

A Review of Rehabilitation and Maintenance Performance-Based Contracting in Urban Areas

Irina Chepilevskaya<sup>a</sup>, Carlos Espindola<sup>a</sup>, Cesar Queiroz<sup>b</sup>

<sup>a</sup> *Nathan Associates Inc., 2101 Wilson Blvd, Suite 1200, Arlington VA 22201*

<sup>b</sup> *The World Bank Group, 1818 H St. NW, Washington DC 20433*

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**ABSTRACT**

Performance-based contracts (PBC) differ substantially from traditional method-based contracts that have been 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.

This paper discusses the advantages of the PBC contracts compared with traditional contracts and presents a strategy for launching such contracts in urban areas. It also briefly describes the performance indicators that help City Governments evaluate the contractor's work and provides a matrix of risks associated with PBCs. The paper also reviews in some detail the key steps of tender procedures usually associated with PBCs.

PBCs have become a proved way to increase the sustainability of road maintenance in urban areas.

**1. INTRODUCTION**

Performance-based contracts (PBC) differ substantially from traditional method-based contracts that have been 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, as stated by Stankevich, Qureshi, and Queiroz (2011).

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 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), with no consideration of the quality of the work beyond the very short term.

According to the World Bank Toolkit for Public-Private Partnership (PPP) in Roads and Highways (World Bank 2009), performance-based maintenance contracts, considered in the Toolkit a form of PPP, shifts the focus from administration (maintenance activities and resources) to certain performance conditions valued by the users. PBCs typically leave contractors with more autonomy in the design and organization of the works. Remuneration is based on a periodic (e.g., monthly) fee determined up-front stated in the contract and linked to performance indicators for a number of years.

In PBCs, the client specifies performance indicators that the contractor is required to meet when delivering maintenance services. 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 availability payment through a series of clearly defined penalties. In case of compliance, the payment is made regularly, usually in equal installments.

PBCs 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.

While PBCs have been used more often on inter-urban or rural roads, there are also several successful examples of urban road maintenance performance-based contracts around the world. This paper focuses on such contracts and lessons learned from them. PBCs have become a proved way to increase the sustainability of road maintenance in urban areas.

## **2. SUCCESSFUL PBC IN URBAN AREAS**

Early successful examples of PBCs in urban areas include, *inter alia*, Australia (Sydney), Uruguay (Montevideo) and the United States (Washington, DC and Aspen, Colorado) during the 1990s. They created additional interest around the world. Subsequent applications include work in the UK (Portsmouth) and Denmark (multiple municipalities).

In all cases, these contracts aim at an improved level of service for road users and better value for money, by combining the competences of the private sector and those of the public authorities. A brief description of the above PBCs is given below.

### **2.1 City of Montevideo, Uruguay**

Montevideo started the first performance based contract for 138km of its city roads in 1996. In this case, different parts of the road network required initial spot rehabilitation, which was paid for on a unit price basis. The City introduced a 3-year contract with a possibility of a 3-year extension, with the provision that the monthly fixed payments would be reduced by 40% during the extension period.

The PBC would define performance standards, response times and penalties for non-compliance for pavements, shoulders, and drainage systems.

Since actual road conditions were substantially below the performance standards defined in the contract, the contractor was given between 3 and 12 months to upgrade the different assets to the required standards as indicated by Zietlow (2005).

### **2.2 Sydney, Australia**

Frost and Lithgow (1996) pointed out that Australia started its first Performance Contract in 1995 covering 459 kilometers of urban roads in Sydney. 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 as described by Zietlow (2005).

### **2.3 Washington, DC, USA**

In July 2000, the District of Columbia embarked on the first urban, performance-based asset management project in the United States, known as "DC Streets." Under the \$70 million, 5-year initiative, the District of Columbia Department of Transportation (DDOT) and the Federal Highway Administration (FHWA) contracted with VMS, Inc., to preserve and maintain approximately 121 km (75 mi) of roadway that make up the District's portion of the National Highway System (NHS). Also included in the contract was the maintenance of such assets as tunnels, bridges, curbs, gutters, sidewalks, and retaining walls, according to the US Department of Transportation (2011).

### **2.4 Aspen, Colorado, USA**

Aspen, Colorado, is a major tourist destination during both the winter and summer. Tourism drives the local economy. During the winter, ineffective and inefficient snow and ice control can impair accessibility. Summer road maintenance can also interfere with traffic. To avoid the disruption required to maintain and improve roads and to avoid deferring maintenance, in 1999, the city of Aspen decided to enter into a 15-year contract, with extension options and a product quality warranty. The contract covered both rehabilitation and maintenance on about 30% of the city's streets. One of the objectives of this contract was to encourage a strong relationship between the contractor and the city. Long-term contracts tend to encourage contractors to reduce life-cycle costs by performing quality work at the right locations at the right time. The contract also offered the contractor considerable flexibility to determine the best methods and materials to perform the work. The contractor developed an innovative approach to effectively develop, manage, and oversee aggressive work schedules.

Thus far, the city of Aspen is reputed to be highly satisfied with the contractor and the partnership that has emerged. Cost savings have been realized, work has been completed faster than before, the work has been high quality, and the contractor has limited the adverse impact on tourist travel. A key to success has been the identification and effective alignment of goals and incentives between the city and the contractor, as pointed out by Hyman (2009).

### **2.5 Portsmouth, UK**

Stankevich et al. (2011) indicate that the City of Portsmouth, UK, signed in 2004 a 25-year contract with the Colas Group (JV Colas Ltd. and Colas SA). This contract has performance-based features, as it undertook to finance the rehabilitation and maintenance of roads for a period of 25 years against the payment of a fixed monthly fee during the same period of time. The contract covers 100% (480 km) of the city road network, 19,000 street lighting units, and 84 structures, also including street cleaning, winter maintenance, and emergencies.

### **2.6 Denmark**

Following the successful examples of other countries, Danish municipalities have begun favoring long term performance-based maintenance contracting of asphalt surfaces to other forms of maintenance contracts. The PBCs sizes vary between 30 km and 300 km. Maintenance of the road network is turned over to a contractor for a period of 15 years. This gives many incentives for innovative long lasting pavement types and repair techniques. Besides paved roads and road marking, shoulders and open drainage systems are also included in the contracts. According to Baltzer (2008), by February 2006, 19 municipalities (of a 270 total) have executed such long-term maintenance contracts, covering more than 3,000 km of roads.

### 3. WHY PBC IN URBAN AREAS?

Stankevich et al. (2011) identify reasons to engage in this form of contracting which include: (a) “political” reasons to dedicate resources exclusively to road maintenance which might otherwise be deferred due to budget pressures in other areas of government responsibilities; and (b) the need to reduce the disruption required to maintain and improve roads and to avoid deferring maintenance. Performance-based contracting shifts some risks from the client to the contractor. The performance-based contracts generally give a faster rate of surface renewal in the first years of the contract, at a competitive price.

According to Stankevich et al. (2011), the prices tend to be competitive for several reasons:

1. The work can be planned almost entirely by the contractors, which gives them an opportunity to even out the use of resources.
2. Long-term contracts tend to encourage contractors to reduce life-cycle costs by performing quality work at the right locations at the right time.
3. They also offer the contractor considerable flexibility to determine the best methods and materials to perform the work.
4. It allows the contractor to adopt innovative approaches to effectively develop, manage, and oversee aggressive work schedules.
5. It is a long-term contract with no need to spend resources every year on tenders.

Several studies have been conducted to compare the costs of performance-based maintenance contracts (PBMC) with other forms of maintenance delivery. For example, Smith, Frost and Foster (1994) indicate that in 1990 the Road and Traffic Authority (RTA) of New South Wales conducted a 12-month pilot in Sydney, Australia, that allowed a comparison of maintenance efficiency. During the first year, the private entity was able to achieve, relative to the state forces, a 16% savings in costs, a 22% improvement in productivity, and a 13% improvement in the condition of assets. The bid price was 25% lower than estimated. The Reason Public Policy Institute reported that since New South Wales started this performance contract, roadway condition has improved approximately 15% and there has been a 35% cost savings as stated by Segal et al. (2003).

A well-planned, -designed, and -structured road PPP project can generate substantial “value added” to the project in terms of investments, profits, quality of service, operating efficiency, innovation, and entrepreneurial abilities, but private sector participation in the project can also generate additional risks and costs. One of the main risks is the natural conflict between the interests of private investors and those of the public at large. The contracting agency has to keep in mind that one of the key factors of success has been the identification and effective alignment of goals and incentives between the city and the contractor.

Therefore, it is fundamental that, beginning with the very early stages of the planning process, the benefits and risks of the PPP project are properly allocated among government, private sector operators and investors, service providers, and users, as well as other sectors in the local economy that rely on the city roads.

Experience in privatization and public private partnerships processes of transport infrastructure in several countries indicates that there are some key issues for successful PBCs, including:

- Balancing the interests of the government, the private operators/investors, and the main users with the goal of maximizing the project’s contribution to the socio-economic development of the city
- Promoting stakeholders’ consultation to ensure that the development, management, operation and policies recommended for the Project are consistent with expected socio-economic development of the region

- Understanding of the commercial, economic, legal, regulatory, institutional and political risks that are associated to the Project and incorporating measures to mitigate or address those risks in the structuring of the transaction.

#### 4. LAUNCHING PBC IN URBAN AREAS

PBCs are generally launched with the ultimate goal of developing a sustainable and efficient rehabilitation and maintenance strategy for urban roads.

To accomplish the above goal, a methodology is proposed based on the following four principles: 1) A clear understanding of the objectives presented by the City Government; 2) A strong understanding of the needs and requirements from the public sector and private sector; 3) The application of best international practices and the extensive experience of sector specialists; and 4) A continuous and close coordination between the City Government and key stakeholders. This methodology is illustrated in Figure 1. It comprises (i) laying out the strategic objectives, (ii) carrying out a broad discussion of such strategy, including the proposed tender procedures, (iii) tender preparation, including external support, where needed, and (iv) contract monitoring, including training for incorporating lessons learned in future PBC contracts.

During strategic discussions, special attention should be given to the risk allocation, performance indicators, payment formula and schedules, details of the financial model (in case private financing is included), required investments, and length of the PBC contract.

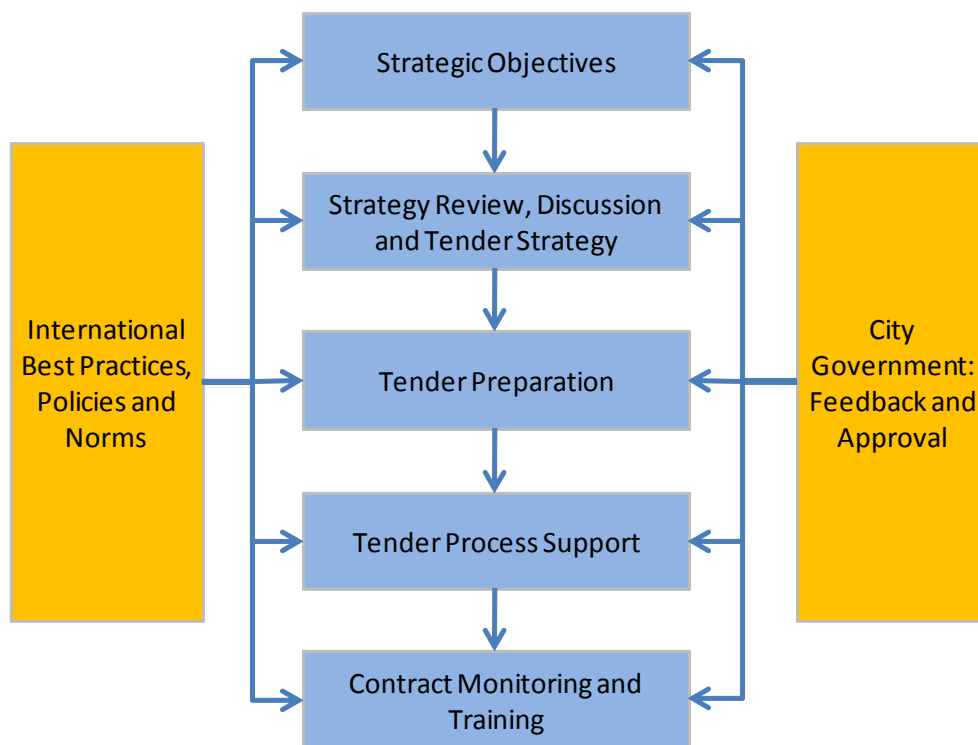


Figure 1. Strategy for Launching PBC Projects in Urban Areas (Source: Authors)

Topics to include in the strategic discussions may comprise:

1. Tasks to be included in the contract (carriageway - actual paved surface, road markings, shoulders and ditches, traffic safety such as guardrail and attenuators, roadside cleaning, bridges, snow and ice control, as well as bicycle tracks, pedestrian footways).
2. Risk Allocation; completion of risk allocation matrix.
3. Financial Arrangements: (a) financial guarantee that may be required, (b) payment schedule, (c) penalties assessed, and (d) concession or PBC length.
4. Institutional arrangements: Institutional arrangements are essential to ensure effective project preparation, planning, implementation and monitoring, clear procedures and an efficient allocation of needed functions. Which institutional design will be optimal? This will affect the nature of functions allocated to the Contractor / City Government.

## 5. PERFORMANCE INDICATORS

Before the tendering process, it is essential to carry out an inspection of the entire network to be contracted through PBC. This gives the City Government and prospective contractors a measure of the road network condition, through the use of key performance indicators. Such indicators will be used to measure the contractor's performance, which will be monitored during the life of the PBC contract. Payment deductions and penalties may be applied to the contractor in cases the minimum specified requirements are not met during a payment period (usually monthly). A good knowledge of the existing conditions makes it possible to set realistic requirements. Table 1 provides a sample of the most relevant performance indicators commonly used.

Table 1 Some examples of performance indicators

Category	Performance Indicators		
1. Road Surface	Potholes Patches Cracking Rutting	Corrugation Depression Heaves and Shoves Bleeding	Ravelling Skid resistance Roughness Deflection
2. Pedestrian ways	Potholes Depression	Patches Heaves and Shoves	Cracking
3. Horizontal Markings	Retro-reflectivity and completeness of horizontal lines and road signs		
4. Winter Maintenance	Ice and snow on road surfaces Road patrolling		

## 6. RISKS ASSOCIATED WITH PBC

It is critical to identify the risks associated to each of the tasks to be considered under the PBC contract and make recommendations as to which party is best able to handle them. An indicative set of foreseeable risks is given in Table 2. For the most significant risks, Phillips (2008) has proposed several mitigating measures.

Table 2 Sample risks, cost drivers, allocation, and treatment

Type of Risk	Risk	Cost driver	Allocation			Treatment
			City	Contractor	Shared	
Design Risk	Delay in final approval of detailed design	Construction Cost		●		Could result in increased cost of design or delay of the project, Overall design will be agreed prior to financial close. The design submitted as part of the proposal process ought to be sufficiently advanced. Compensation if unreasonable delay in the City's approval of detailed design.
Design Risk	Changes in design and construction standards during the Construction Period	Construction Cost	●	●	●	This depends upon the reason for the change. If the original design was deficient then Contractor's risk. If required by the City where no fault by Contractor then difficult for Contractor to assume.
Works and Services Risk	Quality assurance and quality control	Construction Cost		●		Responsibility of the Concessionaire
	Achieving Construction Standards and Specifications	Construction Cost		●		Note: * Standards: requirements by regulatory authorities * Specifications: requirements for the project
Force Majeure Risk	Intensive or extended event leading to termination	Construction Cost			●	Again turns on extent of insurance. Payment by Grantor would be off-set by amount of insurance received.
	Uninsurable risks (throughout the concession)	O&M Cost and possibly Performance Payment/Toll			●	International guidance is that the public sector retains risk that insurance is not available at commercial rates or that certain risks become uninsurable. In practice, due to difficulties in the insurance market post 9/11, the international market is adopting a risk sharing mechanism for increases in insurance costs above 50% and / or uninsurable risks.
Revenue Risk	Availability of road	Performance Payment/Toll	?	●		Unless non availability due to act of City or a risk for which grantor has responsibility then at risk of Contractor but may be insured risk.
	Volume risk	Performance Payment/Toll	?	?	?	Confirm applicability of tolls vs. performance payment. Where traffic forecasts weak City may assume some risk e.g. if tolled through minimum volume guarantee
O&M Risk	Increased maintenance due to traffic volume	Life Cycle Cost	?		?	Risk being shared in the event that there will be some element of performance payment which provides a partial hedge. Banks would conduct

						their own due diligence and usually use sensitivity analysis and Monte Carlo simulation to price this risk.
<b>Performance Risk</b>	Equipment used becomes prematurely obsolescent	Life Cycle Cost	?	●		If changes required to make systems compatible with other systems of City then City's change-otherwise Concessionaire risk.
	Change in scope of service specifications by public sector	Life Cycle Cost and/or Performance Payment/Toll	●			Losses in income or increased expenditure should be borne by City.
<b>External Risk</b>	Changes in standards	Life Cycle Cost	●			May be treated as change in law.
<b>Other Market Risk</b>	Base interest rates to Financial Close	Life Cycle Cost	●			If there is a period between commercial close i.e. project agreements are signed and financial close i.e. when financing documents are signed and conditions precedent to draw down are met then risk of interest changes usually taken by public sector in so far as payment will be based on interest rates at financial close.

## 7. TENDER PROCEDURES

### 7.1 Development of the Tender Procedure

This is probably the most critical element of the project preparation. It is essential that full agreement of all parties regarding the tender procedure is secured.

### 7.2 Pre-qualification Procedure

The objective of the prequalification procedure is to establish a list of legal entities (individual companies or consortia) that can demonstrate possession of the necessary financial and technical qualifications and experience to submit a competitive tender and to successfully conclude any subsequent contract. A Procurement Notice (call for Prequalification) should be published in appropriate national and international media. The Notice must provide would-be tenderers with the information they need to determine their capacity to fulfill the contract in question. The selection criteria identified in the procurement notice should be clearly formulated, without any ambiguity, easily verifiable on the basis of the information submitted, and should be devised to allow a clear “yes/no” assessment to be made as to whether or not the candidate satisfies a particular selection criterion.

### 7.3 Preparation of the Tender Dossier

Particular attention should be given to the following issues, depending on the type of financing and implementation model adopted:

- Compliance with national (and/or those of financing agencies) procurement requirements
- Conditions of Contract (e.g., FIDIC Red/Yellow/Gold Book)



- development of comprehensive and unambiguous particular conditions of contract
- clear definition of the selection criteria
- identification of tender, financial and performance guarantees required
- operational requirements
- monitoring requirements
- hand-over arrangements upon expiration of the PBC period

#### **7.4 Receipt and evaluation of tenders**

Tenders received before the prescribed deadline shall be registered and opened in a public session.

The Committee's first task is to establish administrative compliance of the offers, i.e., the completeness of the submissions in terms of documentation defined in the Instructions to Tenderers. Technical and financial evaluation of administratively compliant offers will establish compliance with the technical and financial criteria detailed in the tender dossier. The Committee will determine the most advantageous offer that fully satisfies the selection criteria. The Committee's evaluation report will summarize the results of all steps of the procedure, including details of any clarifications and responses requested, and make an unambiguous recommendation regarding the tenderer to be invited for contract negotiations.

#### **7.5 Contract negotiation**

Negotiations with the preferred company/consortium should aim to resolve any minor ambiguities in the technical and/or financial offer. The negotiations may also refine the terms of any subsequent contract, but must not materially alter the basis upon which the tender was prepared and submitted.

### **8. CONCLUSION**

This paper demonstrated that performance-based contracts have gained its popularity among city governments as an innovative and cost efficient form of PPP contract. It also discussed the strategy of launching PBC contracts in urban areas, described the performance indicators which help City Governments to evaluate contractors' work, and provided a sample matrix of risks associated with PBCs.

Successful examples of PBCs in urban areas are available from countries such as Australia (Sydney), Uruguay (Montevideo), United States (Washington, DC; Aspen, Colorado), UK (Portsmouth), and Denmark (several municipalities). These contracts have led to an improved level of service for road users and better value for money, by combining the competences of the private sector and those of the public authorities.

While PBCs have been used more often on inter-urban or rural roads, the paper showed that there are several successful examples of urban road maintenance performance-based contracts around the world. Based on such positive examples, it seems fair to conclude that PBCs have become a proved way to increase the sustainability of road maintenance in urban areas.

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