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**Cutting Costs and Improving Quality through
Performance-Based Road Management and Maintenance
Contracts
- The Latin American and OECD Experiences -**

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1. Introduction

The traditional way of contracting out road maintenance is based on the amount of work being measured and paid for on agreed rates for different work items. By contrast, Performance-based Road Management and Maintenance Contracts (herein after referred to as Performance Contracts) define minimum conditions of road, bridge, and traffic assets that have to be met by the contractor, as well as other services such as the collection and management of asset inventory data, call-out and attendance to emergencies, and response to public requests, complaints and feedback. Payments are based on how well the contractor manages to comply with the performance standards defined in the contract, and not on the amount of works and services executed. Performance Contracts are defining a final product and it is up to the contractor how to achieve this. Therefore, work selection, design and delivery are all his responsibility. Hence, the choice and application of technology and the pursuit of innovative materials, processes and management are all up to the contractor. This allocates higher risk to the contractor compared to traditional contract arrangements, but at the same time opens up opportunities to increase his margins where improved efficiencies and effectiveness of design, process, technology or management are able to reduce the cost of achieving the specified performance standards.

2. Brief History of Performance Contracts

The development of Performance Contracts for road maintenance started in the late 1980's and early 1990's. First **British Columbia in Canada** contracted out its road maintenance in 1988. But performance standards were still more oriented towards work procedures and materials to be used, rather than result oriented, very much limiting the contractor in the application of new technologies.

Shortly afterwards, **Argentina** concessioned approximately 10000 kilometers of its national roads, using end result performance specifications for the maintenance services and a penalty system for not meeting response times for rectifying deficiencies. In the mid 1990 the maintenance of another 10000 kilometers was contracted out using similar performance specifications. But this time without applying tolls, since average traffic levels were below 2500 vehicles per day and therefore could not sustain a tolling system. These contracts are also referred to as CREMA, contracts for rehabilitation and maintenance.

In the mid 1990's **Uruguay** started its first pilot scheme of Performance Contracts on a small network of 359 kilometers of its national roads. In the same year Montevideo followed suit by contracting out the maintenance of 150 kilometers of its main arterial urban roads. The new contracting scheme proved to be so successful that now, only five years later, 50% of the national roads in Uruguay are being maintained through Performance Contracts.

Box 4: Uruguay was quick to adopt Performance-Based Road Asset Management and Maintenance Contracts

National road network

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 covered routine maintenance only and the other one included initial rehabilitation and periodic and routine maintenance.

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 new contracts could absorb.

The second type was introduced as a pilot project and rapidly went beyond this stage as the systems was producing excellent results in a fairly short time-period. By January 2000 42% 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.

City of Montevideo

Montevideo started the first performance based contract for 138km of its city roads in 1996 as well. Due to deficiencies parts of the road network required initial spot rehabilitation, which was paid for on a unit price basis. The 3-year contract allows for a 3-year extension, whereby the monthly fixed payments will be reduced by 40% during this extension period.

Performance standards, response times and penalties for non-compliance are defined for

- Pavements
- Shoulders
- 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.

Several other countries in Latin America such as **Brazil, Chile, and Colombia** have started similar contracts and others such as 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 40000 kilometres of roads in Latin America are being maintained under Performance Contracts.

Australia started its first Performance Contract in 1995 covering 459 kilometers of urban roads in Sydney (Frost, M. and C.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.

In 1998 **New Zealand** let its first Performance Contract for the maintenance of 406 kilometers of national roads. Presently, 10% of New Zealand's national roads are maintained using the new contract scheme. Contracts in one of the counties!

In the **United States of America**, the State of Virginia pioneered a Performance Contract called "Asset Management and Maintenance Contract" for the maintenance of 402 kilometers of Interstate Highways in 1996. Four years later Washington D.C. followed suit with a similar contract that covers 119 kilometers of federal roads (Federal Highway Administration, 1999). Both contracts are considered pilots. Several other states have started to contract out maintenance on parts of their road networks applying a mixture of performance specifications and unit prices.

3. Main Reasons for Implementing Performance Contracts

The main reasons for contracting out road maintenance implementing Performance Contracts are to

- reduce maintenance costs through the application of more effective and efficient technologies and work procedures;
- provide transparency for road users, road administrations and contractors with regard to the conditions roads have to be maintained;
- improve control and enforcement of quality standards; and
- improve overall road conditions.

The introduction of Performance Contracts in road maintenance has resulted in considerable cost reductions in Australia, the United States and New Zealand (see section 7). In Latin America no cost reductions have been reported so far, since no cost comparison studies have been undertaken. But road conditions have notably improved on roads that are being maintained under the new contracting scheme.

4. Preparation of Bidding Documents and Bidding Process

All counties, which have introduced Performance Contracts, have done so gradually, starting with one or two pilot projects in order to gain experiences with the new contract arrangement.

Before embarking on such pilot scheme, it is necessary to analyze its legal and financial feasibility first. One of the most important legal aspects is the maximum contract period allowed by law. In most of the countries in Latin America, for example, the maximum contact duration is restricted to either four or five years, making it necessary to change laws in order to accommodate long-term contracts. Financing has to be secured for the entire duration of the contract. For example, one pilot project in Brazil had to be abandoned only after one year of operation due to a shortage of funds.

Prior to the preparation of the bidding documents a number of steps have to be taken to define the road network to be contracted out, to make an inventory of the assets involved and to determine its condition, to select and define the performance standards, select and define the methods of measuring those standards, to define the likely maintenance and possibly rehabilitation works, and to prepare preliminary cost estimates. The data on the

inventory and the conditions of the assets are given to the potential contractor as reference only. It is the responsibility of the contractor to make sure that the information is correct, since he has to assume responsibility for meeting the performance criteria. A methodology of designing a pilot contract can be retrieved under <http://www.zietlow.com/docs/actcns.pdf>

For the preparation of bidding documents, existing bidding documents used for road construction can be used, but they will have to be adapted to suit the special nature of Performance Contracts. Performance Contracts that are being used in other countries might be helpful. Good examples are the Performance Contracts for road rehabilitation and maintenance in Argentina (CREMA) and the bidding documents prepared by the DNER of Brazil for a similar scope of work, and the Performance Contracts for road maintenance in Uruguay. Uruguayan bidding documents can be found under <http://www.dnvuruguay.com/licitaciones/pliegos-r8.htm> and for the Technical Specifications of the CREMA, see <http://www.zietlow.com/docs/crema.htm>. A Sample Bidding Document for Performance-based Management and Maintenance of Roads prepared by the World Bank can be found under http://www.worldbank.org/transport/roads/c&m_docs/pmmr_final.doc

Since Performance Contracts are new for road administrations and contractors alike, close cooperation between both parties is vital for success. Both sides have to be comfortable with the contractual arrangement and understand the risks involved. In all Performance Contracts that have been let until now, road administrations and contractors have closely worked together in preparing the bidding documents.

In some countries such as Uruguay the road administrations, which were used to prepare bidding documents without consulting contractors, had to adjust to the new situation, because of a lack of interest from contractors to embark on the new contracting scheme. In the United States it was the contractor who actually initiated the process and presented a draft of the bidding documents to the road administration. In this case the Virginia State Parliament had to pass a law first to allow for unsolicited bids to be accepted by the Virginia Department of Transport.

In all the other Performance Contracts competitive bidding procedures have been used after pre-qualification of potential contractors. Especially in the case of pilot schemes the qualification of the contractor is a major factor besides the overall price. Therefore, the contractor who offers the lowest price does not necessarily win the contract.

Performance Contracts essentially are fixed price contracts. But they often do contain a schedule of prices for emergency works. If sections of the road in question are in poor condition, the contract should include the rehabilitation of these sections as well. In this case rehabilitation works may be carried out in the "traditional" form, with official design and paid on the basis of unit prices as in the cases of Chile, Colombia and Uruguay. Or alternatively, final design of rehabilitation works can be left to the contractor and payment for these works can be included in the lump sum contract price. Argentina has taken this approach whereby 55% of the lump sum has been paid in three installments during the first year (rehabilitation period) and 45% in 48 equal monthly installments in the years two to five of the five-year contract period. To include initial rehabilitation works in the Performance Contracts has two main advantages: first, it gives the contractor incentives to perform well on the rehabilitation works to avoid premature repairs which would increase maintenance cost, and second, it insures that maintenance will start immediately after the rehabilitation works have been finished.

Performance Contracts shift much of the risk, which is normally assumed by the road administration, to the contractor. Therefore, the potential bidders have to be given sufficient time to prepare their bids. This time of course is much longer than in the case of “traditional” maintenance contracts.

Performance Contracts are essentially management contracts and traditional road construction or maintenance contractors often do not have the required qualifications necessary for this type of contract. Consulting firms with extensive know-how in managing other contractors and experiences in pavement management systems seem to be more suited for the job. In Virginia, for example, the Performance Contract is managed by a firm, which has been formed by two consulting firms. Most of the maintenance works are subcontracted, allowing for an efficient resource allocation (just on time principle). A joint venture of a road construction firm and a consultant might also work well. The evaluation criteria and weights that have been applied to award the Performance Contract in Washington D.C. are compiled in Figure 1.

Figure 1: Evaluation Criteria and Weights Applied for the Award of the Performance Contract of Washington D.C.

Technical	Experience, knowledge and understanding of issues relating to preservation and maintenance of the assets covered by this contract. Soundness of technical approach for meeting the performance measures for all of the assets referenced in this contract	20%
Staffing, Quality Control/Quality Assurance, Management	Staffing Plan	5%
	Management Plan	5%
	Quality Control/Quality Assurance Plan	5%
Past Performance	The extent to which the Prime Contractor's and subcontractors' past performance on similar asset preservation, maintenance, and management contracts demonstrates a likelihood of successfully performing all of the tasks set forth in this contract.	15%
Cost	The extent to which proposed costs are realistic and reflect the likely overall cost to the government over the term of the contract	50%

5. Performance Standards and Response Times

To define the “right” performance standards is a rather challenging task. The objective is to satisfy a set of goals such as

- to minimize total systems cost, including the long-term cost of preserving road, bridge and traffic assets and the cost to the road user, and
- to satisfy comfort and safety of road users.

To avoid ambiguity, performance standards have to be clearly defined and objectively measurable.

Typical performance standards are:

- The International Roughness Index (IRI) to measure the roughness of the road surface, which affects vehicle operating cost;
- The absence of potholes and the control of cracks and rutting, which effects safety and pavement performance;
- The minimum amount of friction between tires and the road surface for safety reasons;
- The maximum amount of siltation or other obstruction of the drainage system to avoid destruction of the road structure; and
- The retro reflexivity of road signs and markings for safety purposes.

As traffic conditions vary from road section to road section, different sets of parameters will create minimal system cost, taking into account road maintenance and vehicle operating costs. The application of the Highway Design Model (HDM) can be helpful to define some of these parameters, such as the IRI.

Examples of performance standards applied in different contracts in Latin America are compiled in Figure 2. For more details see <http://www.zietlow.com/docs/spadocs.htm> and go to Contratos de Conservación Vial por Estándares ó Niveles de Servicio.

Figure 2.: Examples of Performance Standards Applied in Different Performance Contracts 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	Complete and clean (Argentina, Chile, Peru)
	Road markings	Complete and visible (Argentina, Chile, Peru)
	Reflectivity of road markings	160 mcd/lx/sqm. (Argentina) 70 mcd/lx/sqm. (Uruguay)
Right of way	Vegetation	< 15cm height (Argentina, Uruguay)
	Foreign elements	No foreign elements allowed

While in the Performance Contracts in Latin America all performance standards have to be met 100%, the contracts in Australia, New Zealand, and the United States allow performance targets to be less than 100%, see Figure 3. For a list of performance standards used in the contract in the State of Virginia go to <http://www.zietlow.com/docs/washdcap.pdf> and for a list of performance standards and response times used in New Zealand go to http://www.transit.govt.nz/technical_information/content_files/Amendment68_PDFFile.PDF

Figure 3. Example of Performance Standards of the Performance Contract let in Virginia, USA

Asset	Outcome	Performance Target in % of Asset	Performance Standards
Cross Pipes < 36 ft sq)	Structurally sound Open drains Joints intact Adequate capacity No erosion	95	< 10% deteriorated barrel > 90% diameter open Joints intact End protection intact No dip in road over pipe indicating structural problems
Paved Ditches	Aligned Structurally sound Clean	95	< 1" settlement < 25% spalled no obstruction to flow of water
Sidewalks and Ramps	Smooth Safe Sound	90	No settlement > 1/2" No unsealed cracks > 1/4" < 25% spalled

For each performance standard there is a response time and often a penalty defined for non-compliance. For example, in the CREMA contracts for each pothole more than 2 cm deep, a penalty of US\$ 100 is being applied for each day it stays open. For a detailed list of performance standards and response times of the CREMA contract see http://www.worldbank.org/html/fpd/transport/roads/c&m_docs/7thiclv.pdf. Another good example for performance standards and response time is the latest State Highway Maintenance Contract Proforma Manual SM032 of Transit New Zealand. The document can

be downloaded from

http://www.transit.govt.nz/technical_information/content_files/Amendment68_PDFFile.PDF

Figure 4. Example of Contract Standards and response times used in the State Highway Maintenance Contract Proforma Manual SM032 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 kilometer 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

In addition to the performance standards defining asset conditions, there are other standards covering, for example, emergency response times and reporting procedures.

Performance standards and response times vary widely from one contract to another. Each country seems to follow a slightly different path due to a variety of factors. One thing is clear that performance standards are still evolving and continue to be a subject of further analysis and debate.

6. Performance Monitoring and Payment Procedures

Performance monitoring is key to the success of this new way of contracting road maintenance. Appropriate control procedures as well as penalties for non-compliance have to be well defined in the contract documents. Procedures defined in various contracts, as well as experiences, vary.

In the case of road concessions in **Argentina** inspectors are inspecting the road and making random checks to verify compliance at least twice per month. Over time, inspectors become more experienced and familiar with trouble spots along the roads. Experience underlines the importance of having a well-documented inventory of the road as well as daily records of activities undertaken by the contractor. This helps to understand the specific behavior of the roads and contributes to better preventive maintenance. Inspectors and personnel of the contractors went through a valuable phase of learning and adaptation to arrive at an effective control system. In Argentina a very important role is given to the active participation and control of the road user. Each toll station is keeping a complaints and

suggestions book and users are encouraged to report incidents to the Road Administration. Extensive use of this mechanism has helped to improve road conditions and has revealed an increasing satisfaction of the road users with the new scheme. As for the CREAMA contracts performance monitoring and payment procedures are very similar to the ones in Chile.

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.

In order to enable the contractor to manage the contract properly and the road administration to monitor, it is vital that the contractor has a proper management and quality control system in place. The Argentinean, Chilean and Uruguayan contracts are especially specific in this respect. Part of the obligations of the contractor is to keep records of his inspections, quality control procedures and works undertaken. This is especially important to monitor and to make necessary adjust to the pilot projects as well as to gain experiences for further contracts. For example, due to the excellent contract monitoring system in place in Uruguay, the recently let contracts show significant improvements over the earlier contracts.

In **Australia, New Zealand, and the United States** the management and quality control systems used by the contractors are even more sophisticated compared with the Performance Contracts in Latin American. The maintenance management system that is being used in the contracts in Virginia covers:

- Asset inventory and condition assessment (updated annually)
- Pavement management program
- Bridge management program
- Snow and ice control operations plan
- Safety management and traffic control plan
- Emergency response plan
- Hazardous materials communications plan
- Customer response plan
- Public information plan
- Implementation plan
- Annual work plan updated every 3 months
- Extensive reporting procedures

The monitoring of the performance of the contractors is done on a daily, monthly, and annual basis. For more details on how this is being done in the case of the contract in Washington D.C., see <http://www.zietlow.com/docs/washdcap.pdf>

Box 3: State of Virginia is the first to let a Performance-Based Road Asset Management and Maintenance Contract in the United States of America

In December 1996 the Virginia Department of Transportation (VDOT) awarded VMS, Inc. (VMS) a contract for asset management and maintenance of 1,250 lane miles or approximately 250 miles of interstate highways. The contract was developed on the basis of performance criteria with clearly defined outcomes. This contract is the first road asset management and performance based contract in the United States of America and an innovative approach to provide a high and well-defined quality of service to the user at lower cost. Interestingly, VMS is an independent company with two consulting firms as prime investors that made an unsolicited offer to VDOT for this contract, sensing that this line of business is especially apt for consulting firms and is going to have a great future in the US.

Cost Savings

VDOT estimated to save with this contract approximately 16% over the five and one-half year contract period maintaining the highway in its existing conditions. A report issued by VDOT in December 2000 showed that actual conditions indicate significant improvements resulting in further savings. In addition, VMS has implemented a number of pavement material innovations, including Roadflex, Novachip, and a crack seal program that has improved the service life of the interstate highways.

With a “just-in-time” delivery of maintenance services the contractor engages resources – labor, materials and equipment – on an as needed basis. This lowers total cost by avoiding excess inventory and under utilization of resources.

Asset Management Services

Under the contract VMS is 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
- Snow and Ice Control

Within each feature there is a series of functional activities. For example, the pavement group includes activities such as pothole patching, base repair, pressure grouting and asphalt resurfacing. Each asset has been assigned a tolerance level of acceptance, which VMS is expected to meet or exceed. For example, potholes are not acceptable if bigger than 75mm x 100mm (3” x 4”) and more than 25mm (1”) deep. VMS guarantees services to meet agreed upon standards and performance measures and backs this guarantee with performance bonds. These outcomes were developed jointly between VDOT and VMS during contract negotiations and provide measurable standards that are monitored on a quarterly basis.

Under the contract VMS is also responsible for traffic control and assistance to the Virginia State Police and to local police and fire authorities. VMS’ response time is 20 minutes during normal working hours and 40 minutes during non-working hours. After major incidents a critique of how well VMS responds and manages traffic control is performed. In

addition, VDOT submits questionnaires to all nine Virginia State Police units along the interstate corridors managed by VMS. Past results have indicated that VMS' performance was highly appreciated.

Subcontractors

In-house staff is providing only approximately 15% of VMS' services. The remaining services are being subcontracted. In order to raise the quality of services of subcontractors and improve competition among them, VMS engaged in an extensive training program for small contractors. This way better quality could be provided at lower cost. (Lande 1999 and VDOT 2000)

Contractors are being paid a fixed fee per monthly as stipulated in the contract. There are no provisions for deductions to be made to the monthly fee in case of underperformance. Instead, the road administrations have the right to terminate the contracts prematurely if the contractor does not meet his contractual obligations. Especially strict in this sense is the contract in New Zealand (see <http://www.zietlow.com/docs/PSCM-NZ.htm>).

Normally, the fixed monthly fees are adjusted in accordance with a pre-established formula to account for any possible inflation or deflation of prices. The adjustment formula used in the Performance Contract in New Zealand can be found under <http://www.zietlow.com/docs/PSCM-NZ.htm>).

7. Implementation Experiences

The approach taken to implement Performance Contracts varies from country to country. The experiences of the road administrations with contracting out road maintenance and the competence of local contractors played a major role. The longer the experience of contracting out road maintenance, the more comprehensive was the scheme that has been adopted. Guatemala and Honduras, which previously had executed all road maintenance by in-house staff started with one or two-year contracts with performance standards related to routine maintenance only.

Brazil, Chile, and Uruguay have started with pilot contracts with a road network of approximately 300 kilometers each, concentrating mainly on roads with asphalt concrete and bituminous treated surfaces. In some cases gravel roads were included as well. Typical contract duration was between 3 to 5 years.

Except for one contract in the state of Santa Catarina in Brazil, which had to be terminated prematurely due to a shortage of funds, all contracts have been successful. Uruguay went already beyond the pilot stage and is maintaining more than 50% of its network through Performance Contracts. Chile, which has two contracts, is planning to extend the number of Performance Contracts in the near future. Figure 5 provides an overview of Performance Contracts in Latin America.

Figure 5. Performance Contracts in Latin America (December 2001)

	Number of Contracts	km (total)	km (average)	Contract Period years	Type of Maintenance	Annual Cost in US\$ per km
Argentina 1 (c)	59	11 295	191	5	l-r	11 000 (a)
Argentina 2 (c)	11	3 623	329	4	r	2 100 (b)
Brazil 1 (c)	7	2 000	286	5	l-r	7 000 (a)
Brazil 2 (c)	1	193	193	3	l-r	1 600
Chile (c)	2	747	374	5	l-r	3 200
Colombia (m)	280	11 487	41	1	r	1 500
Colombia (mU)	5	308	62	1*	r	1 050 (b)
Guatemala (m)	130	4 200	32	1*	r (d)	1 700 (d)
Honduras (m)	36	1 670	46	1	r	1 200 (d)
Nicaragua (m)	27	1 250	46	1	r	1 000 (d)
Uruguay (c)	7	1 486	248	4-5	r-p	7 000
Uruguay (m)	10	1 823	182	2*	r	3 800
Uruguay (s)	2	733	367	2*-4	r	--
Uruguay (U)	1	143	143	3*	r-p	2/m2
Total	579	40 988	(c): 203 (m): 42			

I: initial rehabilitation; r: routine maintenance; p: periodic maintenance

(c): traditional contractors; (m):small-scale enterprises; in Colombia (mU) and in Guatemala with the participation of women;

(U): urban roads; *: renewable for a further term

(a): includes initial rehabilitation cost

(b): small-scale enterprise, the Municipality of Popayán is providing materials and tools.

(d): covers only the drainage system and right of way

Note: Brazil has let performance-based contracts on more than 25000 km during the year 2002

Cost savings have not been reported in the case of the Performance Contracts in Latin America, since no studies have been undertaken to analyze this issue. But in all cases road conditions have improved considerably.

In contrast the Performance Contracts in Australia, New Zealand and the United States have reported substantial cost savings compared to the traditional form of contracting out road maintenance. The contract in Sydney was more than 10%, the contract in Virginia at least 16%, and the first contract in New Zealand 15% and the second 20% lower compared to traditional contract prices. These cost savings have been achieved mainly through better resource allocation, the introduction of new technologies and work procedures, and the training of subcontractors. At the same time contractors are maintaining the road, bridge, and traffic assets to a higher standard than previously applied to the same assets. Since these Performance Contracts are still in a pilot stage and road administrations as well as contractors have to gain experiences with this new kind of contract, it can be expected that costs will drop even further.

Interestingly, in the case of Virginia the Department of Transport has adopted several work procedures and materials, which have been introduced by the contractor of the Performance Contract.

8. Lessons Learned and Recommendations for Future Contracts

Most of the Performance Contracts have been let recently and are still in a pilot stage. Therefore, only preliminary conclusions can be drawn at this moment. The following recommendations are mainly based on the experiences gained with the Performance Contracts in Latin America.

- **Securing finance on a pluriannual basis is critical to success.** Normally, Performance Contracts have duration between 4 and 10 years. It is important to secure financing for the entire contract period before starting such a contract, see Brazilian experiences on pages 11 and 13.
- **Each Performance Contract has to be tailored to each specific situation.** Performance Contracts are still in an early stage of development and differ widely from country to country and even within countries. Studying the experiences of existing Performance Contracts in several countries is recommended before embarking on this new type of contract.
- **Pilot schemes for contracting out road maintenance based on performance standards should be carefully planned and implemented.** The complexity of the contracts, especially with regard to performance standards, road surfaces and contract duration should be based on past experience in contracting out road maintenance, the ability of the road administration to prepare and monitor such contracts, and the qualifications of local contractors to manage this new type road maintenance contract. Wherever there is little experience with contracting out road maintenance, a gradual approach is recommended, starting with short-term contracts and simple performance standards with regard to the control of potholes and cracks and the cleaning of the drainage system. Whenever roads are not in maintainable conditions, prior rehabilitation is necessary, either based on unit prices or included in the fixed monthly payments the contractor receives over the contract period.
- **Whenever circumstances permit, Performance Contracts should be longer than five years and should include periodic maintenance in order to maximize the potential benefits.** The longer the contract the greater is the incentive for the contractor to try-out and apply new technologies and to optimize resource allocation.
- **Well-qualified contractors and inspectors are key to the success of Performance Contracts.** Training programs which have been conducted for small-scale enterprises and inspectors in Uruguay and Honduras have shown good results. Equally, traditional contractors require training in modern management techniques and the application of new maintenance procedures and technologies.
- **Proper performance monitoring and strict application of penalties for non-compliance have proven to be critical to the success as well.** Wherever road administrations did not properly monitor the performance of the contractor or did not apply proper penalties for non-compliance, contractor's performance was deficient.

- **Performance standards need to be developed further.** The development of performance standards is still in its early stage. Until now each road administration has developed its own standards by slightly modifying the ones they used before for in-house labor or contractors.
- **Performance Contracts might not result in cost savings immediately.** Until now only the contracts in Australia, New Zealand and the United States have reported substantial cost savings. As for the contracts in Latin America no comparable cost analysis has been undertaken. Nevertheless, some of the contracts have been awarded for lower prices than expected by the road administrations, which indicates possible cost savings. But contracts also might turn out to be more expensive than expected. Recently, the DNER of Brazil had to cancel a tender for Performance Contracts, as the prices offered were much higher than expected. This was mainly due to the high risks perceived by the bidders that the government might not honor its payment commitments. Therefore, a balanced approach towards the distribution of risks is recommended. The party that controls the risks should also take the risks.

The principal advantage of contracting out road maintenance based on performance standards is its **potential** for reducing road maintenance costs and improving road conditions. Another important advantage of this new contracting scheme is that the users know exactly the road conditions they can expect and demand. Unfortunately, improper implementation of this scheme could backfire and produce adverse effects. It is to be expected that contracting out road maintenance based on performance standards will quickly spread all over the world and eventually will replace the traditional way of contracting out road maintenance based on unit prices.

Biography

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Note: Additional documents on Performance-Based Road Management and Maintenance Contracts can be found on the Website: <http://www.zietlow.com/docs/engdocs.htm>