TRANSPORT NOTES

ROADS AND RURAL TRANSPORT THEMATIC GROUP

THE WORLD BANK, WASHINGTON, DC Transport Note No. TN-27 September 2005

Performance-based Contracting for Preservation and Improvement of Road Assets

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The method of delivering road maintenance has progressively evolved. Historically, road agencies have moved from using in-house force account to traditional method-based maintenance contracting. Many countries are now heading towards performance-based contracting (PBC), an approach that has been deployed rapidly in the road sector in the past decade. However, while PBC offers a number of benefits for road agencies and road users, it is a relatively new approach and there are several aspects that need careful consideration to ensure that the goals of PBCs are fully achieved.

The purpose of this Note is to review the worldwide experience with the PBC approach, highlight the main advantages, the steps involved and the results generated. The document is intended to provide World Bank transport sector staff, Ministries of Transport and road agencies of developing and transition countries with a clear understanding of the benefits, and risks, of applying the PBC approach. A separate Resource Guide (to be released by the World Bank in 2006) will offer more detailed information and resources pertaining to performance-based contracting

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The Note has been produced with the financial assistance of a grant from TRISP: a partnership between the United Kingdom Department for International Development and the World Bank for learning and sharing of knowledge in the fields of transport and rural infrastructure services.

WHAT IS A PERFORMANCE-BASED CONTRACT?

Performance-based contracts (PBC)[1] differ significantly from method-based contracts that have been traditionally used to maintain roads. PBC is a type of contract in which payments for the management and maintenance of road assets are explicitly linked to the contractor successfully meeting or exceeding certain clearly defined minimum performance indicators.

In traditional method-based contracts, the road agency as a client normally specifies techniques, technologies, materials and quantities of materials to be used, together with the time period during which the maintenance works should be executed. The payment to the contractor is based on the amount of inputs (e.g., cubic meters of asphalt concrete, number of working hours).

In performance-based contracting the client does not specify any method or material requirements. Instead he specifies performance indicators[2] that the contractor is required to meet when delivering maintenance services.

According to the World Bank Procurement Guidelines (2004), performance-based procurement, also called output-based procurement, refers to competitive procure ment processes resulting in a contractual relationship where payments are made for measured outputs instead of the traditional way where the measurement and payment reflects the quantity of input.

For example, the contractor is not paid for the number of potholes he has patched, but for the output of his work: no pothole remaining open (or 100% patched). Failure to comply with the performance indicators or to promptly rectify revealed deficiencies adversely affects the contractor's payment through a series of clearly defined penalties. In case of compliance the payment is regularly made, usually in equal monthly installments.

PBC within the road sector can be "pure" or "hybrid". The latter combines features of both method- and performance-based contracts. Some services are paid on a unit rate basis, while others are linked to meeting performance indicators. Throughout this paper the authors broadly refer to both of these contract types as performance-based contracts, unless indicated otherwise.

WHAT IS COVERED? (SCOPE, ASSETS AND SERVICES)

A PBC may cover either only individual assets (e.g., only traffic signs, only bridges) or all road assets (from right-of-way to right-of-way) within a road corridor.

The level of complexity of a PBC can range from “simple” to “comprehensive”[3] depending on the number of assets and range of services included. A "simple" PBC would cover a single service (e.g., only mowing, only street light maintenance) and could be awarded for relatively short periods (several months or one year).

[1] In some literature PBCs are also referred to as output-based or outcome-based contracts. In the World Bank sample bidding document (WB 2003), it is referred to as performance-based contract for management and maintenance of roads (PMMR). In the very latest version of the Bank’s document (WB 2005) the title has been changed from PMMR to OPCR – Output- and Performance-based Road Contracts.

[2] Performance specifications are often called "levels of service" in some countries.

[3] In some literature, the "comprehensive" PBC is referred to as "integrated full service PBC".

A "comprehensive" PBC would typically cover all road assets with the right-of-way and comprise the full range of services needed to manage and maintain the contracted road corridor (see Appendix 1). Such services would include routine maintenance, periodic maintenance and traffic accident assistance, etc. As periodic maintenance works (e.g. resurfacing, re-graveling) need to be repeated in a certain period, the contract tenure is usually from 3 years to 10 years and could go up to 30 years. In a "comprehensive" PBC most of the works are often outsourced by the main contractor to subcontractors.

Rehabilitation is not a compulsory component of a "comprehensive" PBC. Some road agencies include rehabilitation as part of the PBC; others choose to handle rehabilitation using traditional method-based approaches.

WHERE HAS IT BEEN USED? AND SINCE WHEN?

The first PBC of road maintenance was piloted in British Columbia, Canada, in 1988 (Zietlow 2004). Later, PBCs were introduced and adopted in two other Canadian provinces: Alberto and Ontario.

In 1995 Australia launched its first PBC to maintain urban roads in Sydney. Since then New South Wales, Tasmania, and Southern and Western Australia have started using performance-based[4] and "hybrid" approaches (Zietlow 2004).

In 1998 a PBC was introduced in New Zealand to maintain 405 km of national roads (Zietlow 2004). At present, 15% of New Zealand's national network is covered under this type of contract (MWH NZ Ltd. 2005).

A PBC was first introduced in the USA[5] in Virginia State in 1996. Since then, four other states (Alaska, Florida, Oklahoma, Texas) and Washington, D.C. have started applying a PBC approach to maintain highways, bridges, tunnels, rest areas and urban streets (FHWA 2005).

In the developing world Latin America was the pioneer in developing and adopting its own performance-based contracting model. In 1995, Argentina introduced performance-based contracts[6], which at present cover 44% of its national network (Liautaud 2004). In the mid nineties Uruguay also piloted PBC, first on a small portion of its national network and then on the main urban roads of Montevideo. Shortly thereafter, other Latin American countries, such as Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico and Peru, also started adopting a performance-based approach.

Gradually, this trend has spread to other developed and developing countries in Europe, Africa and Asia, e.g., UK[7], Sweden, Finland[8], Netherlands, Norway, France, Estonia (63% of national roads), Serbia and Montenegro (8% of national roads), South Africa (100% of national roads), Zambia, Chad (17% of all season roads), the Philippines (231 km of national roads). At present, preparations for launching PBC programs are underway in Albania, Cape Verde, Chad, Madagascar, Tanzania, Burkina Faso, India, Cambodia, Thailand, Indonesia, Vietnam and Yemen.

Some of the above countries use "pure" performance-based contracts, while others (e.g., Finland, South Africa, Serbia and Montenegro) use "hybrid" contracts.

WHY HAS IT BEEN USED? (KEY OBJECTIVES AND CONTEXT)

Road agencies have moved towards a PBC approach because it offers several advantages over more traditional approaches: (a) cost savings in managing and maintaining road assets; (b) greater expenditure certainty for road agencies; (c) ability to manage the road network with fewer agency staff; (d) better customer satisfaction with road service and conditions; and (e) stable multi-year financing of maintenance.

The PBC can lead to cost savings through:

- incentives to the private sector for innovation and higher productivity;
- reduction in administrative expenses and road agency overheads, due to better packaging of contracts, requiring fewer agency personnel to administer and supervise contracts;
- significantly greater flexibility in the private sector (than in the public sector) to reward performance and react quickly against non-performers.

The PBC helps insure that variation orders are minimized and that the contractor is generally paid in equal monthly instalments throughout the contract period. The risk for cost overruns is transferred to the contractor and the road agency faces fewer unpredictable costs.

In the PBC approach, fewer contracts have to be processed and administered, and there is no need to measure vast quantities of inputs as a basis for payments. Due to the reduced administrative effort needed, the road agency can manage its network with fewer in-house personnel.

The PBC can deliver higher customer satisfaction by aligning contractor payments with the needs of the customer/road users. These needs are directly reflected in the performance indicators specified in the contract. Performance specifications set a minimum level of service that is expected from the contractor over the entire contract period. For example, winter maintenance performance specifications spell out the depth of snow that is permitted to remain on the roads (in mm).

A PBC approach can help ensure stable financing for the maintenance program over a longer-term when compared with traditional method-based contracts. A PBC typically covers a period of several years. It therefore obliges the government treasury to make a multi-year funding commitment for road maintenance.

WHAT ARE THE KEY DIFFERENCES FROM TRADITIONAL METHOD-BASED APPROACHES?

The idea that risks should be borne by the party that can manage them best is acknowledged in the literature (Amos 2004; Queiroz 2000). What significantly differentiates a PBC is that the contractor is assigned a number of the responsibilities and risks that used to be

[4] A PBC is referred to as a 'performance-specified maintenance contract' (PSMC) in Australia and New Zealand.

[5] A PBC is referred to as an 'Asset management contract' in the USA.

[6] Argentina refers to it as 'CREMA,' which stands for 'Contrato de REcuperation y MAntenimiento' in Spanish or 'Contract for Rehabilitation and Maintenance.'

[7] PBC is referred to as a 'Managing agent contract' (MAC) in the UK.

[8] Referred to as "Area maintenance contracts" in Finland.

borne by the owner agency under traditional method-based contracts. On the one hand, the contractor is not tied down by the contracting agency in making his decisions regarding "what to do", "when to do" and "how to do". He is free to innovate with techniques and technologies to reduce his own costs, as long as the level of service specified in the bidding documents is achieved (WB 2004). On the other hand, the contractor now bears the entire risk in case of failure of his management and innovation – his errors in (i) predicting deterioration of contracted assets; (ii) determining appropriate design, specifications and materials; (iii) planning needed maintenance interventions; and (iv) estimating quantities.

The selection process in performance-based contracting is normally based on "the best value", which may not be necessarily "the lowest bid". Since more risks and management responsibilities are carried by the contractor, the contracting agency wants to ensure management capacity with the potential contractor, his clear understanding of the new approach, the new responsibilities and his ability to handle the associated risks. The selection process involves choosing a contractor who has the capability to assess the condition of the assets, determine the timing of interventions, select materials and work methods, a suitable work plan and arrange the monitoring of his own services. Only after ensuring that the bidders are sufficiently qualified (normally through a pre-qualification process), does the selection process consider cost proposals. The "best value" approach tries to ensure a high quality product at a low overall cost.

Payment in PBCs is made on a fixed price lump sum basis normally through uniform instalments, linked to continuing to meet performance targets. The contractor is not paid for physical works completed, but for the final results (or levels of service) he has delivered.

The duration of PBCs is typically longer than that of traditional contracts as the contractor carries greater risk and responsibility and is obliged to undertake certain maintenance interventions that occur every few years.

Use of PBC requires the existence of a mature and well developed contracting industry with capability to undertake long-term management of contracted assets, assume additional risks, and establish necessary programming and quality assurance mechanisms. In case of comprehensive PBCs, this is often achieved through formal collaboration between construction management firms and traditional road contractors.

To be successful PBCs need a strong "partnering" philosophy. This is particularly critical in the initial stages when the PBC is being introduced, since neither the client nor the contractor has experience in this approach, and performance indicators and monitoring procedures are still evolving. Good communication is essential between the client, contractors and supervisor/engineer, to facilitate the discussion and prompt resolution of issues and concerns, so as to minimize the risk of future disputes and claims.

WHAT IS THE DECISION PROCESS?

Historically, the move towards performance-based maintenance contracts has originated from one of several sources: (i) higher levels of government, (ii) external financing agencies, or (iii) the private sector. This section describes the type of decision-making process needed to move towards a PBC approach.

Pre-bidding Stage

Reasons to consider a PBC approach. The road agency needs to clearly understand its main objective in adopting a PBC approach. These may be one or more of the following: (i) need to cut costs; (ii) implement higher level government directive; (iii) manage the road network with fewer staff; (iv) receive long-term funding for the maintenance program either from the government treasury or external financial sources that support a PBC approach; (v) improve customer satisfaction; and (vi) in response to the private sector's offer to deliver more cost effective maintenance services. Depending on its main objective, the agency should determine the appropriate PBC format, i.e., extent (number of km) and tenure of the contract, types of services and range of assets to be outsourced.

Existing legislation. The selected PBC format needs to comply with the country's legal and regulatory framework. Some aspects of the contract format may be dictated by the prevailing environment. In this case the agency may need to promote necessary changes to achieve the desirable format. For example, if the legislation permits a maximum two-year contract, the agency may start with a two-year contract. However, once the appropriate changes permitting longer-term contracts are approved in the legislation, the agency can move to longer-term contracts.

Capacity (skills, expertise) and changing the role of the road agency. Firstly, the road agency has to be ready to switch from the role of a micromanager to that of a strategic manager, regulator and auditor. Secondly, the agency has to acquire new skills and expertise to be effective in this new role. Some countries may decide to seek technical assistance (TA) from countries more experienced in the PBC approach, to build up their agency's capacity. Others may find it more cost effective to engage consultants for assisting with this role, provided the domestic consulting industry possesses appropriate skills. Lastly, the agency needs to identify what agency procedures need modification to match the selected PBC format. For example, the provision of required annual funding for multi-year contracts should be incorporated in the agency's budget process to ensure stable funding for PBCs.

Capacity and unionization of the contracting industry. The road agency needs to match the complexity of the PBC to the capacity of the contracting industry available in the country. Where the industry is less developed, it would make sense to start with shorter-term, simple PBCs, e.g., contracts for routine maintenance or street lighting only. In addition, the unionization level of the contracting industry needs to be taken into account. The prospective PBC format should not be perceived by the industry as depriving most contractors of business opportunities, while placing a privileged few in a dominant position. If the road agency prefers a "comprehensive" PBC, it is important to evaluate the level of collaboration between contractors and build in appropriate subcontracting opportunities for small- and medium-size firms. A single-service PBC may be more appropriate in a less collaborative and unionized contracting environment. Either way, it is essential that the contracting industry be engaged at an early stage in the process of moving towards

PBCs and appropriately consulted to adjust the format to suit local circumstances.

Bidding and Implementation Stage

Inventory of potentially contracted assets and determination of their condition. Prior to developing an Invitation for Bids, the agency shall arrange the inventory and collection of data. It needs to: (i) accurately determine the conditions of the road assets to be contracted out; (ii) define performance indicators in the contract; (iii) undertake preliminary cost estimates; and (iii) specify a monitoring process.

Performance indicators (see Box 1 and Appendices 5 and 7). Performance indicators shall be established for each asset to be contracted out. The selection and definition of indicators shall be based on (i) road user needs, (ii) the expectation of the client to have assets back on contract completion at the same level as they were contracted out or better, (iii) affordability, or the level of funding available. The agency shall avoid setting performance standards too high, since ambitious goals might significantly affect the bid price. Only a "vital few" performance indicators should be specified. The definitions of performance indicators should be simple, clear and easy to understand and achieve by the contractor (a 'SMART' approach can be applied in defining performance specifications: Specific, Measurable, Achievable, Realistic and Timely to schedule).

Methodology to measure performance indicators. The agency needs to determine the methodology (i.e., methods and tools) which will be applied to measure performance indicators for each contracted service. It should be simple and inexpensive. The methodology should be clearly and accurately spelled out in the contract to prevent any misunderstanding from the contractor's side and avoid potential disputes. Within the "comprehensive" PBC, the contractor's performance is usually evaluated at the three levels: 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, etc. 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 and road furniture.

Payment conditions. The payment conditions shall be linked to the performance indicators spelled out in the pring, umpttimctors'

Some examples of such criteria are provided in Tables 1 and Appendices 3 and 8. Due to the allocation of management responsibilities and risks to the contractor by a PBC, some countries opt for a "best value" approach in selecting a winner, arguing that the "low bid" approach does not ensure relevant experience and appropriate understanding of the PBC approach. However, these concerns can be addressed through appropriate pre- or post-qualification. Pre-qualification of bidders, based on clearly defined technical, financial, past experience, and other relevant criteria, is usually the preferred approach. The use of a consortium between contractors and consultants is encouraged because of the total asset management concept inherent in such contracts. The World Bank guidelines recommend that contracts be awarded to the bidder who meets the appropriate standards of capability and resources and whose bid has been determined (i) to be substantially responsive to the bidding documents and (ii) to offer the lowest evaluated cost (WB 2004).

Performance and payment security. Legislation in some countries may require performance security based on the value of the contract. In case of multi-year PBCs, this requirement may become a significant issue, since it could tie up a contractors' security capacity and restrict the number of potential bidders on other contracts. To overcome this problem, some countries started with shorter-term PBCs, whereas in others, authorities require either a two-year bond[9] renewable annually (e.g., in Texas, USA) or one-year value bond (e.g., in Washington, D.C., USA). The D.C. Department of Transportation considers the latter option sufficient, as it allows the agency to find another contractor, in case the incumbent defaults. Alternatively, contracts may provide for a percentage of each periodic payment to be held as retention money until final acceptance of the services (WB 2004).

Quality assurance program. Monitoring and evaluation of the contractor's performance shall be arranged to ensure the contractor's compliance with the performance specifications. The road agency shall determine the manner and frequency of monitoring inspections, composition of the joint inspection panel, party

WHAT HAVE BEEN THE RESULTS?

Significant achievements

Road agencies that have adopted a PBC approach have achieved:

- Cost savings from 10% up to 40%. For example, the USA Virginia Department of Transportation pays USD 22,400 per mile per year under PBC, while in-house maintenance costs USD 29,500 per mile per year (FHWA 2005). In New Zealand, there has been a 30% decrease in professional costs and 17% decrease in physical works with traffic growth by 53% (FHWA 2005). More examples are given in Table 2. In addition, recent evaluations made by Liautaud (2005) indicate that the savings in costs accrued from the CREMA are in order of 12 to 18% compared to the traditional method-based contracts. Cost comparisons are not readily available for other developing countries that have adopted a PBC approach.

Table 2. Cost savings of different countries under PBC over the conventional contracts

Country	Cost savings, %
Norway	About 20-40%
Sweden	About 30%
Finland	About 30-35%; about 50% less cost/km
Holland	About 30-40%
Estonia	20-40%
England	10% minimum
Australia	10-40%
New Zealand	About 20-30%
USA	10-15%
Ontario, Canada	About 10%
Alberta, Canada	About 20%
British Columbia, Canada	Some, but might be in the order of 10%

Source: Pakkala 2005.

- Expenditure certainty. As the contractor is paid a fixed price, based on a regular schedule the road agency enjoys full control of expenditures without unexpected variation orders.
- Reduction of the in-house workforce. For example, in Estonia, where 63% of the national network is under PBC, the workforce of the national and sub-national road agencies has declined, specifically from 2,046 (administration staff – 561, workers -1,485) in 1999 to 692 employees (administration staff – 343, workers – 349) in 2003 (ENRA 2004).
- Improved conditions of contracted road assets and reduction of roads in poor condition. Many road agencies have acknowledged that on completion of a PBC, road assets are generally returned either in an improved condition or in a condition similar to when the PBC was awarded, but not in a worse condition. The Department of Transportation in Texas State, USA, has reported that "after the first year of the performance-based contracts, [road] facilities were rated at an average of 91%, an 18-point increase over their pre-contract condition" (FHWA 2005). Argentina has reduced the share of roads in poor condition from 25 percent to less than 5 percent by the end of 1999 due to the PBC approach (Liautaud 2004).
- Greater road user satisfaction. Road users appear to become more satisfied with the services delivered and the condition of the roads maintained under PBCs. No quantified results of improved road user satisfaction, reflecting PBC implementation have been reported to date[10], some agencies have noticed a decline in the number of complaints from road users. For example, in Chad "road users appreciate that the road is always in good conditions and not only after specific works were completed. Especially important is that they can use the road in the rainy season, which was impossible before" (Zietlow 2004).
- Multi-year financing of a maintenance program. For example, by making the long-term payment obligations legally binding on the government, the CREMA contracts in Argentina have deterred the Treasury from failing to provide funding for road maintenance (Liautaud 2004).

The growth and expansion of a PBC approach to other roads in the network is the best indicator of its success. The Department of Transportation in Washington, D.C., USA, recognizes PBC as an effective way to keep assets at or above their current condition. It has therefore decided to apply this approach for management and maintenance of tunnels, street lighting, and other streets in Washington, D.C. Peru has expanded its program of performance-based contracting of micro-enterprises from the rural to the national network. Argentina is currently conducting preparations to expand a performance-based contracting from the national to provincial roads. The Florida Department of Transportation plans to increase from the current 19 performance-based contracts to 28 by 2008 (see Appendix 2).

Main challenges

Main challenges that road agencies face when introducing and expanding PBC include, but are not limited to the following:

- Adequate allocation of risks to the party that is able to manage them best.
- Establishing a "partnering" relationship between the contractor and client. This requires a change in the road agency's mindset: from the role of a micromanager to the role of a strategic manager.
- Need to acquire a new set of skills and expertise to enable the road agency staff to effectively develop and manage a PBC program;
- Downsizing of the agency. Extensive adoption of the PBC approach may trigger the need to reduce the in-house workforce, since significantly less effort is needed to administer and supervise PBCs.

[10] British Columbia, Canada, where 100% of highway maintenance is outsourced under a PBC, developed a road user satisfaction survey (RUSS) in 2002 to conduct it once each two years in order to rate highway maintenance contractors' performance. However, the results of the RUSS undertaken in 2004 are still forthcoming.

- Choosing a PBC format that is consistent with the contracting industry capacity available in the country.
- Identification and clear definition of appropriate performance specifications. This requires good knowledge by the agency staff of how to establish the actual and desired condition of road assets - to specify achievable and realistic performance indicators for each contracted service.
- Design of an incentive payment mechanism that encourages the contractor to consistently meet or exceed the specified minimum performance indicators.
- Assured long-term funding for multi-year PBCs. In most countries the budgeting process is an annual exercise. This makes it virtually impossible to have total assurance about the funding for each year in a multi-year contract. However, this can be overcome by the political will to comply with the financial obligations assumed by the government when such contracts are signed. As construction contracts also usually extend beyond one year, the risks are similar for multi-year PBCs. The contracting road agency can mitigate these financial risks by giving priority in its budget proposals to contractual obligations relating to past years.
- Determination of the liability and indemnity of the contractor and client, particularly, in relation to incidents, accidents and emergencies caused by force majeure events.

Directions for the future

Road agencies in many countries have moved to a second round of PBCs, as they found this approach effective. However, prior to the second round road agencies have reviewed the results of the first round to learn lessons and have made necessary changes to improve their approaches. The main changes made by these agencies are described below:

- Performance indicators. After the first round of PBCs, the contracting agencies usually know what indicators should be revised and re-defined, and what additional indicators should be incorporated in the next round. For example, Argentina considered it necessary to include several new performance indicators into the second round of CREMA contracts. Specifically, some road safety measures (such as horizontal and vertical signing, protection barriers, upgrading urban crossways and intersections) and detailed environmental management plans were included as compulsory works.
- Payment schedule. Some agencies have found their payment schedule did not provide sufficient incentives to the contractors and have re-designed these. For example, the National Road Directorate of Argentina admits that in its first generation CREMA maintenance turned out to be more expensive than rehabilitation, although actual expenses for rehabilitation were higher than for maintenance. In the first generation CREMA 5-10% of the contract price was paid upfront upon initiation: 1/3 at the completion of the site camp and 2/3 – when equipment and staff are mobilized on a site; 15-25% was paid after the first six months of work; 25% - at the end of the 1st year; 50% was paid in 48 equal monthly installments. Therefore, the National Road Directorate adopted a new payment schedule for the second generation CREMA, which has no large upfront pre-financing from the contractor: apart from an initial payment of 7% of the contract amount that is supposed to cover mobilization and the detailed engineering project, the contractor now receives full payment for the rehabilitation works that he executes and proportionately to the outputs achieved during the first eighteen months of execution; the remaining portion of the contract representing routine maintenance (usually between 15% and 25%) is paid in 60 equal monthly instalments, i.e., over the full contract period.[11].
- Extension or reduction of the contract tenure. Many road agencies have recognized the need for longer-term contracts, as it would encourage development of this line of business within the contracting industry. For example, the City of Portmouth has awarded a 25-year PBC for the rehabilitation, operation and maintenance of the entire city road network (480 km), including 19,000 street lighting units and 84 structures and British Columbia Ministry of Transportation, Canada, has recently moved from 7- to 10-year contracts (BC MOT 2005). The main reasons for using longer-term contracts are that longer periods enable “contractors to plan over the longer term and pay off the costs of heavy equipment and facilities” (BC MOT 2005), “to amortize equipment, develop small contractors, utilize experimental materials or subcontract work with warranties” (AASHTO 2002). On the other hand, Columbia has reduced the contract tenure to 4 years to fit with the local realities of budgeting. In general, the contract period for PBCs should be as long as possible, consistent with the type of services covered and local budgeting practices, without depriving road administrations of the flexibility needed to deal with strategic changes in management of their road networks.
- Inclusion of more services and assets in the second round of PBCs. Some agencies (e.g., the Virginia Department of Transportation, USA) have found it advantageous to give the contractor responsibility for all assets within the right-of-way, all maintenance activities and traffic assistance services. Such an approach provides the contracting agency with a single point of contact for quality assurance on the network. It also avoids the situation in which the client is unable to clearly allocate responsibility for defective work, due to several different contractors working on the network.
- Rehabilitation works as part of a PBC. Several agencies have recognized the benefit of including rehabilitation[12] in PBCs, since this encourages contractors to render services at higher level in order to reduce their future maintenance related expenses. For example, the contractors’ obligation to maintain the roads over a five-year period in Argentina has reduced the risk of unsatisfactory quality in the rehabilitation works (Liautaud 2004). However, when initial rehabilitation cost exceeds some 40 percent of the

[11] Interview with G. Liautaud, WB staff.

[12] Rehabilitation as part of PBCs can be paid either on a fixed price lump sum or unit rate basis.

initial rehabilitation cost exceeds some 40 percent of the total cost of the contract, rehabilitating the roads through a traditional method-based contract and then applying a PBC is considered more advisable (Hartwig, Mumssen and Schliessler 2005).

LESSONS LEARNED FOR DEVELOPING COUNTRIES INTERESTED IN PBC INTRODUCTION

The review indicates that the following factors are key to successful implementation of the PBC approach:

- Commitment of higher level government;
- Adequate skills and expertise within the road agency;
- Appropriate capability of the contracting and consulting industries;
- Enabling contracting and partnering environment;
- Stable multi-year funding;
- Adapting the PBC generic principles and format to the specific local context of each country.

Developing and transition countries that have experience in method-based contracting may find the PBC approach useful for delivery of certain services and management of certain road assets. However, the degree of complexity of PBC should be matched to the level of development of the road sector in each country. Countries at an early stage of development with a relatively weak contracting industry and poorly defined legal framework may be able to pilot simpler forms of PBC, e.g., routine maintenance for a one year duration. Transition economies and middle-income countries with a more developed road sector and better-defined legislation could probably move directly to more complex forms of PBC. Each country/road agency would need to determine the market niche where the PBC approach would add most value.

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APPENDICES

1. A general checklist of road assets that can be included in the "comprehensive" performance-based contract

Pavement surface; Shoulders; Slopes; Potholes; Open drainage system (paved and unpaved ditches and swales); Catch basins; Drains; Inlets; Curbs; Gutters; Sidewalks; Roadsides; Medians; Signs and traffic signals;	Lighting; Fencing; Guardrails; Barriers; Attenuators; Street trees, shrubs and other plantings; Vegetation and aesthetics; Pavement markings; Pavement striping; Raised pavement striping; Highway and sign lights; Tunnels; Bridges; Rest areas, Over-height detectors; Oil/grit separators on bridges.

2. Cost comparison of PBC, method-based contracting and force account for 2007/08 by Florida Department of Transportation.

	PBC	Method-based contract	In-house
Annual Maintenance Cost	$121 m	$139 m	$148 m
Percentage Cost Savings	13%	6%	0
Number of contracts	28	993	0
Number of invoices to process annually	336	11,916	0
Contract advertisements and letting or renewals annually	4	962	0
In-house maintenance staffing	38	124	3,049
In-house non-maintenance staffing	2	30	123
Performance or task oriented	Perfor-mance	Task	Performance /Task

Source: Holmes 2005.

3. Weight of price and non-price criteria in the PBC procurement process in different countries.

Country	Weight of Selection Criteria
Australia Sydney, WA and Tasmania,	50% - price, 50% - others (varies with territory)
Alberta, Canada	78% - price, 22% - others
British Columbia, Canada	40% - price, 60% - others
Ontario, Canada	90% - price, 10% - others
England	30-40% - price, 60-70% - others
Finland	75% - price, 25% - others
New Zealand	50% - price, 50% - technical criteria
Sweden	90% - price, 10% - others
USA	50% - price, 50% - others and negotiated

Source: Pakkala 2002.

4. Ways of partnering in the PBC approach.

In **Serbia**, where the first round of hybrid contracts went out in 2004, the National Road Directorate has placed an emphasis on partnering since beginning. Regular weekly meetings are arranged for the three parties concerned and the Road Directorate is daily accessible for the contractor to clarify burning issues.

In **Estonia**, the National Road Administration arranges bi-annual workshops to bring together representatives of the contractors and road agencies (the latter perform both the role of client and supervisor) involved in PBC. The main purpose of such events is to share experiences of different counties, collaboratively discuss lessons learnt and find innovative solutions for future implementation of PBC.

In **Washington, DC, USA**, the client, contractor and supervising consultant started with weekly meetings, then switched to monthly ones and then to quarterly gatherings once number of issues requiring attention and clarification was declining.

5. Example of performance specifications for highway pavement patching and crack sealing: Case of British Columbia, Canada.

Performance Time Frames

a) The following table establishes the maximum time, from the time the deficiency was detected by or reported to the Contractor, within which the Contractor must complete repairs to each deficiency based on the severity rating in the Pavement Surface Condition Rating Manual:

		Summer Highway Classification				
Pavement Deficiency	**Severity**	**1&2**	**3**	**4**	**5**	**6&7**
Pothole on traveled lane or inner shoulder of curved highway sections	High	24 hours	2 days	3 days	7 days	14 days
Pothole on outside shoulder of curved highway sections and tangents	High	3 days	7 days	10 days	21 days	45 days
Pothole on right edge of divided highway in the directions of travel	High	24 hours	2 days	3 days	7 days	14 days
Pothole on left edge of divided highway in the directions of travel	High	3 days	7 days	10 days	21 days	45 days
Bleeding on traveled lane, or inside shoulder of curved highway sections	High	24 hours	2 days	3 days	7 days	14 days
Distortions presenting a safety hazards	High	24 hours	2 days	3 days	7 days	14 days
Source: B.C. MOT 2005.						

6. Monitoring system: Cases of British Columbia, Canada, and Chile.

A. In **British Columbia, Canada**, contractors must maintain and implement a Quality Management System (QMS) based on the principles of the International Organization for Standardization's ISO 9000-2000 standard. While contractors do not have to be certified, they are required to have a system that meets both the letter and the spirit of the ISO standard. The Contractor's QMS must include all processes and procedures for all activities, work and services to be provided by the contractor which conform to, but not limited to, the following requirements in the contract:

- all maintenance specifications;
- work identification and planning;
- stakeholder communication;
- environment;
- site safety;
- emergency response;
- equipment;
- gravel and stockpile licences;
- yards;
- provider system;
- signs;
- bridge journeyman requirements;
- reporting requirements.

Source: BC MOT 2005.

B. In **Chile** there are four kinds of inspections: (i) monthly inspections cover 10% of the roads under contract. Selection of stretches of 1 km each is based on a random sample well defined in the contract; (ii) weekly inspections looking at 5% of the roads randomly selected; (iii) non-programmed inspections to respond to complaints by road users; and (iv) follow-up inspections to verify that appropriate action has been undertaken by the contractor to rectify non-compliance. Payments to the contractor are based on the results of the monthly inspections. A percentage of compliance is being calculated based on a formula using the results of each individual performance standard as input data. Full payment will only be made on 100% compliance. During the first two years of the contract, compliance has been around 95%. Penalties are being applied if the contractor does not rectify established deficiencies within a certain time limit.

Source: Zietlow 2004.

7. Penalties for non-compliance with mandatory requirements: Case of CREMA in Argentina, 2004-2005

Section	Parameter	Performance Requirements	USD equivalent
Subject to rehabilitation	Pavement Roughness	IRI max.=3 (AC) IRI max.=3.5 (S.T./RC)	250/week/km
	Pavement Rut Depth	1 cm max.	500/week/km
	Pavement Edge Break	0 cm	500/week/sector
	Pothole>2.5 cm	100% patched	500/day/pothole
	Cracking	100% sealed, and < 15% type 2 or 4	250/week/km
	Concrete pavement joint cracks	100% sealed	250/week/km
	Ravelling	0%, and <2% if surface treatment	250/week/km
Subject to Routine Maintenance	Edge Break	3 cm max	500/week/sector
	Cracking	100% sealed up to type 4	250/week/km
	Pothole	100% patched	500/day/pothole
	Ravelling	100% patched	250/week/km
	Paved Shoulders	Pothole/raveling=0 Edge break=0 Rutting<12 mm Cracks sealed up to type 4	500/week/km
	Unpaved Shoulders	No erosion, no rut, good transversal slope; edge break<2 cm; width>=3 m.	500/week/km
	Bush Clearing	Bush height<15 cm over 15 m	50/ha/week
	Culvert/drains/bridge cleaning	Clean/Unobstructed	250/day/km
	Cleaning of Right-of-Way	No debris; maintain green areas	250/day/km
	Vertical Signs	Well maintained and visible day and night	50/day/sign
	Lighting	Well maintained	50/day/light
	Horizontal Marking	Well maintained and visible day and night	100/day/line/km
	Guardrails	In good condition	500/week/location

Notes:

1. Penalty application are waived during initial 3 months of contract, generally;
2. Roughness on sections subject to routine maintenance is measured for indicative purposes only;
3. 10% of the contracted network has to be inspected every month, by individual segments of 2 km;
4. Reduction of original thickness of wearing course not allowed;
5. Milling of rut allowed only if material milled is replaced;
6. Surface treatment over Asphalt concrete not allowed;
7. When crack type > 4, sealing may be replaced by other treatment (ex: slurry seal, micro-asphalt);
8. One month routine maintenance = USD 200/month*200 km= USD 40,000/month, on average per network;
9. Ex: 1 pothole remaining open every 10 km during one week = 500*7 days*200/10 km = USD 70,000 penalty;
10. 4 horizontal marking lines missing over 10 km during 1 week = 4*100*7*10=USD 28,000 penalty;
11. More than half of the above penalty parameters related to road safety concerns (risk of accidents)

Source: Gerard Liautaud, WB Staff.

8. Evaluation of bids: Cases of British Columbia, Canada, Finland, Washington, D.C., USA.

A. In **British Columbia, Canada**, the evaluation and selection process has several stages: (1) evaluation and ranking of Quality Management System (QMS, which is based on the principles of the International Organization for Standardization's ISO 9000-2000 standard) and Price Proposals to identify the "Preferred Proponent", and (2) finalization of the QMS and contract issues and awarding of a contract to the winner.

Source: BC MOT 2005.

B. In **Finland** the contractor selection criteria are weighted 75% to price and 25% to technical ones. The criteria cover references, personnel, and competence: equipment, depots, and salt storage; quality plan and subcontractors; methodology and traffic safety; a customer service provision; environmental assurance; a special winter index feature; and a 10% annual bonding requirement.

Source: Pakkala 2002.

C. During the evaluation of bids for a **Washington, DC**, performance-based contract, the evaluation panel focused their attention not on choosing only the lowest bid, but also on technical criteria (see Table 1). Though the contract price had the biggest weight of 50% in their decision, still the lowest bid was not the winner. The rationale behind it was that the lowest bid does not necessarily mean the best quality of service.

Source: Interview with James Sorenson, FHWA, Office of Asset Management