

**PERFORMANCE SPECIFIED ROAD MAINTENANCE CONTRACTS:
THE ROAD TO THE FUTURE
THE LATIN AMERICAN PERSPECTIVE**

Dr. Gunter J. ZIETLOW
Alberto BULL

International Road Federation (IRF)
UN-Economic Commission for Latin America and the Caribbean (ECLAC)
Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
8516 Meadowlark Lane, Bethesda, MD 20817, USA
Tel: (301) 767 8934, Fax: (301) 767 0346
E-mail: irfgtz@mindspring.com
Internet: <http://www.zietlow.com>

SUMMARY

Cutting the cost of road maintenance and improving road conditions are the main reasons why several Latin American countries have started to look for new ways of contracting out road maintenance. With technical assistance from the International Road Federation and German Aid, Colombia, Brazil, Guatemala, Peru and Uruguay have initiated so called Performance Specified Road Maintenance Contracts on a pilot basis. In addition, Argentina and Chile have let several such contracts recently. In this scheme the Road Authority serves as the owner, but out-sources both the management and production of the maintenance work to a single contractor. Most of these contracts have been operating for more than a year and cover routine maintenance and, in some cases, periodic maintenance and road rehabilitation as well. Extension of the road network, road surfaces and conditions, and the time period vary in each pilot project and will provide a wide basis for evaluation and improvements.

This article provides an overview of the different pilot projects, giving special attention to the performance specifications and control procedures, how these contracts have been implemented, and what lessons can be learned so far.

KEY WORDS: CONTRACT / CENTRAL AMERICA / COST / MAINTENANCE / QUALITY / QUALITY ASSURANCE / SOUTH AMERICA / SPECIFICATION

1. INTRODUCTION

Cutting the cost of road maintenance and improving road conditions are the main reasons why several Latin American countries have started to look for new ways of contracting out road maintenance. With technical assistance from the International Road Federation and German Aid, Brazil, Colombia, Guatemala, Peru and Uruguay have initiated so-called Performance Specified Road Maintenance Contracts on a pilot basis. In addition, Chile and Argentina have let several such contracts recently. Most of these contracts have been operating for more than a year and cover routine maintenance and, in some cases, periodic maintenance and road rehabilitation as well. Extension of the road network, road surfaces and conditions, and the time period vary in each pilot project and will provide a wide basis for evaluation and improvements (see Table 1).

Table 1. Examples of Performance Specified Road Maintenance Contracts as of Dec. 1998

Country	Number of Contracts	Length in km	Duration of Contract in years	Type of Maintenance	Cost per km and year in US\$
Argentina	61(a)	11.813	5	r	A: 11.000(c)
Chile	2(a)	747	5	r	C: 3 850 A: 3 200 B: 2 700
Colombia	3	545	2	r, s	A: 6 200
Guatemala, small scale enterprises	70	2 995	1 (b)	r (drainage system and right of way only)	1 950 (drainage system and right of way only)
Uruguay	4(a)	1 007	4	r, p	C, A, B and G 6 980
Uruguay, small scale enterprises	8	1 564	2 (b)	r (excluding signs and markings)	A, B and G: 3 800
Uruguay (Montevideo)	1(a)	1.05x10 ⁶ m ² !	3 (b)	r, p	A: 1.8/m ² C: 2.8/m ² G: 2.0/m ²
Brazil (Santa Catarina)	1(a)	375	5	r	A and G 3 000

(a) Contracts include some initial road rehabilitation works

(b) Can be extended for one period of equal duration

(c) Lump sum including the initial rehabilitation costs

r: routine maintenance; p: periodic maintenance; s: other services provided to users (telephone, ambulance, towing) and administration of the roads

C: cement concrete; A: asphalt concrete; B: Bituminous treated; G: gravel

The experiences of the road rehabilitation and maintenance concessions let in Argentina in 1990 were used in the design of these projects. In addition, several developed countries such as Australia and, most recently, the United States of America and New Zealand¹ have started to contract out road maintenance based on performance specifications.

2. PERFORMANCE SPECIFIED ROAD MAINTENANCE CONTRACTS

What is a Performance Specified Road Maintenance Contract? The traditional way of contracting road maintenance is based on a schedule of unit prices and estimates of quantities. The works to be performed are specified in the contract and payments are based on executed measured works. By contrast, a Performance Specified Road Maintenance Contract defines the minimum conditions of road, bridge, and traffic assets that have to be met by the contractor. 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 executed. The nature of the contract allocates responsibility for work selection, design and delivery solely to the contractor. Hence, the choice and application of technology and the pursuit of innovation in materials, processes and management is all up to the contractor. This allocates higher risk to the contractor compared to the traditional contract arrangement, but on the other hand may increase the contractor's margin where improved efficiency and effectiveness of technology, process, design or management reduces the cost of achieving the specified standards.

To define these standards is rather a challenging task. The aim is to minimize total systems cost, including the long-term cost of preserving the roads as well as the cost to the road user. 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;
- 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;
- The retroreflexivity of road signs and markings, and
- The control of vegetation close to the roadway to a specific height.

Examples of performance standards applied in different contracts are compiled in Table 2.

¹ For further details visit the world wide web under the address: <http://www.zietlow.com>

Table 2.: Examples of performance standards applied in different contracts

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 unhindered flow of water (Chile, Uruguay) Without damages and deformations (Chile, Peru)
Road signs and markings	Road signs Road markings Retroreflexivity of road markings	Complete and clean (Argentina, Chile, Peru) Complete and visible (Argentina, Chile, Peru) 160 mcd/lx/sqm. (Argentina) 70 mcd/lx/sqm. (Uruguay)
Right of way	Vegetation Foreign elements	< 15cm height (Argentina, Uruguay) No foreign elements allowed

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.

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 is being paid in three instalments during the first year (rehabilitation period) and 45% in 48 equal monthly instalments in the years two to five of the five year contract period. To include initial rehabilitation works in the performance specified road maintenance contracts as well provides 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 specified road maintenance contract in Montevideo, Uruguay

In addition, performance standards may include other obligations, i.e. supplying direct services to the road user such as roadside telephone, ambulance and towing, as for example in the case of Colombia.

All of the performance specified road maintenance contracts let so far have a contract period of between 1 and 5 years. This is to give the road administrations as well as the contractors the opportunity to gain experience with this new kind of contract. Of course, long-term contracts with contract periods of more than 10 years are better suited to capitalize on the potentials of performance maintenance contracts since the optimization of periodic versus routine maintenance interventions needs at least a ten-year period in the case of asphalt concrete roads. Long-term contracts also provide a better incentive to use new technologies and even to undertake some research on how to adapt these technologies to the very specific conditions at hand.

3. CONTROL PROCEDURES AND PENALTIES

How can we make sure that the contractor complies with the performance standards specified in the contract? Vital to the success of this new way of contracting road maintenance is to have appropriate control procedures as well as penalties for non-compliance well defined in the contract documents. Procedures defined in various contracts, as well as experiences, vary.

In the case of **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 behaviour 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.

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 other countries, such as Colombia and Guatemala, slightly less sophisticated ways of assessing the compliance with performance standards are being followed.

In order to enable the contractor to manage the contract properly and the road administration to monitor it, it is vital that the contractor has a proper management and quality control system in place. The Argentinean, Chilean and Colombian 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 adjust the pilot projects. For example, due to the excellent contract monitoring system in place in Uruguay, the recently let contracts show significant improvements over the earlier contracts.

4. IMPLEMENTATION OF PILOT PROJECTS

How can this new contracting scheme best be implemented? The approach to be taken very much depends on the specific circumstances of each country. The experiences of the road administrations with contracting out road maintenance and the competence of local contractors play major roles. The longer the experience of contracting out road maintenance, the more comprehensive the scheme to implement pilot projects based on performance standards can be. If all maintenance is still being executed by force account, pilot projects should be limited to small-scale schemes.

A first step could be to award one or two-year contracts, with performance standards related to routine maintenance only. A suitable second step could consist of four to five year contracts that might include more demanding standards such as the IRI. Embarking on long-term contracts will require some experience with short-term contracts and very much depends on the ability of the road administration, as well as the contractors, to assume the special responsibilities and risk associated with such contracts.

In order to gain experience Brazil, Chile, Colombia, Peru and Guatemala have started with 1 to 3 pilot projects with a road network of approximately 300 kilometres each, concentrating mainly on roads with asphalt concrete and bituminous treated surfaces. In some cases gravel roads were included as well. Typical contract duration is 3 to 5 years.

Generally, contracts have been awarded based on public bidding. Prior to the preparation of bids extensive discussions took place between the road administration and the potential contractors. As this is a new contracting scheme, all parties involved went through a learning and adaptation process to come up with the final contract documents. In addition, extensive consultation with other road administrations already experienced in setting up pilot projects in their countries has helped to speed up the process of preparing the necessary documentation.

In Guatemala and Uruguay the road administrations have successfully encouraged some of their staff to form small road maintenance enterprises and to maintain roads under the new contracting scheme. This has helped the road administrations to reduce excessive staff as well as to gain experience with contracting out road maintenance by performance standards.



Example of a small-scale road maintenance enterprise in Guatemala working under the performance specified road maintenance scheme.

5. LESSONS LEARNED

Fortunately, most of the pilot schemes have been highly successful so far, with the exception of a few smaller contracts in Guatemala which have not been prepared properly. In all other cases, road conditions in the pilot areas have improved notably and maintenance costs have either stayed the same or have been reduced. Road administrations and contractors express satisfaction with the preliminary results. Nevertheless, it is far too early to come to final conclusions.

Preliminary conclusions can be drawn as follow:

- **Pilot schemes for contracting out road maintenance based on performance specifications should be carefully planned and implemented.** The complexity of the contracts, especially with regard to performance specifications, 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 these new road maintenance contracts. 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.
- **As with all new concepts, the road administrations as well as the contractors have to co-operate very closely to make the scheme work, and some adjustments may be required during the course of the pilot project.** Preliminary reluctance and concerns expressed by some of the contractors to engage in the new contract scheme have encouraged road administrations to closely co-operate with the contractors in the preparation of the contract documents and have helped both sides to better understand the opportunities and risks involved. They have also contributed to increasing the number of bids received.
- **Substantial improvement of road conditions and/or reduction of road maintenance costs cannot be expected immediately.** Cost may even prove higher in the beginning to reflect higher risks taken by the contractor due to the unfamiliar contract scheme. Proper risk allocation between the road administration and the contractor, as well as full information on the possible risks involved, can reduce this problem, as has been successfully proven in Uruguay.
- **Wherever experienced contractors are managing the pilot projects, the new contracting scheme has resulted in encouraging the introduction of new technologies in order to reduce maintenance cost.** Since all of the contracts have been let fairly recently and are of short duration, few technological improvements have been observed so far. But the increasing experience with the new contracting scheme, the exchange of knowledge between contractors, and the gradual introduction of long-term contracts will most likely accelerate the application of new technologies.
- **With less experienced contractors, especially newly formed small-scale road maintenance enterprises, training in management, financial and technical issues is essential for the success of the pilot projects.** Uruguay, for example, was most successful in this respect, implementing an ample training program for small enterprises, which produced excellent results.

- **Proper control and application of sanctions for non-compliance with performance standards is equally vital for the new scheme to be successful.** In principle, these contracts are far easier to control than traditional contracts. Supervision of the pilot projects might be contracted out, applying stiff penalties if controls are not enforced properly. In addition, as long as performance standards are made public, road users will become the best "inspectors" and will complain if standards are not being met. Unfortunately, some of the pilot projects have not been supervised properly in the initial phase of these projects. The main problems have been the regularity to control the performance standards as well as certain reluctance in applying the proper penalties foreseen in the contracts, when performance standards were not met. This very often reinforced the rather poor performance of the contractor. In contrast, wherever proper controls have been enforced and the appropriate penalties have been applied in the case of non-compliance with the performance standards, contractor performance has improved significantly.

The principal advantage of contracting out road maintenance based on performance standards is its potential for reducing road maintenance costs and improving road conditions, especially in developing countries. 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.