lanes. • No erosion >2" deep. Timeliness Requirement: • All potholes shall be repaired within 7 days of notification or discovery with a product listed on the VDOT approved patching material list. • Erosion or drop offs >2" deep shall be repaired within 7 days of notification or discovery.	Sq. Ft
Concrete Surface	Safe Durable Smooth	95	• No potholes. • <10% of surface area has cracks >¼" wide. • <25% surface area has spalling >1" deep. • <25% of joint material missing, no silt, debris, or grass growing in joint. • Patches <¼" higher or lower than surrounding pavement. • No pavement failures that present a safety hazard. Timeliness Requirement: • Temporary repairs to potholes 6" x 6" x 1 ½" or equivalent deep or larger shall be repaired immediately upon notification. All others within 2 days. • Permanent repairs to potholes/ pavement failures shall be completed within 30 days of notification. • Pavement failures that present a safety hazard shall be mitigated immediately.	Sq. Ft
BRIDGE ASSET GROUP				
Superstructure (Includes Parapet Walls)	Structurally Sound Free of Debris	90	• Perform all routine/ordinary maintenance including sweeping, washing, clearing of all obstructions at a minimum annually. • No spalling >1" deep. • All structural steel and bearing assemblies will be clean and free of debris. • No damaged or missing parts. • Bridge components are free of damaging vegetation. • VDOT Structure Report shall be reference for other routine maintenance and minor repair needs. Timeliness Requirement: • Clean at a minimum of once every 12 months	Sq. Ft

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Deck	Safe Structurally Sound Free of Dirt/ Debris	90	• Perform all routine/ordinary maintenance including sweeping, washing and cleaning. • No potholes. • <10% surface area spalling <1" deep. • Temporary patches < ¼" higher or lower than surrounding concrete deck surface. • No damaged or missing bridge railings. Railings are intact and connections are tight. • Drains/scuppers open and functional. • The deck is free of foreign material (grass, stones, limbs, trash, etc.). • Joints are clean, intact, and joint material is present and functioning as designed and not leaking. • Drainage system (drains, scuppers, trough, etc) is clean and functioning as designed. • VDOT Structure Report shall be reference for other routine maintenance and minor repair needs. Timeliness Requirement: • Temporary repairs to pavement failures 6" x 6" x 1 ½" or equivalent deep or larger shall be repaired immediately upon notification or discovery. All others within 2 days of notification or discovery. • Permanent repairs to potholes shall be completed within 30 days of notification or discovery and flush with surrounding surface. • Damaged/ missing bridge railing shall be mitigated immediately upon notification or discovery. • Damaged/ missing railing shall be repaired or replaced within 30 days.	Sq. Ft
Weep Holes	Functional	90	• >90% of diameter opens. Timeliness Requirement: • Repair within 30 days of notification or discovery.	Each
Substructure	Structurally Sound Free of debris	90	• Seats & Pier Caps clean and free of debris. • VDOT Structure Report shall be reference for other routine maintenance and minor repair needs. Timeliness Requirement: • Clean every 24 months.	Sq. Ft
Slope Protection	Structurally Sound Minimal Erosion	90	• No trend or pattern of erosion > 2" deep. • No settlement >2". • No damaging vegetation. Timeliness Requirement: Repair within 30 days of notification or discovery.	Sq. Ft

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
SERVICES GROUP				
Customer Response	Timely Efficient Effective Productive	100	• All customer concerns/ requests shall be resolved to the Department's satisfaction. Timeliness Requirement: • Contact the NOVA Call Center and the Program & Contract Management Team within 12 hrs. following the initial customer inquiry. • Work resulting from request shall be scheduled within 2 days of the initial contact. • Follow-up contact with the NOVA Call Center within 3 days of the completion of work.	Each
Roadway Sweeping	Neat, Clean appearance Free of Debris	90	• No debris (sand, gravel, dirt) at barrier walls, retaining walls, sidewalks, or curb and gutter. • Contractor to provide schedule of planned sweeping operations. Timeliness Requirements: Sweeping shall be performed at a minimum of every 4 months and spot cleaning shall be performed as necessary.	Each
Bay Saver Separation System	Neat, Clean & less than 40% full		Timeliness Requirements: • Quarterly Inspection • Annual Cleaning or as needed by inspection	Each
Graffiti Removal	None present	90	• Contractor is to remove all graffiti. Timeliness Requirements: • Graffiti to be removed within 48 hours from notification or discovery. • Pictures of graffiti are to be taken for each site and shared with law enforcement as requested.	Each
Barrier Gates	Clean & Fully Operational		Timeliness Requirements: • Weekly Operation Check & Inspection • Quarterly Cleaning or as needed	Each

Table C-1. Virginia DOT Performance Criteria

ASSET	OUTCOME	TARGET (%)	TOLERANCE & CRITERIA	UOM
Incident/ Emergency Response	Timely Efficient Safe Effective	100	• The contractor shall provide equipment and labor resources necessary to support Safety Service Patrol and Emergency Services Responders, for Incident Management Operations for 24 hours a day & 7 days a week. The contractor shall provide equipment/ personnel as necessary to support EMS and other response operations 24 hours, 7 days a week. • The contractor after arriving on site shall report to the Incident Command, provide and support appropriate resources to handle any and all traffic control needs to insure the safety of the incident scene and traveling public. • The Contractor shall provide timely notification of arrival and departures covering all incidents to the Transportation Operations Center. • Contractor will coordinate activities in accordance with the terms outlined in the VDOT, VDEQ, VDEM interim agreement for emergency response (executed by VDOT May 12, 2005) and any subsequent agreements that substantially reflect the terms outlined in the interim agreement <u>Timeliness Requirement:</u> • On site response during normal business hours of 05:00 to 19:00 hours (considered normal business hours) shall be no greater than 60 minutes, once notification or discovery of the incident. • On site response during the hours of 19:00 to 05:00 hours (after normal business hours) shall be no greater than 120 minutes once notification or discovery of the incident. • Temporary lane closures shall be installed immediately or as directed by Incident Command. • Traffic detours and diversions, if needed, shall be installed within 120 minutes after being directed by Incident Command. Permanent lane closures if needed shall be installed within 120 minutes after being directed by Incident Command.	Each

APPENDIX D MAINTENANCE PERFORMANCE STANDARDS COMPARISON TABLE (SAN ANTONIO SPREADSHEET)

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
1. Shoulders and Ditches						
a. Unpaved Shoulders	< 10% (linear measure) >1" per segment none > 2"		No dropoffs greater than 2” within 4’ of the edge of pavement No shoulders higher than 1” within 4’ of the edge of pavement No shoulders that cause water to drain back within the travelway	Less than 10% edge drop off greater than 1.5” (linear measure) Less than 10% separation greater than 0.5” (linear measure) Less than 10% of shoulder causes water to drain back into the pavement	Unpaved Shoulder: No deviation exists across the shoulder width greater than 5” above or below the design template. No shoulder build-up exceeds 2” across the design template for a continuous 25 feet. No shoulder drop-off exceeds 3” deep within 1 foot of the pavement edge for a continuous 25 feet. No washboard areas exist having a total differential greater than 5” from the low spot to the high spot.	Difference in height at edge of pavement shall not be more than X

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
1. Shoulders and Ditches						
b. Lateral Ditches (Paved and/or unpaved)	Ditch bottom elevation does not vary by more than 25% of original grade. No undermining (paved elements). No erosion showing a pattern that will endanger slope stability. No obstruction to flow of water. Grass no higher than 12" and slopes clear of foreign vegetation.	Ditch or channel erosion and siltation located within ROW or drainage easements that adversely effect the drainage shall be graded to the original likes and grades. Adequate sodding, seding, fertilizer, erosion control blankets, silt fences, rock berns, etc. shall be provided to allow the area to revegetate.	No more than 50% blocked. No erosion greater than 1' below original ditch line. No joint separation, misalignment, or undermining in paved ditches.	Less than 2" undermining or undercut. No obstruction to flow. Joints intact. Grade drains. Minimal erosion. Outfalls functional. End protection intact.	Front Slope: No ruts or washouts exist greater than 6 inches in depth in front slopes. Roadside/ median ditch: The ditch bottom elevation shall not vary from the ditch design elevation more than 25% of the difference between the edge of pavement elevation and the ditch design elevation. Outfall ditch: The ditch bottom elevation shall not vary from the ditch design elevation more than 33% of the difference between the natural ground and the ditch design flow line.	Must be clean and lined without any significant damage of the lining. Must be free from obstacles. Must be firmly contained by surrounding soil or material.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
2. Drainage						
a. Crossline Pipes (< 54")		All culverts, pipes, channels, inlets, storm drain systems, ditches, traffic barrier slots, etc. and their appurtenances shall be kept clear and functioning and free of debris, trees and brush. Any ponding on the roadway should be investigated immediately to insure drainage in functioning as designed. Any obstructions shown to cause ponding shall be removed immediately. Cross road and side drainage structures shall be maintained with a max. of 1/5 of the cross sectional area silted. They shall be maintained as originally constructed or subsequently modified condition. Any repair work performed to the structures shall be approved by the	Greater than 50% diameter open and/or meets environmental permitting requirements. No evidence of flooding. Minimal erosion at ends. End protection intact. No obstructions to water flow. No damage due to cracking, joint failures, or corrosion. No water infiltration causing pavement failures, shoulder failures, or roadway settlement.	Greater than 90% diameter open and/or meets environmental permitting requirements. No evidence of flooding. Minimal erosion at ends. End protection intact. No obstructions to water flow.	Side/Cross Drain: 60% of the cross sectional area of each pipe is not obstructed and functions as intended.	Must be clean and free from obstacles and without structural damage Must be firmly contained by surrounding soil or material.

Table D-1. Maintenance Performance Standards Comparison Table.

		engineer.				
Component Element	**Washington DC**	**Texas**	**North Carolina**	**Virginia**	**Florida**	**World Bank**
2. Drainage						
b. Pipes and Culverts (>/=54")			Perform all routine maintenance. Opening ≥ 90% open. Free of debris and vegetation. Any erosion and scour at inlet and outlet ends has been stabilized. End walls/wing-walls are clear of vegetation and debris. Concrete elements have no spalls ≥2 inches deep. Weep holes are clean and free of foreign material and properly functioning. There are no construction joints opened greater than	Perform all routine/ordinary maintenance. Opening ≥ 90% open. Free of debris and vegetation. Any erosion and scour at inlet and outlet ends has been stabilized. End walls/wing-walls are clear of vegetation and debris. Concrete elements have no spalls ≥2 inches deep. Weep holes are clean and free of foreign material and properly functioning. There are no construction joints opened greater than ¼ inch.		

Table D-1. Maintenance Performance Standards Comparison Table.

			¼ inch.			

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
2. Drainage						
c. Drop Inlets/Catch Basins/ Shoulder Drains/Funnel Drains/etc.	90% open, free flowing. ½" of settlement (if part on sidewalk) 1" (otherwise), grate unbroken.	All culverts, pipes, channels, inlets, storm drain systems, ditches, traffic barrier slots, etc. and their appurtenances shall be kept clear and functioning and free of debris, trees and brush. Any ponding on the roadway should be investigated immediately to insure drainage in functioning as designed. Any obstructions shown to cause ponding shall be removed immediately. Cross road and side drainage structures shall be maintained with a maximum of 1/5 of the cross sectional area silted. They shall be maintained as originally constructed or subsequently modified condition. Any repair work performed to the	Grates and Outlets not blocked greater than 50% Minimal erosion. Outfalls functional. Grates are present and not broken No erosion/settlement around boxes. Outlets are not damaged and are functioning properly. End protection intact with no erosion.	Grade drains. Minimal erosion. Outfalls functional. End protection intact. Greater than 90% open. Functional.		

Table D-1. Maintenance Performance Standards Comparison Table.

		structures shall be approved by the engineer.				
2. Drainage						
d. Curb & Gutter/ Valley Gutter/ Median Barrier	< 1" settlement or misalignment in 10 feet. no unsealed cracks and joints > 1/4" (excluding granite curbs). no spalling > ½" deep in 25% of surface per curb section between joints.		No obstruction greater than 2” for a length of 2’. Runoff does not spread into travelway for a distance of half the lane width. No cracking, settlement, joint separation, misalignment, or deterioration.	Clear. Free from debris. Intact.	Inlets: 85% of the opening is free of obstruction. Miscellaneous Drainage Structures: 90% of each structure functions as intended. Roadway Sweeping: Material accumulation is not greater than ¾” deep for more than one continuous foot in the traveled way or shall not exceed 2 ¼” in depth for more than one continuous foot in a gutter.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
3. Roadside Appurtances						
a. Guardrail/ Cable Rail	95% of guardrail/barrier free of structural defects per 100' section. All guardrail posts, offset blocks, panels and connection hardware in good condition and in place. Cables taut and properly secured (according to standard).	Damaged guardrail that will no longer function as designed shall be repaired or replaced within 1 week, remove debris and install warning signs immediately. Damaged, but functional, guardrail shall be replaced or repaired within 1 month. If, in the opinion of the engineer, they are required for access control, the contractor shall install new post and cable fence.	Contractor to respond to all failures, which include site mitigation and repairs. No dents that decrease structural integrity. Badly damaged guardrail must be repaired/replaced within two (2) days following notification or discovery. Damaged but functional guardrail must be repaired/ replaced within seven (7) days following notification or discovery. Mitigate immediately upon notification or discovery.	Contractor to respond to all failures, which include site mitigation and repairs. No dents that decrease structural integrity. Badly damaged guardrail must be repaired/replaced within two (2) days following notification or discovery. Damaged but functional guardrail must be repaired/replaced within seven (7) days following notification or discovery. Mitigate immediately upon notification or discovery.	Each single run of guardrail will single run function as intended. Any guardrail function as intended. Hits will be mitigated immediately to ensure 90% of guardrail/barrier will be free motorist safety. Permanent repairs will be made of structural defects and set at the proper height for each single section. Guardrail posts, offset blocks, panels and connection hardware will be in good condition and in place. Cables will be taut and properly secured in accordance with standards.	Present, clean and without any significant damage or corrosion.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
3. Roadside Appurtances						
b. Sound Wall	Graffiti removed from DCDPW assets within 5 workdays of the noted deficiency.		Free of Damaging/ Unsightly Vegetation. No Graffiti. Repaired if Damaged.			
c. Concrete Median Barrier	95% of barrier free from structural defects per 100 ft section.		Clean. Free of vegetation. Straightened. Repaired and or replaced, if damaged.	Clean. Free of vegetation. Straightened. Repaired and or replaced, if damaged.		
d. Impact Attenuators	No damage to any piece of attenuator unit. All damaged impact attenuators repaired or replaced within 2 workdays of the noted deficiency.	Damaged attenuators that will no longer function as designed shall be repaired or replaced within 1 week, remove debris and install warning signs immediately. Inspect every 6 months and clean or adjust as necessary. Damaged but functional attenuators shall be replaced or repaired in 1 month.	No missing parts, properly maintained and undamaged. Contractor to respond to all failures. Badly damaged impact attenuators must be repaired and/or replaced within 30 days following notification or discovery. Damaged but functional impact attenuators must be repaired or replaced within 7 days following	No missing parts, properly maintained and undamaged. Contractor to respond to all failures. Badly damaged impact attenuators must be repaired and/or replaced within 30 days following notification or discovery. Damaged but functional impact attenuators must be repaired in 7 days of	Each attenuator device functions as intended.	

Table D-1. Maintenance Performance Standards Comparison Table.

			notification or discovery.	notification/discovery.		

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
3. Roadside Appurtances						
e. Fence	Openings repaired within 7 workdays of noted deficiency fence height = original height.			Where existing, Intact & functional as designed. No damage that allows access. No present or leaning vegetation on the fence. No less than 10% of any intact functional section.	No unrestrained entry is allowed within the right-of-way.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
4. Roadsides						
a. Mowing/Turf Condition	Urban streets Grass height 4" or less. No bare patches greater than 36 square inches, except for pathways. Free of weeds. Freeways Grass height 6" or less. No bare patches greater than 36 square inches. Free of weeds.	In Urban areas, grass height shall be kept between 5 and 18". Mowing shall begin before vegetation reaches 18". In Rural areas, grass height shall be kept between 5 and 30". Mowing shall begin before vegetation reaches 30". Spot mowing at intersections, ramps, etc shall be performed as needed for visibility. Grass shall not be allowed to encroach into paved shoulders, main lines, sidewalks, etc. Chemical or mechanical edging is permitted. Contractor shall utilize a herbicide program approved by the engineer to control noxious weeds. A full width mowing cycle shall be completed after the first frost or as directed by the engineer.	Average grass height is ≤ to 15". Grass and vegetation are mowed in order to maintain roadside aesthetics and safety. Vegetation must be controlled around signs, delineators, and guardrail. Unpaved shoulders, slopes, and ditch lines free of bare, dead, diseased, distressed, or weedy areas. NCDOT approved species (Fescue, Bermuda, crown vetch, lespedeza etc.) Vegetation height should not exceed the bottom of the guardrail/cable rail. Vegetation around signposts should be uniform with the roadside grass height.	Height not to exceed 12". Mow height not to be less than 2-6". Neatly trimmed around fixed objects. VDOT approved species. Less than 10% bare ground.	Roadside mowing: Not > 1% of the vegetation, excluding seed stalks, exceeds the acceptable range of 5"-12" high on rural arterials and no vegetation higher than 9" on urban arterials. Slope mowing: Not more than 2% of the vegetation exceeds the acceptable range of 5-24" high. Turf condition: Turf in the mowing area is 75% free of undesirable vegetation. Curb/ Sidewalk Edge: No encroachment of vegetation or debris for more than 6 in onto the curb or sidewalk for more than 10 continuous f feet or no deviation of soil more than 4 inches above or 2 inches below the top of the curb or sidewalk for more than ten continuous feet. Maintain mowing and slope mowing MRPs of	

Table D-1. Maintenance Performance Standards Comparison Table.

					70%.	
Component Element	**Washington DC**	**Texas**	**North Carolina**	**Virginia**	**Florida**	**World Bank**
4. Roadsides						
a. Mowing/ Turf Condition		Wildflowers shall be preserved utilizing the guidelines in the mowing specifications and vegetation management manuals.				
b. Brush & Trees	No sight distance or sign obstructions. Vertical clearance of 15' over roadway, 7' over sidewalks. Tree plantings. All trees requiring replacement replaced by the following planting season. Tree trimming. All untrimmed trees trimmed by the following planting season. Tree Removal. All dead trees removed within 30 days of notification or	Trees, brush and ornamentals on the right of way, except in established non-mow areas, shall be trimmed in accordance with the Department standards to allow mowers access. Trees, brush and ornamentals shall be trimmed to ensure they do not interfere with vehicles or sight distance, or inhibit the visibility of signs. Dead trees, brush, ornamentals and branches shall be removed within 6 months unless considered to be a hazard. Potentially dangerous trees or limbs shall be removed as soon as possible. All undesirable trees and vegetation shall be removed as determined by the	No sight distance or sign obstruction. Vertical clearance of 15’ over roadway and shoulder within 10’ of back of ditch or shoulder point. No dead trees or leaning trees that present a hazard. A clear distance of 5’ behind guardrail.	No sight distance or sign obstruction. Vertical clearance of 20’ over roadway and shoulder and 7’ over sidewalks. No dead trees or leaning trees that present a hazard. No weed/ invasive trees.	No encroachment of trees, tree limbs or vegetation in or over travel way lower than 14.5 feet, or lower than 10 feet over sidewalks. No dead or dying vegetation next to or over a travel way or clear zone. Clear zone shall be free of trees 4” or greater in diameter.	

Table D-1. Maintenance Performance Standards Comparison Table.

	discovery.	engineer.				
Component Element	**Washington DC**	**Texas**	**North Carolina**	**Virginia**	**Florida**	**World Bank**
4. Roadsides						
b. Brush & Trees	Hazardous or dangerous trees removed within 1 workday. Fallen trees or limbs blocking roadways or sidewalks removed within 4 hours of notification between 7a.m. And 7p.m., within 6 hours at other times. In the event of a storm that knocks down multiple trees, Contractor must be mobilized within 2 hours.					
c. Debris & Road kill	Road kill removed from shoulders and disposed within 1 workday of the noted deficiency.	Dead animals that can be handled by one person shall be removed immediately upon discovery. Large animals shall be immediately removed from the paved surfaces. Large animals shall be disposed of at an approved	Respond immediately upon notification or discovery. Road kill and Debris promptly and properly disposed.	Respond immediately upon notification or discovery. Road kill and Debris promptly and properly		

Table D-1. Maintenance Performance Standards Comparison Table.

		site within 24 hr of discovery or notification.		disposed.		

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
4. Roadsides						
d. Slope		Slope failures shall be repaired by a method approved be the engineer. Slopes shall approximately conform to the original cross-section and shall be re-vegetated. Adequate sodding, seeding, fertilizer, erosion control blankets, silt fences, rock berms, etc. shall be provided to allow for repaired areas to re-vegetate.	No washouts or ruts greater than 2" deep and 1' wide. No erosion showing a pattern that will endanger the stability of the slope creating an unsafe recovery area.	Less than 2" erosion. No erosion showing a pattern that will endanger the stability of the slope creating an unsafe recovery area.		Slopes have no deformations or erosion. Cuts must be stable and slope stabilization measures must be in place.
e. Litter	less than 10 pieces of fist-sized litter per tenth of a roadside (or median) mile.	Right of way shall be kept in a neat condition No more than 20 pieces of litter per roadside mile shall be visible traveling at highway speeds. Tires or tire treads shall be removed from paved surfaces daily upon discovery. All litter collected shall become the property of the contractor and shall be disposed of at an approved solid waste site. Bagged litter shall be picked up and disposed of on the dame day of collection. Contractor shall immediately remove	Roadside appears neat and clean. Less than 100 pieces of fist size or larger litter/debris within 0.2mi. Areas of excessive litter will fall under performance criteria of debris and road kill.	Roadside appears neat and clean. No more than 10 items per 0.1 mile and no more than 6cf per acre of total litter accumulation. Areas of excessive litter will fall under performance criteria of debris and road kill.	No more than 3 cubic feet per acre excluding travel way pavements. No litter exists that creates a hazard to motorists or pedestrians. Maintain a 80% MRP.	

Table D-1. Maintenance Performance Standards Comparison Table.

		potentially dangerous debris. Lost and found items are to be forwarded to the engineer.				

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
4. Roadsides						
f. Landscape Beds		All landscaped areas shall be maintained to the originally constructed condition. Landscaped areas will be as designated in the plans. Items include but are not limited to mowing, litter pickup, irrigation system maintenance and operation, plant maintenance, pruning, insects, diseases, fertilization, mulching, bed maintenance, etc. Height of grass and weeds shall be kept between 2 and 8 inches. Mowing shall begin before the vegetation reaches 8 inches. Contractor shall replace any damaged or dead vegetation.	Overall appearance is neat and well maintained. Ornamentals and shrubs pruned for optimum aesthetics and plant health. Plant beds regularly mulched and weed free. Contractor will utilize and be evaluated on the roadside environmental landscape plant bed inspection report.	Overall appearance is neat and well maintained. Ornamentals and shrubs pruned for optimum aesthetics and plant health. Plant beds regularly mulched and weed free. Wildflowers planted and managed.	Landscaping: Vegetation is maintained in a healthy, attractive condition.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
a. Long line Pavement Markings	Striping and/or raised pavement markings are visible at a distance of 125'. No gaps in striping or raised pavement markings greater than 120'.	Pavement striping shall be inspected every 6 months and all markings not meeting the minimum retro-reflectivity as shown below shall be re-striped within 1 month after inspection. <u>Minimum requirements</u> White: 150 milli candelas per square meter per lux. Yellow: 100 milli candelas per square meter per lux. Contractor shall provide portable retroreflectometer devices. <u>New stripes</u>: White: 250 milli candelas per square meter per lux. Yellow: 175 milli candelas per square meter per lux. Markings that have peeled or flaked away shall be restriped within 1 month after inspection/ Restriping of broken lines shall be in approved like materials. Continuous stripe shall be restriped not less than 100 ft in	No edgelines, centerlines, or skip lines worn, missing, or obliterated. Must be present, visible, and reflective at night. Replaced when damaged/lost during pavement repair or winter weather events.	Replaced when damaged/lost during pavement repair or winter weather events.	Striping: 90% of the length and width of each line are reflective and functions as intended both day and night.	Markings must be present, visible and firmly attached to the pavement. Micro spheres must be firm and visible.

Table D-1. Maintenance Performance Standards Comparison Table.

		any one direction.				
Component Element	**Washington DC**	**Texas**	**North Carolina**	**Virginia**	**Florida**	**World Bank**
5. Traffic						
b. Words and Symbols		Night inspection shall be performed on pavement symbols every 6 months and all non-reflective markings should be corrected within 1 month after inspection.	Must be present, visible, and reflective at night. Replaced when damaged/lost during pavement repair or winter weather events.		Pavement Symbols: 70% of pavement symbols function as intended both day and night.	Markings must be present, visible and firmly attached to the pavement. Micro spheres must be firm and visible.
c. Pavement Markers	Striping and/or raised pavement markings are visible at a distance of 125'. No gaps in striping or raised pavement markings greater than 120'.	Lane and center line markers shall be removed and replaced every 12 months on main lines and 24 months on frontage roads. Pavement markers shall be inspected every 6 months after initial installation and all broken, missing and non-reflective markers should be replaced within 1 month. Gore markings and wrong way arrows on pavement shall be removed and replaced every 12 months.	Markers must be present and reflective at night. Replaced when damaged/lost during pavement repair or winter weather events. All lenses replaced or installed if missing or non-functional.	Replaced when damaged/lost during pavement repair or winter weather events. All lenses replaced or installed if missing or non-functional	Raised Pavement Markers: 70% of the raised pavement markers (RPMs) to required markers function as intended provide the visual information needed by and no more than 100 feet of continuous the driver to steer a vehicle safely in a centerline or lane line is without an RPM. variety of situations.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
d. Signs	Signs are clear and visible at a distance of 225'. 100% clear of obstruction, surface damage, and graffiti. Replace missing regulatory signs within 1 workday of the noted deficiency. Replace other signs within 7 workdays of the noted deficiency.	(Includes overhead signs). New signs added shall be installed by the contractor as directed by the engineer. Department will furnish posts, signs and hardware. Perform night sign inspections on 6 month intervals and replace non-reflective signs within 30 days. Maintain all sign posts vertical with all break-away sing mounts clear of silt or other debris that could impede break-away features. Posts shall not be rusted. Signs shall be replace when more that 5% of the face is damaged or vandalized Replace deficient warning or regulatory signs as soon as possible upon discovery. Damaged stop, yield, do not enter, one way and wrong way signs shall be replaced within 2 hours of discovery. Large signs knocked down shall be removed to the right of way immediately or off the right of way and shall be repaired or replaced within 2 months. Sign faces shall be properly	Signs must be visible and legible at night. Contractor to respond to all failures. Badly damaged regulatory and safety signs must be repaired/ replaced within one (1) day following notification or discovery. All others and damaged but functional signs must be repaired/replaced within five (5) days following notification or discovery. Replace broken/damaged posts.	Contractor to respond to all failures. Badly damaged regulatory and safety signs must be repaired/ replaced within one (1) day following notification or discovery. All others and damaged but functional signs must be repaired/replaced within five (5) days following notification or discovery. Replace broken/damaged posts.	Signs <30 sf: 95% of signs less than or equal to 30 sf function as intended for both day and night usage. Signs >30 sf: 85% of signs greater than 30 sf function as intended for both day and night usage.	Signs must be present, complete, clean, legible and structurally sound. Signs must be visible at night.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
		washed prior to reinstallation. Signs warning of ice on road shall be opened in the fall and closed in the spring on a schedule directed by the engineer.				
d. Signs		Install temporary ground mounted sings within 7 days of removal of an overhead sign structure. Install temporary ground mounted signs immediately upon discovery for a damaged exit sign. Repair or remove overhead sign structures that present a safety hazard immediately. Replace overhead sign structures that must be replaced within 120 days.				
e. Overhead Signs (Includes Sign Lighting)	Structurally sound; Properly assembled and hung. No loose sign panels. Repair overhead sign structures that	SEE SIGNS (above)	Contractor to respond to all failures due to incidents, accidents, etc., and includes site mitigation/other repairs. Badly damaged overhead signs must be mitigated immediately. Repaired/replaced	Contractor to respond to all failures due to incidents, accidents, etc., and includes site mitigation/other repairs. Badly damaged overhead signs must be mitigated		Signs must be present, complete, clean, legible and structurally sound. Signs must be visible at night.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
	present a safety hazard immediately upon the noted deficiency.		within seven (7) days following notification or discovery. Damaged but functional overhead signs must be repaired/replaced within sixty (60) days following notification or discovery.	immediately. Repaired/replaced within seven (7) days following notification or discovery. Clean and lubricate anchor bolts and nuts.		
e. Overhead Signs (Includes Sign Lighting)	Respond and make safe overhead sign structures within 4 hours between 7 a.m. And 7 p.m. And within 6 hours at other times.		Clean and flush debris from and around the base support areas. Clean and lubricate anchor bolts and nuts.	Damaged but functional overhead signs must be repaired/replaced within sixty (60) days following notification or discovery. Clean and flush debris from and around the base support areas.		
f. Roadway and Interchange Lighting	98% functioning along each highway segment.	Night inspection shall be performed monthly of luminaries and sign lighting and all deficiencies shall be repaired within 1 week after inspection. 100% of all access panels present and	Lighting must be operational at night. Contractor to replace defective lighting upon notification or		Lighting: 90% of the total luminaires of the combined sign and highway	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
	Light bulbs or ballasts repaired within 48 hours of noted deficiency. No 2 consecutive luminaries out Sign lighting illuminates signs.	secured. Non-functional lights will be repaired within a week of discovery or notification. Luminaire poles knocked down shall be removed immediately and repaired or replaced within 3 weeks. Broken or damaged transformer bases shall be replaced within 3 weeks of discovery.	discovery.		lighting are functioning as intended.	
f. Roadway and Interchange Lighting	100% of access panels present and secured; Non-functional lights repaired within 2 workdays of noted deficiency. Pole knock-downs “made safe” within 4 hours of noted deficiency					

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
5. Traffic						
	between 7a.m. And 7p.m. And 6 hours at other times. DCdot is responsible for service to the pole base.					
g. Object Markers & Delineators		No more than 5 object markers or delineators shall be defective per mile. They will be considered defective if they are not reflective, are not vertical or are missing. Use like delineators when replacing unless approved by the engineer.	Properly mounted. Correctly positioned. No sight distance or sign obstructions. Contractor to replace posts delineators, or object markers upon notification or discovery.	Properly mounted. Correctly positioned. No sight distance or sign obstructions. Less than 10% damaged	Object markers and delineators: 80% of delineators and object markers function as intended for both day and night usage.	Present, complete, clean, legible and structurally sound. Surface painted or otherwise covered.
h. Glare Foils			No sight distance or sign obstructions. Contractor to replace damage or defective foils upon notification or discovery.	No sight distance or sign obstructions. Less than 10% damaged.		

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
6.Pavements						
a. Paved Shoulder			Pavement failures are repaired with patches in kind (asphalt with asphalt, concrete with concrete). Failures >1 sq ft x 1.5" are repaired within 1 week of notification or discovery. Rumble strips are retained or replaced when damaged. Longitudinal joint separation is <0.5" or is sealed. No unsealed cracks in asphalt shoulders larger than 0.5" Cross section allows drainage from mainline (no shoulder buildup).	Respond to all incidental pavement failures (potholes, blowouts, etc) that are cause for safety concern, to include permanent patch repairs or site mitigation. Pavement failures >1 sq ft x 1" deep will be addressed immediately, all others within 2 days of notification or discovery. Responsible for preventative work. Seal Rumble strips. Less than 10% separation greater than 0.5" (width) (Linear measure). No unsealed cracks in asphalt shoulders larger than 0.5".	Flexible Pothole: No defect is greater than 0.5 SF in area and no more than 1.5" deep. No pervious base is exposed in any hole. Flexible Edge Raveling: 90% of the total roadway edge is free of raveling. No continuous section of edge raveling 4 inches or wider exceeds 25 feet in length. Flexible Paved Shoulder/ Turnout: Rate flexible paved shoulder for pothole, edge raveling and depressions/ bumps. Rate flexible turnout for	Must always be sealed to avoid water penetration, without deformations and erosion and free from potholes and erosions.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
				No false ditch (shoulder build up causes water to drain back into the pavement)	pothole only.	
6.Pavements						
b. Asphalt Pavement Repair	Asphalt paved Interstate. IRI < 181. Exclusive of: Non-DDOT manholes, Utility Trenches, Rail Road crossings, Bridges, Pavement sections included in TIP program or planned for repaving or reconstruction. Average of all Roads. Maintained at average level equal to that at start of contract. Exclusive of: Non-DDOT manholes, Utility Trenches, Rail Road crossings, Bridges, Brick Paver crosswalks, Pavement	No unsealed cracks greater than or equal to 1/16in wide. Patching even and < ¼ in high or low. Potholes shall be temporarily repaired immediately. Based failures shall be temporarily repaired immediately/ Permanent failures shall be performed within 1 month. Bleeding pavement shall be treated in a manner satisfactory to the engineer. No edge drop offs > 2 in deep.	Pavement potholes or failures greater than 1 sq ft x 1.5" deep are patched within 2 days of notification or discovery. Permanent patches are placed as soon as weather conditions permit. Patching is done in a manner that maintains or improves the ride quality. Rut depths > 0.75" are reduced to <0.25". No unsealed cracks larger than 0.5".	Contractor shall respond to all incidental pavement failures (potholes, blowouts, etc) that are cause for safety concern, to include permanent patch repairs or site mitigation. Pavement potholes or failures greater than 1 sq ft x 1.5" deep are patched within 2 days of notification or discovery. Squared up within 10 days. Permanent patches are placed as soon as weather conditions permit. Contractor	Flexible Shoving: Shoved area does not exceed a cumulative area of 25 SF. Flexible Depression/Bump: No deviation exceeds more than 0.5" for any area greater than 1 SF within the initial 10 feet increment or plus 0.375" for each additional 10 feet increment. No single measurement shall exceed 2". On shoulders, no deviation exceeds 1" for any area greater than 1 SF within the initial	Potholes shall be no more that a maximum dimension and no more than some number per section length. Patching shall be square, level with surrounding pavement, consistent, etc. There shall be no cracks more than 3mm wide. For any 50m section no cracked area can be more than 10% of the pavement surface. Road surface shall always be clean

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	sections included in TIP program or planned for repaving or reconstruction. Skid number > 40			responsible for preventative work. No open cracks larger than 0.5". (width).	10 foot increment or plus 0.375" for each additional 10 foot increment. No shoulder single measurement shall exceed 3". .	and free of soil, debris, etc. No ruts deeper than X . No raveled areas. No loose pavement edges or pieces of pavement breaking off at the edges.
6.Pavements						
b. Asphalt Pavement Repair	Potholes/blowups that are a safety hazard (greater than 12" x 12" x 4" deep) removed within 4 hours of the noted deficiency. 95% of all reported potholes/blowups permanently repaired within 2 workdays of the noted deficiency. No potholes encompassing an area > 64 sq. in. No average rut depth > 2.0" (based on a 100 foot average).				95% of the roadway surface is free of stripping or delaminating. 85% of the length of transverse and longitudinal joint material appears to function as intended. 90% of the roadway area is free of unsealed 1/8 inch cracking.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	Rutting > 2.0" must be temporarily repaired within 1 month of the noted deficiency, or permanently repaired within 4 months of the noted deficiency. Potholes/blowups that are a safety hazard removed within 24 hours of the noted deficiency. 95% of all cracks > 0.25" must be sealed.					
6.Pavements						
b. Asphalt Pavement Repair	95% of all reported potholes/blowups permanently repaired within 2 workdays of the noted deficiency. No potholes encompassing an area > 144 sq. in.					
c. Concrete Pavement Repair	Maintained at average level equal to that at start of contract. Exclusive of: Non-DDOT manholes,	Spalls and potholes shall be temporarily repaired. Permanent repairs shall be made within 2	CRC punchouts: CRC punchouts are repaired within 2 days of notification or discovery.	Contractor shall respond to all incidental pavement failures (potholes, blowouts, etc) that	No spall or pop-out defect > than 72-sq. in. area and 1.5” deep. 90 % of the slabs	Potholes shall be no more that a maximum dimension and no more than some

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	Utility Trenches, Rail Road crossings, Bridges, Brick Paver crosswalks, Pavement sections included in TIP program or planned for repaving or reconstruction. Skid number > 40. Potholes/blowups that are a safety hazard (greater than 12" x 12" x 4" deep) removed within 4 hours of the noted deficiency. No average rut depth > 2.0" (based on a 100 foot average).	months. Pavement failures, punch outs, joint failures, etc. shall be temporarily repaired immediately. Permanent repairs shall be performed within 2 months. Concrete shall be screeded to the elevation of the adjacent concrete pavement and checked with a straightedge to ensure the riding surface will be satisfactory.	Permanent patches with concrete and restoration of reinforcing steel as soon as weather conditions permit. Patching is done in a manner that maintains or improves the ride quality.	are cause for safety concern, to include permanent patch repairs or site mitigation. Pavement potholes or failures greater than 1 sq ft x 1.5" deep are patched within 2 days of notification or discovery. Squared up within 20 days	do not show signs of pumping. 85% of the length of transverse and longitudinal joint material appears to function as intended. 90% of the roadway area is free of unsealed 1/8 inch cracking.	number per section length. Road surface shall always be clean and free of soil, debris, etc. No ruts deeper than X. No raveled areas. No loose pavement edges or pieces of pavement breaking off at the edges. There shall be no cracks more than 3mm wide.
6.Pavements						
c. Concrete Pavement Repair	No potholes encompassing an area > 64 sq. in. 95% of all reported potholes/blowups permanently repaired within 2 workdays of the noted deficiency. Rutting > 2.0" must be	No unsealed joints > ¼ in wide No edge dropoffs > 2 in deep.	Jointed PCC: Slabs broken into 4 or more pieces will be repaired within 1 week of notification or discovery. Corner breaks and spalls are patched with asphalt			Patching shall be square, level with surrounding pavement, consistent, etc. For any 50m section no cracked area can be more than 10% of the

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	temporarily repaired within 1 month of the noted deficiency, or permanently repaired within 4 months of the noted deficiency. 85% of all cracks > 0.25" must be sealed. Potholes/blowups that are a safety hazard removed within 24 hours of the noted deficiency. 95% of all reported potholes/blowups permanently repaired within 2 workdays of the noted deficiency. No potholes encompassing an area > 144 sq. in.		surface course or concrete. Cracks in slabs broken into 2 or 3 pieces are sealed.			pavement surface.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
7. Bridges						
a. Bridge Deck	Less Than 5% Of Deck Surface Spalled, Cracked Or Damaged Per 100 Sq. Ft. 85% Of All Cracks >¼" Must Be Sealed. All Joints Seals In Alignment And Undamaged And Without Signs Of Leakage. <u>Metal Railings</u> All connections are sound and tight. No missing, damaged, or severely deteriorated sections protective coating provides an acceptable aesthetic appearance.	Repairs for bridge damage, whether caused by collision, natural disaster or normal deterioration shall be approved by the engineer in writing before work is begun, except for shoring and other temporary measures. When damage to a highway bridge structure or overpass is discovered, then safety of the traveling public shall be of immediate concern. If there is any question of ability of the structure to function in a safe manner, detours shall be established immediately. Structurally critical conditions must be addressed immediately.	Perform all routine/ordinary maintenance including sweeping, washing and cleaning. The deck is free of foreign material (grass, stones, limbs, trash, etc.) Riding surface has no spalls ≥ 2 inches deep. Joints are clean and joint material is present and functioning as designed. Drainage system (drains, scuppers, trough, etc) is clean and functioning as designed. Railings are intact and connections are tight. Routes receiving de-	Perform all routine/ordinary maintenance including sweeping, washing and cleaning. The deck is free of foreign material (grass, stones, limbs, trash, etc.) Riding surface has no spalls ≥ 2 inches deep. Joints are clean and joint material is present and functioning as designed. Drainage system (drains, scuppers, trough, etc) is clean and functioning as designed. Railings are intact and connections are tight.	Less than 5% of deck surface spalled, delaminated, or damaged per 200 sq. ft. 95% of structural and non-structural concrete deck cracks will be repaired in accordance with Florida DOT Standard Specification 400-21. 95% of broken welds and /or deteriorated main bars and cross bars on steel open grid decking will be repaired. Bridge spans with open grid decking will be cleaned with air or water pressure cleaning methods to prevent excessive accumulations of sand, dirt, and debris from building up. Bridge decks, approach slabs, and drainage scuppers will be cleaned	Guardrails must be present and not deformed. Metal parts of overall structure shall be painted or otherwise protected and free of corrosion. Drainage systems in good condition and fully functional. Expansion joints clean and in good condition.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
		When damage requires lane closures, work shall progress immediately to reopen the closed lanes.	icing salts, each deck shall be washed after the last snow fall has melted.	Routes receiving de-icing salts, each deck shall be washed after the last snow fall has melted.	of dirt, debris, and vegetation that impede the flow of rainwater from draining off the bridge decks.	
7. Bridges						
a. Bridge Deck	<u>Concrete Railings</u> No missing, damaged or severely deteriorated sections. No cracks > 0.25". No spalling > 0.5" deep. No exposed reinforcing. Damaged railings and barriers replaced within 2 workdays of noted deficiency.	Spalls or damaged areas shall be repaired immediately or as approved by the engineer. Drains must be functional and clean. Joints shall be clean. Joints shall be checked with a straightedge to ensure the riding surface shall be satisfactory. Loose armor joints shall be repaired immediately or as approved by the engineer. Repair or replace damaged bridge rail, approach guardrail, end treatments or			Joints are free of dirt, sand, and incompressible, in alignment, undamaged and without signs of significant leakage that may cause detrimental effects to the bridge substructure or cause undermining or erosion that will endanger slope or approach roadway stability. <u>Metal</u> Minimal active corrosion. Bolted connections are sound and tight. Welds intact and in good visible condition. No missing, damaged, or severely deteriorated sections.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
		attenuators within 2 days; install warning signs and temporary railing as appropriate immediately within discovery or as approved by the engineer. All bridge rails shall be free from rust.			Protective coating intact, functioning, and providing an acceptable aesthetic appearance. Bridge railing reflectors are the correct color, in place, and functioning where applicable based on the Standard Specification.	
7. Bridges						
a. Bridge Deck	<u>Drainage Systems</u> Clean, and functional. < 10% deteriorated barrel. End protection intact. No dip in road over pipe. Free flowing. Joints intact. Minimal erosion at ends.				<u>Concrete</u> No missing, damaged, or severely deteriorated sections. Visible cracks sealed in accordance with Florida DOT Standard Specification 400-21. No exposed reinforcing steel or surface evidence of corrosion. Bridge railing reflectors are the correct color, in place, and functioning where applicable based on the Standard Specification.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
b. Bridge Superstructure	Cracks shall be mitigated. Paint in good shape; no spot painting greater than 1000 sf per structure. No spalling; no loose stone façade. Steel fasteners in place, tight, with none missing.	Repairs for bridge damage, whether caused by collision, natural disaster or normal deterioration shall be approved by the engineer in writing before work is begun, except for shoring and other temporary measures. Structurally critical conditions must be addressed immediately.	Perform all routine/ordinary maintenance including sweeping, washing, clearing of all obstructions. No damage by vehicular impact is evident. Bridge components are free of damaging vegetation. Bearing assemblies are clean and lubricated.	Perform all routine/ordinary maintenance including sweeping, washing, clearing of all obstructions. No damage by vehicular impact is evident. Bridge components are free of damaging vegetation.	Minimal active corrosion to superstructure members. Bolted connections tight and sound. Welded connections intact and in good visible condition. Protective coating intact, functioning, and providing an acceptable aesthetic appearance. No spalls or delaminations to concrete superstructure members.	All metal parts of overall structure shall be painted and otherwise protected and free of corrosion. Beams and other structural parts must be in good condition and fully functional.
7. Bridges						
b. Bridge Superstructure		When damage to a highway bridge structure or overpass is discovered, then safety of the traveling public shall be of immediate concern. If there is any question of ability of the structure to function in a safe manner, detours shall be established immediately.	The bearing assemblies and the end 5 feet of longitudinal superstructure elements are free of foreign material (grass, stones, limbs, trash, sand dirt, etc.) Bearing assemblies and the end 5 feet of longitudinal superstructure	Bearing assemblies are clean and lubricated. The bearing assemblies and the end 5 feet of longitudinal superstructure elements are free of foreign material (grass, stones, limbs, trash, sand dirt, etc.)	Visible cracks sealed in accordance with Florida DOT Standard Specification 400-21. Beam ends and diaphragms under spans with steel open grid decking will be cleaned using air or water pressure cleaning methods to prevent excessive accumulations of sand, dirt, and debris from	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
		When damage requires lane closures, work shall progress immediately to reopen the closed lanes. Steel beams shall be striaght with minimal cosmetic damage or rust as approved by the engineer Steel fasteners shall be tight in place with none missing Concrete beams shall have minimal unrepaired damage, spalls or cracks	elements shall be washed after the last snow fall has melted.	Bearing assemblies and the end 5 feet of longitudinal superstructure elements shall be washed after the last snow fall has melted.	building up.	
7. Bridges						
c. Bridge Substructure	No spalls, cracks > 1/8 inch scaling. Abutment seats clean and sound. Pier seats clean and sound. Bearings clean and	Repairs for bridge damage, whether caused by collision, natural disaster or normal deterioration shall be approved by the engineer in writing before work is begun, except for shoring and	Perform all routine/ordinary maintenance including sweeping, washing, clearing of all obstructions. No damage (≥2" deep spalls) caused	Perform all routine/ordinary maintenance including sweeping, washing, clearing of all obstructions. No damage (≥2" deep spalls) caused	No spalls with exposed reinforcing steel. Abutment and intermediate caps cleaned of accumulations of sand, dirt, debris and vegetation. Bearings clean and	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	sound. All navigation and underside lighting functional and operating properly.	other temporary measures. When damage to a highway bridge structure or overpass is discovered, then safety of the traveling public shall be of immediate concern. If there is any question of ability of the structure to function in a safe manner, detours shall be established immediately. Structurally critical conditions must be addressed immediately. When damage requires lane closures, work shall progress immediately to reopen the closed lanes.	by vehicular impact is evident. Bridge components are free of damaging vegetation. Horizontal surfaces to including bridge seats and bearing areas are free of foreign material (grass, stones, limbs, trash, sand, dirt, etc.) Horizontal surfaces including bridge seats and bearing areas shall be washed after the last snow fall has melted. Weep holes are clean and free of foreign material and properly functioning.	by vehicular impact is evident. Bridge components are free of damaging vegetation. Horizontal surfaces to including bridge seats and bearing areas are free of foreign material (grass, stones, limbs, trash, sand, dirt, etc.) Horizontal surfaces including bridge seats and bearing areas shall be washed after the last snow fall has melted.	functioning as intended. Protective coating intact, functioning, and providing an acceptable aesthetic appearance. Visible cracks sealed in accordance with Florida DOT Standard Specification 400-21.	
7. Bridges						
c. Bridge Substructure		Columns, pilings and caps shall have minimal unrepaired damage, spalls, cracks or scaling.		Weep holes are clean and free of foreign material and properly		

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
		Bearing assemblies should be clean and functional. Abutment and bent caps should be clean with minimal debris.		functioning.		
d. Retaining Walls	No evidence of blocked drainage. No indication of settlement or rotation. Notify project team in case of significant settlement.	Retaining walls shall be maintained vertical, with drain holes clear. Reinforced earth walls shall be monitored for movement or for loss of backfill, and repaired as approved by the engineer.	Perform all routine/ordinary maintenance. Concrete elements have no ≥2 inches deep. Weep holes are clean and free of foreign material and properly functioning. Free of vegetation.	Perform all routine/ordinary maintenance. Concrete elements have no ≥2 inches deep. Weep holes are clean and free of foreign material and properly functioning. Free of vegetation.	Retaining walls free of graffiti	Contractor must control presence and adequate condition of retaining walls and their drainage
e. Channel and Slope Protection		Undermining or Riprap failures should be repaired within 2 months of discovery. Riprap or concrete slope protection shall have all joints free from vegetation.	Maintain bridge slope protection as designed. Drainage systems are clean and functioning as designed.	Maintain bridge slope protection as designed. Drainage systems are clean and functioning as designed.	Fender piling, cable wraps and fastening hardware in good overall condition. Timber walers and plank in good overall condition. Vertical clearance signs intact and legible.	Contractor must ensure free flow of water under bridge and up to 100m upstream. Contractor must maintain design clearance under bridge.

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
7. Bridges						
e. Channel and Slope Protection		Care should be taken to avoid damaging slopes and embankments Adequate sodding, seeding, fertilizer, erosion control blankets, silt fences, rock berms, etc. shall be provided to allow for repaired areas to revegetate. Debris that interferes with stream flow shall be removed within 1 month after storm events. Vegetation, including trees and brush, that interefere with stream flow shall be removed from channels; however vegetation protecting or stabilizing the channel banks may be allowed to remain if approved by the enginee.r Riprap protection should be maintained to its original configurations or modified as approved by the engineer. Repair erosion or damage by	Perform all routine/ordinary maintenance to include removing channel drift, stabilizing, erosion, cutting, removing and disposing of vegetation, brush and trees that are on, adjacent to, or under bridges Channel and/or Slope Protection components are free of vegetation. Any erosion and/or scour has been stabilized.	Perform all routine/ordinary maintenance to include removing channel drift, stabilizing, erosion, cutting, removing and disposing of vegetation, brush and trees that are on, adjacent to, or under bridges Channel and/or Slope Protection components are free of vegetation. Any erosion and/or scour has been stabilized.	Navigational lighting in working order and inspected on a monthly basis. Navigational lighting will be repaired within one hour of notification, when they are in operation, or a temporary navigation light will be installed. Adequate depth to provide required draft and vertical clearance. Channel is clean, flushed, and free flowing. Fender system is fully functional and structurally sound. Fender system delineation is intact and functional. Minimal erosion at channel banks. No evidence of flooding or overtopping.	Contractor shall take all reasonable measures to control erosion around bridge abutments and piers

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
		filling to bring the ROW back to the original lines and grades.			Minimal channel misalignment and scour.	
7. Bridges						
e. Channel and Slope Protection		Slope failures shall be repaired by a method approved by the engineer. Slopes shall conform to the original cross-section and shall be revegetated.				

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
8. Tunnels						
a. Fans	All fan shafts and bearings inspected and serviced according to maintenance schedule and instructions. All fans and fan drives operational at all design speeds and capacities. All fans properly lubricated and free of vibration Fan housings free of corrosion and accumulated dirt. Automatic control systems (CO sensors, Heat Sensors, etc.) shall be properly maintained and calibrated to assure functionality with their intended design intent. Fan rooms shall be clean and have no more than small amount of debris such as leaves. Mall tunnel control room shall be monitored 2 shifts per day covering all periods of high traffic volume. Fan deluge systems maintained and made functional.					
b. Ventilation Shafts	Dampers shall be free of obstructions and all actuators, limit switches and seals shall be operating properly. Shafts shall be free of litter, rubbish, etc. which may be damaging to the fans and prevent proper drainage. Portals between the tunnel and ventilation shaft shall be unobstructed, the area behind the jersey barriers is generally free of rubbish and debris.					

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	No leaks in supply water lines serving fire hydrants.					
c. Drainage and Sump Pumps	All floor drains shall be clean, flushed and free flowing. Sump pumps shall operate as required.					
8. Tunnels						
d. Tunnel walls and ceiling	Tunnel walls shall be clean and free of accumulated dirt as necessary to achieve maximum levels of light reflectivity. No water running out of tunnel walls and/or ceiling. Not including past evidence thereof. Seal all water leaks in conduit opening. No visible water damage. Tunnel walls and ceiling are free from graffiti Restore all damaged and knocked down ceiling panels within 30 days of noted deficiency. Area behind jersey barriers shall be kept free of accumulated debris.					
e. Lighting	No more than 10% of fixtures shall be burnt out at any one time. All light fixtures (lenses) shall be clean and free of dust buildup. All Light fixtures in control rooms, mechanical fan rooms and air shafts functional and clean. Illumination levels shall comply with ISE standards. Damaged or out of service lights repaired within 30					

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
	days of noted deficiency.					
f. Power	Power distribution systems shall meet all applicable codes and safety requirements and PEPCO high voltage testing requirements. Circuit Breakers and trip units shall function properly.					
g. System Controls	All controls including computer systems are operational.					
8. Tunnels						
h. Over height detection, VMS, radio, fire alarm, emergency phones	All systems operational and functioning properly All damaged or malfunctioning systems repaired within 30 days of noted deficiency.					
i. Video Surveillance	All Video cameras shall be angled as required for proper viewing of tunnel activities. All cameras shall be operational and properly functioning.					

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		General Requirements Maintain a diary at each rest area detailing pertinent information on a daily basis Submit a monthly report to the engineer indicating the following: tiny facility malfunction, required repairs, repairs made, vandalism, complaints, incident and other items considered significant Keep storage areas secured and in a clean and orderly condition at all times Report daily to the local Department district representative, "Lost and Found" items discovered The Contractor will treat all rest area visitors in a proper manner and use the utmost courtesy at all times. Do not accept tips or other gratuities from the traveling public. No visitors of contract personnel, including relatives of the Contractor's employees will remain in the rest areas during working hours, unless they are bona fide employees of the Contractor. Provide at least one English-speaking employee per rest area.			General Requirements The Contractor will maintain a customer service log, which shall detail all complaints, correspondences and/or requests received, and the disposition of all items contained in the log. The Contractor will contact the customer within one (1) working day and have resolution of the customerservice request within two (2) weeks. The Contractor will develop and implement a Customer Service Resolution Plan The Contractor will manage all assets identified in the contract and perform routine, nonroutine, and intermediate maintenance and repair activities as necessary. These activities will be performed at a frequency that ensures uniform and consistent compliance with the Quality The Contractor will manage the maintenance program including the performance of work needs	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		Ensure undesirable activities such as camping, vending or soliciting do not occur. General Requirements Provide uniforms with readily visible identification for all rest area personnel working at the rest areas. Vending. The contractor shall not distribute, advertise or sell products or services of any kind in the rest area. The Contractor should be aware of the provisions of Title 5, Chapter 94 of the Texas Human Resources Code, which outlines vending requirements by the Texas Blind Commission. Holiday coffee rest stops. Requests to establish holiday coffee rest stops at a rest area will be processed by the appropriate Department district. The Contractor will prohibit any unapproved entity from establishing a holiday coffee rest stop. Facility Water blast, clean and deodorize all rest room facilities to remove odors, unless otherwise approved by the department. Install approved			determinations, location of resources, work assignments and management of resources. The Contractor will comply with the all Department Procedures. Rest Area Maintenance and Repair The Contractor will manage and perform maintenance and repairs of Rest Areas. The Contractor will operate, maintain, and repair all components of the Rest Area facilities including but not limited to buildings, grounds, picnic areas, emergency generators, wastewater treatment facilities, stormwater management facilities, potable water facilities, scales, and roadways. The Contractor will provide attendant(s) at Weigh Stations sufficient to comply with performance measures. The Contractor will perform all necessary maintenance, repair, and replacement to keep all Rest Area facility components functioning properly and	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		deodorant devises in all restrooms to ensure they have a pleasant smell at all times. Repair or replace all broken or missing tile, brick or grout as needed. <u>Facility</u> Replace all cracked, broken, non-functioning items such as rusted lights, liquid soap dispensers, trash receptacles, hand dryers, sinks, mirrors, stall doors, partitions, urinals and commodes. Paint all existing painted structures and fixtures and repainted annually unless otherwise approved by the engineer. Annual repainting should be scheduled between March 1 and April 30. <u>Landscape Areas.</u> It is the intent of this specification that landscaping be installed and/or improved at all rest areas unless otherwise approved. The contractor shall provide a landscape architect who will develop a landscape design plan that will ensure plants are flowering at each rest area from early spring until the first freeze. All existing shrub and flowerbeds shall be improved by repairing any damaged edging, installing edging where needed, removing weeds and providing at least 3 inches of mulch.			aesthetically pleasing until the Department reconstructs or refurbishes the entire Rest Area facility. The Contractor will provide copies of documentation of Weigh Station Inspections to the Department monthly. The Contractor is required to achieve and maintain a score of 85 or better on the "Quality Assessment Weigh Station Inspection" form. <u>Rest Area Maintenance and Repair</u> The maintenance and repair of Weigh Stations includes all facilities, buildings, grounds, and scales. Weigh Station maintenance and repair will be performed in accordance with the Standard Scope of Services for "Scale and Lightning Systems Maintenance". Controlled pavement at weigh scales must meet the requirements of the Department of Agriculture and	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		The plan shall be submitted within one month of the work order and installed by the deadline shown above. <u>Grounds</u> Backfill low areas around sidewalks and curbs with approved soil and revegetate. Remove and replace curb that is broken, loose or has moved from its original position. Repair as needed, tables, benches, arbors, trash receptacles, barbecue pits, fireboxes and other outdoor appurtenances. Remove and replace all sidewalks that are broken, raised, sunken or are out of alignment. Repair any pavement failures by methods approved by the department. Replace all metal trash barrels with plastic barrels unless otherwise approved. <u>Janitorial Services.</u> Rest Room Facilities. Perform the following services on a maximum of 8-hour intervals. Inspect each restroom a minimum of one time each hour during scheduled duty hours . Items requiring attention shall be addressed immediately.			Motor Carrier Compliance. Weight Stations lights intended to illuminate the immediate area around the scales or an area where trucks are being weighed, must be repaired within 24 hours of the light outage. The Contractor will properly inspect and maintain all stormwater management facilities within the Rest Area. Maintenance of the stormwater management facilities includes, but is not limited to: Removal of built-up sediments, trash and debris; Back flushing under drain systems; Scarifying the bottom of the system; Maintaining the integrity of the control structure and conveyance system; Maintaining proper vegetative cover. The Contractor will perform routine inspections of the Rest Areas using the “Quality Assessment Review/Rest Area	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		Mop floors with an appropriate cleaning solution. Thoroughly remove cleaning solution. Immediately clean floors if they become soiled prior to scheduled cleaning. <u>Janitorial Services.</u> Keep the rest area clean, pleasant smelling and free of all dirt, trash or insects at all times. Schedule rest room closures for janitorial work during off peak times. For rest areas with dual men's and women's facilities, maintain one men's and one woman's rest room open at all times. Display "Caution Wet Floor" signs when cleaning, until the floor is dry. Disinfect entire restroom after cleaning. The following is a check list to ensure rest areas are kept clean and presentable: Clean restroom walls, partitions, fixtures, doors, woodwork and handrails. Thoroughly remove cleaning solution. Do not use abrasive cleaning powders to clean the walls and ceilings. Immediately clean listed items if they become soiled prior to scheduled cleaning. Clean surfaces of the sinks and counter tops including levers, spouts and drains. Thoroughly remove cleaning solutions and wipe areas dry. Scrub the inner surfaces of the urinals and toilets. Clean the seat, rim and other surfaces			Inspection" checklist and the "Desired Rest Area Maintenance Conditions" . The Contractor will provide copies of documentation of Rest Area inspections to the Department monthly. The Contractor is required to achieve and maintain a score of 85 or better on the "Quality Assessment Review/Rest Area Inspection" form. <u>Security Guard Services</u> The Contractor will provide Security Guard Services at each Rest Area sixteen (16) hoursper-day from 4:00 PM of each day until 8:00 AM the morning of the next day unless, the time period must be adjusted to accommodate the hours of operation. No Security Guard Services are required at Weigh Stations. Security Guard Services will be provided in accordance with the Standard Maintenance Scope of Services for "Rest Area / Welcome Station Security". The Contractor will be	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		of the fixtures. Wipe the exterior surfaces and rims dry. Keep all materials and tools in the storage area when not in use. <u>Janitorial Services.</u> Ensure the rest rooms are sufficiently stocked with toilet tissue, deodorant and hand-soap at all times. Clean glass mirrors with a glass cleaner and wipe dry. Clean stainless steel mirrors with a mild liquid soap and wipe dry with a soft cloth. Closing of rest rooms should be minimized and limited to janitorial operations such as pressure washing of floors, ceilings, walls, or similar activities that would inconvenience the traveling public if they were present. At no time will the rest room be closed for more than 30 minutes during a cleaning operation. Remove graffiti or other markings immediately. Paint over when necessary. Repair surface prior to applying paint, where graffiti is scratched into a surface. Display "Caution Wet Paint" signs. Paint entire surface if painting of graffiti results in mismatched colors. Replace all cracked, broken, non-functioning			responsible for permitting activities within or associated with the Rest Areas that are a part of this contract. <u>Security Guard Services</u> The Contractor will meet all requirements in Florida Administrative Code Rules, in particular, the following. <u>Highway Facilities</u> The Contractor will handle coordination, processing, administration, and inspection for all permits in the Rest Areas covered by this contract. The Department will enter all permit related data into the Permits Information Tracking System. The Contractor will collect all required permit fees and turn them over to the Department's representative. All approvals and signatures required by the Florida Administrative Code Rules will remain with the Department. All permits will be processed expeditiously, meeting the requirements of Florida Statutes	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		items such as rusted lights, liquid soap dispensers, trash receptacles, hand dryers, sinks, mirrors, stall doors, partitions, urinals and commodes as necessary throughout the life of the contract. Empty trash receptacles. <u>Janitorial Services.</u> Touch up paint as necessary to ensure rest area does not show any graffiti, rust stain or peeling paint. <u>Lobby/Entry Area</u>. Clean lobby or entry area as needed. Clean inside and outside of display cases and windows daily. Use cleaner that will not damage acrylic material. <u>Rest Area Grounds.</u> Perform the following services as often as needed. Inspections of each item shall be made hourly. If service is needed it shall be addressed immediately. Keep drinking fountains operational, clean and sanitary. Turn off and drain water from drinking fountains when freezing temperatures are forecast. Keep grounds free of all litter . This includes, but is not limited to trash, wastepaper, garbage, scrap metals, paper, wood, plastic,			and Florida Administrative Code Rules. “General Use” permits will be processed in accordance with District requirements. F.A.C. Rule 14-46 Railroads/Utilities Installation or Adjustments F.A.C. Rule 14-28 Public Use of Rest Areas, Wayside Parks and Solicitation on State <u>Highway Facilities</u> F.A.C. Rule 14-86 Drainage Connections The Contractor will process all permits to completion, which is either approval or denial; within 60 days of receipt of a complete permit application. The Contractor will not be penalized if a delay in processing a permit is caused by the Department. <u>Wastewater Treatment Facilities, Effluent Disposal Systems, Lift Stations, Water Wells And Potable Water Treatment Facilities</u>	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		glass products, bottle caps, ring-pull tabs, cigarette butts, gum wrappers, feces, animal remains and other items discarded. Clean and repair as needed, tables, benches, arbors, trash receptacles, barbecue pits, fireboxes and other outdoor appurtenances. Clean and disinfect soiled and stained items. Rinse thoroughly with clean water. <u>Rest Area Grounds.</u> Do not apply a disinfectant to table or bench tops unless the surfaces can be rinsed off immediately with clean water. Keep slabs, walks and driveways free of chewing gum, sand, gravel, grease, leaves, spills and all other types of debris. Pressure wash slabs and walks at the beginning of the contract to remove existing gum and other stains and once a month thereafter. Pressure shall be of adequate strength to remove gum, dirt, grime and grease without causing damage. Care shall be taken to ensure the public or their property is not sprayed. Empty trash receptacles and replace liners. Clean trash receptacles periodically as needed. The contents may be temporarily stored at an approved site located at the rest area. Dumpsters used shall be blocked from public view and located away from public areas. Dumpsters shall be emptied a minimum of			The Contractor will operate, maintain, and repair all Wastewater Treatment Facilities, Effluent Disposal Systems, Lift Stations, Water Wells, and Potable Water Treatment Facilities in or associated with the Rest Areas. The Contractor will insure that all Facilities are operating twenty-four-hours-per-day, seven-days-per-week. The Contractor will furnish qualified and trained personnel to operate, clean, maintain, and repair the Facilities and to satisfy the requirements of all regulatory bodies having jurisdiction. <u>Wastewater Treatment Facilities, Effluent Disposal Systems, Lift Stations, Water Wells And Potable Water Treatment Facilities</u> The Contractor's personnel working on the Facilities will possess the proper certifications/licenses required by the permits.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		twice a week. Dumpsters retaining offensive odors shall be cleaned or replaced as necessary. All litter collected becomes the property of the Contractor. Dispose of litter off the right-of-way in accordance with federal, state, and local regulations. <u>Landscape Maintenance</u> All landscape areas shall be kept neat, mulched with healthy plants and no weeds at all times. Landscaping plants that are damaged or dying shall be replaced with like items. This includes, but is not limited to plants, shrubs and trees. Treat all landscaping as necessary for insect infestations, damaging fungi, and/or damaging parasites. Treatment methods and chemicals shall be approved by the engineer. Mulch shall be replenished as necessary. No bare spots and no exposure of irrigation pipes will be allowed. Ornamental bedding areas shall be appropriately filled with blooming flowers. Flowers shall be changed a minimum of every three months to			The Contractor will pay the permit fees and any associated engineering expenses/fees. The Contractor will operate, maintain, and repair the Facilities in accordance with all applicable permits and approvals. The Contractor will comply with all Federal, State, and Local Laws and Ordinances respecting the safety, health and sanitary codes, permit requirements/conditions, employment and all other such requirements. Fines and penalties incurred for not complying with any regulatory requirements are the responsibility of the Contractor. The Contractor will dispose of all treatment residues, lawfully and properly. Disposal will be in accordance with the established procedures approved by the DEP and EPA and/or other Federal, State, or Local regulatory agencies.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		compensate for varying growing and blooming seasons of the area. Flowers that have proven to be successful within the area and during the season will be utilized. Ornamental bedding areas shall be watered sufficiently to keep all plantings lush without distress. Ornamental bedding plants that appear to be distressed or beyond their useful period shall be removed and replaced regardless of the timing. <u>Landscape Maintenance</u> It is the intent of this specification to provide a lush colorful and attractive ornamental bedding area. <u>Vegetation Maintenance</u> Water grass, trees and shrubs during the early morning hours or as directed. Fertilize two (2) times a year (early spring and mid fall) in accordance with manufacturer's recommendations. The department shall approve fertilizer, and its application rates. Treat all vegetation as necessary for insect infestations, damaging fungi, and/or damaging parasites. Treatment methods and chemicals shall be approved by the engineer. Mow areas, as shown on the plans. Maintain grass height between 2 to 5 inches. Push type lawnmowers or hand held trimmers may be			<u>Wastewater Treatment Facilities, Effluent Disposal Systems, Lift Stations, Water Wells And Potable Water Treatment Facilities</u> The Contractor will obtain and maintain all regulatory permits and approvals. The Contractor will perform tests as required by Federal, State, and Local Agencies. This includes all existing requirements to comply and will also include any and all new requirements, technical memorandum or revision of testing procedures that may be required by/of the Department. The Contractor will maintain an operation, maintenance and repair log for all Facilities. The log at a minimum will include identification of the operator, date and time in and out, specific operation and maintenance, repairs necessary or performed, tests performed, samples collected and changes or adjustments made to the system.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		required around trees, arbor units and other appurtenances. Tractor driven mowers may be allowed in other areas, if approved by the Engineer. All mowers will be equipped with non-damaging turf type tires. <u>Vegetation Maintenance</u> Edging and Trimming. In conjunction with each mowing, edge all sidewalks, concrete pads and curbs with an edger designed to provide a vertical cut. Using a string trimmer, trim around all buildings, trees, shrubs, light poles, guard posts, signs, delineator posts, culvert headwalls and any other appurtenances. Remove noxious weeds and other undesirable growth from lawns, beds of plants and shrubs, as needed. Daily inspections shall be made and all weeds shall be removed. Trim trees and shrubs as needed. At no time shall trees or shrubs be allowed to encroach upon walkways or structures. Trees and shrubs shall be trimmed to maintain uniform and aesthetically pleasing form. Herbicides, which are proven safe for plants, grass and desirable			<u>Incident Response</u> The Contractor will respond and deploy resources within 15 minutes of initial notification, 24 hours per day, 7 days per week, including holidays, to any emergency occurring within the Rest Areas. The Contractor will arrive on site, prepared to take necessary action with necessary manpower and typical emergency response equipment, within a maximum time of 60 minutes from initial notification of the incident. The Contractor will develop an "Incident Response Plan". Included in the "Incident Response Plan" should be details on public/agency notifications, incident management, how the safety of motorist will be ensured, handling of hazardous waste,	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		plants may be used to kill weeds, but must be approved before application. Remove and dispose of grass and tree clippings, limbs, leaves and/or pine straw from grounds, buildings and arbors. All vegetation to be discarded becomes the property of the Contractor and shall be disposed of at appropriate offsite locations.			coordination with Law Enforcement and other appropriate agencies, traffic control, submission of "Incident" reports, the establishment and maintenance of detour routes when needed for closure of the interstate and primary roads, emergency repairs, removal of debris and evacuation response. The Contractor will have incident response procedures in place to ensure proper response within the Rest Areas. <u>Incident Response</u> The Contractor will notify the Department immediately of all Rest Area closures and re-openings, or major incidents. A summary of incident responses, by the Contractor, will be submitted to the Department with the monthly invoice. The Contractor will comply with all Local, State, and Federal Laws and Department plans dealing with evacuation and evacuation routes. The Contractor will have incident response procedures in	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
					place to insure proper coordination of the handling of hazardous waste encountered within the Rest Areas. The Contractor will comply with all Local, State, and Federal Laws and regulations dealing with the handling and disposal of hazardous waste. When an event occurs causing damage to a Rest Area, the Department authorizes the Contractor to pursue claims against any responsible party for reimbursement of expenses incurred. Any advance preparation, repairs, replacement, etc., required as a result of natural disaster, catastrophic or emergency response event will be considered part of the contract responsibilities <u>Incident Response</u> If the Contractor does not arrive on-site, prepared to take necessary action within 60 minutes from initial notification of an incident, $1,000.00 per hour, per incident, will de deducted from the Contractor's	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
					monthly lump sum payment for each hour past the allowed response time it took the contractor to be on site. <u>Performance Standards</u> The Department will provide to the Contractor a schedule of Rest Area inspections to be performed by the Contractor on a monthly basis. The Rest Area Inspection Schedule will identify the required inspection date and time for each Rest Area. The specified inspection will be performed by the contractor and reported to the Department on a monthly basis. If the Contractor is not present at the Rest Area at the scheduled time to perform the Rest Area inspection, The Department will assign a score of zero. Rest Area Maintenance and Repair	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		Appurtenances**.** Maintain and repair all outdoor appurtenances. This includes but is not limited to tables, benches, arbors, barbecue pits, fireboxes, litter barrels, flags, flagpoles and other outdoor appurtenances. Any outdoor appurtenance that can not be repaired must be replaced immediately. Drainage. Maintain and repair all rest area drainage-ways, including any underground facilities. Blockage of drainage facilities shall be removed upon discovery. Inspect drainage facilities every six months to ensure their proper operation. Backfill eroded areas with approved soil and revegetate. Signing and Lighting**.** Maintain, repair, or replace all traffic operations appurtenances including but not limited to delineators, signs, and luminaries in accordance with departmental guidelines and policies. Sidewalks, Curbs and Pavements**.** Maintain all rest area pavements such			Performance Standards The Department may inspect Rest Areas or Weigh Stations using the "Quality Assessment Review/Rest Area Inspection" checklist or the "Quality Assessment Weigh Station Inspection" checklist at any time. If the Department's score is lower than 85, two points will be added to the Departments score, and that score shall be the official score. There will be a $1,000.00 per point, per Rest Area reduction, for any month for scores less than the required rating of 85. The total of the Rest Area reductions will be deducted from the Contractor's monthly lump sum payment. In addition, the Contractor will be assessed reductions, as defined in the Standard Maintenance Scope of Services, for Security Guard Services. The Contractor will be assessed reductions, as defined in the Standard Maintenance Scope of Services, for Rest Area Maintenance Services. There will be a $1,000.00 per hour, per Rest Area, reduction for each Rest Area closure caused by	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		as but not limited to ramps, parking lots, sidewalks, curbs and slabs. Repair all pavement failures, potholes, cracking, rutting, punch-outs, flushing and joint failures immediately or as approved. <u>Striping and Raised Reflective Pavement Markers.</u> Maintain and repaint striping and specialty markings to the latest standard as needed. Replace missing or broken raised pavement markers as needed. <u>Building Maintenance and Repair</u>**.** Maintain and repair all buildings and structures within the rest area complex. The contractor is responsible for, but not limited to, the following items: Make all structural and architectural repairs of building interiors and exteriors. The structural integrity of all buildings shall be ensured at all times. Necessary repairs affecting the structural integrity shall be addressed immediately. All other repairs shall be scheduled and approved by the department's representative.			Contractor negligence. <u>Permits</u> There will be 0.10% (.001) of the monthly lump sum deducted per day, per permit, for each day over 60 days used to process any permit to resolution. This reduction is not cumulative but will be calculated only for the number of days exceeding the 60 days processing time within the month being paid. The 60 days will begin when the Contractor receives a complete permit application. Resolution of the permit is considered complete when the permit is officially submitted to the Department with documentation and recommendation sufficient for approval or denial. The total of the permit reduction will be deducted from the Contractor's monthly lump sum payment.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		Repair and/or replacement of electrical system, plumbing system, utility lines, water and waste water system, hand dryers, light fixtures, lavatory fixtures, toilets and any other repairs necessary for operation of the rest areas. Repairs and/or replacement of these items shall be achieved within 24 hours unless approved. <u>Building Maintenance and Repair</u>**.** Paint blistering, paint peeling, mildew, or mold shall be addressed within one week of discovery or as approved. If painting or treatment of an area results in mismatched colors the entire surface shall be painted. Rusted metal shall be sandblasted to bare metal and primed with rust inhibiting primer prior to painting with outdoor type paint. Water Well Operation. Provide maintenance, testing, repair and operation of water well units serving rest area facilities where applicable. Maintenance and repair shall include all items such as piping, pumps, chemical treatment systems, control systems, electrical systems, and motors above and below ground within			<u>Customer Service Resolution</u> If the Contractor does not contact the customer within 24 hours, there will be $500.00 per day assessed and deducted from the Contractor's monthly lump sum payment, for each day greater than one day that it took the Contractor to contact the customer. The Department will take into consideration if the Contractor took every measure possible to contact the customer and the customer could not be reached. If the customer request is not resolved, to the satisfaction of the Department, within two weeks, $1,000.00 per day, per customer request, will be assessed and deducted from the Contractor's monthly lump sum	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		the well unit. Testing and maintenance shall be in accordance with the most current regulations, guidelines and revisions as required by federal, state and local codes or statutes. Policing of water well clearance zones, operator licensing and associated facility licensing shall be the responsibility of the contractor.			payment for each day over two weeks that it took for the Contractor to resolve the customer complaint.	

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		<u>Water and WasteWater Facilities.</u> Water Treatment Plant Operation. Provide maintenance, testing, repair and operations of water treatment plant facilities servicing rest areas where applicable. Maintenance and repair shall include items such as piping, pumps, control systems, electrical systems, motors, chemical treatment systems, and filter media within the system. Testing and maintenance shall be in accordance with the most current regulations, guidelines and revisions as required by federal, state and local codes or statutes operator licensing and associated facility licensing shall be the responsibility of the contractor. Wastewater Treatment Facility Operation. Provide maintenance, testing, repair and operations of wastewater treatment facilities servicing rest area facilities where applicable. Wastewater treatment facilities shall include but not be limited to septic tanks, septic tank evaporative fields, evaporation/transpiration systems, gray water sprinkling systems, electrical systems, control systems, chemical treatment systems, and any facility utilized for wastewater treatment at a rest area facility. Testing and maintenance shall be in accordance with the most current regulations, guidelines and revisions as required by federal, state and local codes or statutes operator licensing shall be the responsibility of the contractor. Associated facility licensing shall be the responsibility of the contractor.				

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		Wastewater Lift Stations. Provide maintenance, repair and operations of wastewater lift stations servicing rest area facilities where applicable. Lift station facility to include but not be limited to all piping, pumps, control systems, electrical systems, wet wells, dry wells, and associated buildings/covers. <u>Water and WasteWater Facilities.</u> Water Reservoir(s) and Booster Pump Station Operation. Provide maintenance and operations of water reservoir(s), booster pump stations, water mains, and associated appurtenances servicing rest area facilities where applicable. Pump stations shall be maintained as designed. Pressures and volumes shall be maintained to facilitate full operation of all applicable rest area appurtenances and Texas Commission on Environmental Quality (TCEQ) requirements. The contractor shall be responsible for all coordination with the Texas Commission for Environmental Quality. TCEQ licensing and operation requirements shall be complied with by the contractor. Licensing and reporting shall be submitted by the contractor to The department for review and approval. Final submission shall be made by the Contractor. Violations, sanctions and any resulting fines shall be the responsibility of the contractor. System modifications and/or cleaning necessary to address TCEQ regulations or violations are the Contractor's responsibility. Violations will be corrected and reported to				

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
9. Rest Areas						
		the department immediately. <u>Emergency Operations:</u> During periods of emergency such as hurricane evacuation the contractor shall increase staff and hours of operation to address the full evacuation time period. The contractor shall coordinate with the associated department district to determine the applicable evacuation period. The contractor shall coordinate with the associated department district to determine the time to close the rest area and shut down all support facilities.				

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
10. Snow & Ice, Incident Response						
a. Snow and Ice	Maintain a passable lane in each direction on each road segment at all times. Clear all snow and ice from travel lanes within 24 hours of cessation of event. Clear all snow and ice from shoulders within 48 hours of cessation of event.	Using a deicing chemical approved by the engineer, roadways and bridges shall be treated for snow and ice during and after winter events to allow for movement of traffic. Salt shall not be allowed unless approved by the engineer. Contractor shall have sufficient equipment to make at least one treatment for snow and ice on roadways and bridges in a minimum of 2 hours. Contractor shall have at least 1 stockpile of material sufficient to last 24 hours in a snow or ice event in all counties with stockpiles not on State ROW.	At least one travel lane in each direction shall be kept open and free of frozen precipitation so that traffic can proceed in a safe and orderly manner throughout the inclement weather occurrence. Frozen precipitation removal activities shall continue in full force from the onset of a snow event until such time as all pavement lanes are passable (icy spots allowed) by no later that 12 hours after the end of a winter weather event. Frozen precipitation removal activities shall continue in full force from the onset of a snow event until such time as all pavement lanes are 100% free of frozen precipitation and any other frozen accumulations by no later that 24 hours after the end of a winter weather event. All shoulders shall be plowed (pushed back) within 36 hours of the cessation of falling precipitation.	All pavement travel lanes, turn lanes, crossovers and intersections shall be kept open and free of frozen precipitation so that traffic can proceed in a safe and orderly manner throughout the inclement weather occurrence. Frozen precipitation removal activities shall continue in full force from the onset of a snow event until such time as all pavement lanes are 100% free of frozen precipitation and any other frozen accumulations by no later that 6 hours after the end of a winter weather event. All shoulders shall be plowed (pushed back) within 12 hours of the cessation of falling precipitation.		

Table D-1. Maintenance Performance Standards Comparison Table.

Component Element	Washington DC	Texas	North Carolina	Virginia	Florida	World Bank
10. Snow & Ice, Incident Response						
b. Incident Response		Provide traffic control within 45 minutes of notification to close lanes as necessary for cleanup of incident. For any hazardous material spills, call appropriate local, state or federal governmental regulatory agency as necessary. TxDOT will remove spilled cargo to a safe location on the ROW as necessary to restore traffic flow. Notify the Department's public information office about the accident or incident and any lane closures.		Contractor shall respond and deploy resources within 15 minutes of initial notification, 24-hr per day, 7 days per week, including holidays, to any emergency occurring on the roadway. Contractor will arrive on site prepared to take necessary action using appropriate resources within 30 minutes during work hours and 60 min after work hours of initial notification of an incident. Contractor shall provide equipment/personnel as necessary to support EMS operations and notify Smart Traffic Center as to the severity, anticipated duration of event and reopening of the roadway. Contractor shall communicate with the media through the designated VDOT Public Information Officer.		