Infrastructure Maintenance in LAC: The Costs of Neglect and Options for Improvement

Volume 5

Routine Maintenance by Contract (RMBC)

by

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ROUTINE MAINTENANCE BY CONTRACT (RMBC):
EXPERIENCE AND LESSONS FROM LAC

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EXECUTIVE SUMMARY

Introduction

1. Road agencies are turning to road maintenance by contract to increase cost effectiveness and quality, and to end years of frustration with insufficient productivity of force account maintenance. Most road agencies in the developed countries have used private contractors for all road rehabilitation and periodic maintenance. Most Latin American and Caribbean Countries (LAC) have also moved gradually from force account to private contractors for road construction, rehabilitation and, to a lesser extent, for periodic maintenance. These agencies have not been able, however, to take the next hurdle to routine maintenance by contract (RMBC).

2. This paper reviews the experience with RMBC in selected LAC and developed countries, and makes recommendations on: factors which must exist or be absent for its successful introduction, limitations experienced, preparatory work necessary, and approaches that have proved successful in introducing and implementing RMBC. The paper’s findings and recommendations are based on submissions from road authorities in two Canadian provinces (British Columbia, B.C., and Ontario), Spain, the USA (Pennsylvania), and the Bank’s experience in Argentina, Brazil, Chile, Colombia and Jamaica. These countries were selected on the basis of their experience with different form and scope of maintenance by contract.

Reasons for Adopting RMBC

3. Cost reduction is the most predominant reason for road agencies’ adopting RMBC. Other reasons are: the need to reduce staff, inability to attract and retain qualified staff, the need to involve the private sector and the need to improve the agency’s credibility. Brazil, Colombia, Spain, Canada and the US, found RMBC to be more cost-effective than force account. Brazil and Chile adopted RMBC as a result of staff reductions mandated by executive orders, while Colombia and Jamaica adopted RMBC to increase the participation of private contractors and the local community.

Factors Favorable for RMBC

4. A clear governmental or agency policy and support, the existence of a capable local construction industry with sufficient road maintenance capacity, and the ability of the road agency to administer and manage RMBC, are the factors which enhance the probability of a successful implementation of RMBC. In Brazil (DNER) the federal government’s strong support allowed the agency the long, but necessary, experimentation period to arrive at the optimum type,
scope and size of contract and work definition and measurement. In Argentina RMBC was completely stopped when a new road administration withdrew its support for it. In Brazil, Colombia and Chile, the existence of well established and capable local construction industries contributed greatly to the initial success of RMBC. Adequate capability within the road agency to develop good quality contracts, to prepare contract documents, to manage, simplify and expedite the bidding process and to supervise the contract execution facilitated the introduction and implementation of RMBC in Brazil, Chile, Colombia and Jamaica.

Factors Unfavorable for RMBC

5. The absence of any of the above-mentioned factors would hinder the successful implementation of RMBC. The absence of fair competition, the lack of proper preparation for RMBC and undue political pressure on behalf of contractors would in addition jeopardize RMBC’s success. The absence of fair competition either due to the lack of a sufficient number of interested qualified contractors or collusion among contractors can obliterate any potential gains in cost effectiveness and quality from RMBC, as demonstrated in Guyana, where the Guyana National Construction Company (GNCC) is the only roadwork contractor in the country and ends up winning all contracts at close to asking price. Lack of adequate preparation for RMBC was the problem in Brazil where the abruptness of the decision to go for RMBC did not allow the district offices to be prepared to manage it, and in Colombia, where the first attempt at RMBC in 1977 failed because of insufficient study of contractual arrangements and work definition and supervision. Political pressure on behalf of contractors was a problem in Colombia during its first attempt at RMBC and is likely to be a major problem in those LAC countries where contractors wield considerable political leverage.

The Revealed Benefits from RMBC

6. RMBC has yielded many significant benefits (Box 1). Firstly, it has been instrumental in supplementing agency maintenance capacity: neither Brazil nor Chile could have preserved their road network following the drastic staff reductions without recourse to RMBC. Secondly, RMBC has led to lower cost of
routine maintenance services: on average, DNER's RMBC costs are estimated to be some 25% lower than the equivalent force account costs; in Colombia, the micro empresa cost is about half the maintenance rates by force account and in Pennsylvania the difference is about 23%. Thirdly, the quality of RMBC work has been superior to force account work. Fourthly, the awarding of RMBC contracts has "locked" in the funds for those activities, thus making it difficult for diversion of those funds to other road activities. Fifthly, RMBC has provided increasing job opportunities for the private sector, particularly for small and medium-sized private road contractors, as demonstrated in Brazil, where the number of contractors in RMBC has increased from 18 in 1970 to 160 at present, and in Colombia, where the number of micro empresas has gone from 28 in 1984 to about 362 in 1990 providing employment for some 4400 workers.

The Fears and Perceived Constraints of RMBC

7. The LAC road agencies have hesitated in moving to RMBC due to several fears and perceived constraints. Firstly, the power which comes with supervising and controlling large force account resources and the ability of road agencies to respond to political demands are advantages which their managers are unwilling to give up easily. Secondly, reducing force account staff and dispensing with a large equipment fleet require both good planning and very deliberate implementation both of which may not be easily achieved. Thirdly, there is a perceived loss of agility in responding to emergencies. Fourthly, there is a strong likelihood of insufficient response from contractors for works in remote areas. Fifthly, some serious concerns exist regarding possible collusion among contractors. Sixthly, difficulties in specifying and measuring works is considered a key potential problem. The experience of the countries studied shows that all these fears and potential constraints can be overcome if RMBC is designed, introduced and implemented deliberately.

RMBC Implementation

8. There is scope for the use of RMBC in one form or the other in all LAC countries: success with widely different countries such as Argentina, Brazil, Colombia and Jamaica attests to that. Also, RMBC has proven to be more cost effective than force account maintenance, has ensured that maintenance is actually done when the funds are spent and has helped in alleviating the diversion of funds to other activities. It is strongly recommended that all road agencies in the LAC countries gradually move towards executing the bulk of their routine maintenance by contract. In terms of actually adopting and implementing RMBC, the following guidelines, based on the experience of the road agencies studied, would be useful, depending on the stage it is at in introducing RMBC:
(a) the authorities in the road agency should study the pros and cons of RMBC, decide on the objectives they intend to achieve, design their approach accordingly and involve all concerned in the final decision;

(b) the agency needs to assess the internal capacity of the local construction industry to manage and administer RMBC contracts over and above the capacity required for other road activities. Based upon this the agency should decide on the need for staff training and the use of consultants to complement agency staff;

(c) staff redundancy impacts caused by the introduction of RMBC should be planned for and dealt with adequately (attractive severance pay and/or incentives to become contractors). Resulting equipment surplus could be converted into a plant pool for leasing;

(d) RMBC contracts should be based on unit prices with some allowances, up to a given financial ceiling, for works to be done on a cost plus profit basis for those items for which unit prices are inapplicable. Road agencies may however, wish to consider other types of contracts where the contracting environment, such as the risk of collusion among contractors, favors those forms;
(e) contracts should include all the roadwork on a given section or on all the roads within an administrative division. However, contracts for specialized activities may also prove to be the most efficient. The study recommends that the choice of contract scope be based on the particular situation of the road agency involved;

(f) contracts should be awarded the lowest evaluated bid after local competition. Where there are obvious signs of collusion, however, the road agency may wish to consider other forms of contracting including, in the extreme cases, negotiated bids;

(g) to minimize the effect of inflation, prompt payment to contractors for work done and the inclusion of price adjustment for inflation are essential: Contractors will over time more than recuperate their losses from late payments through higher future bids; and

(h) private consultants should be used in the early stages of RMBC implementation to supplement the in-house capacity and capability.
I. INTRODUCTION

1.01 An increasing number of road agencies have turned to road maintenance by contract to respond to staff reductions mandated by their governments, to profit from demonstrated superior cost effectiveness and quality of contracted over force-account maintenance, and to end years of frustration with insufficient productivity of force account maintenance. An additional perceived advantage is that, with contractors, one pays for the product, while with force account one pays for large staff, often hired with political motives, and equipment fleet which may or may not yield the required product.

1.02 This paper reviews the experience with routine maintenance by contract (RMBC) in selected Latin American and Caribbean Countries (LAC) and developed countries and to make recommendations on: (a) the factors which must exist or be absent for its successful introduction; (b) the limitations experienced; (c) the preparatory work necessary for its successful implementation; and (d) the approaches that have proved successful in introducing and implementing RMBC.

1.03 Over the past decade, most road agencies in the developed countries have successfully used private contractors for all road rehabilitation and periodic maintenance and, to a lesser extent, for routine maintenance. The former West Germany carried out all its maintenance by contract; France, and the UK execute all rehabilitation and periodic maintenance by contract and are steadily increasing the use of contractors for routine maintenance; Spain uses concessionaires for toll collection and road maintenance of its freeway system, and also contractors for maintaining roads outside the jurisdiction of the municipalities. Most LAC countries have moved gradually from force account to private contractors for road construction, rehabilitation and, to some extent,

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1/ road rehabilitation is the work required to bring badly deteriorated roads back to the original standards.

2/ periodic maintenance includes those road maintenance activities that typically need to be repeated every five to ten years (i.e. resealing, regraveling, etc.).

3/ routine maintenance includes those maintenance activities that normally need to be repeated one or more times every year (i.e. patching, clearance of drainage channels and structures, regrading, etc.)
Most of the same agencies have, however, not been able to take the next hurdle to RMBC for a variety of reasons, including: (a) perceived loss of power or political importance; (b) difficulties in getting rid of large equipment fleets and laying off personnel; (c) perceived loss of agility in responding to emergencies; (d) difficulties in getting contractors to submit reasonable bids for works in remote areas; (e) possible collusion among contractors or corruption of agency staff; (f) difficulties in specifying and measuring work for RMBC; (g) fear of lack of interest from the more experienced contractors because of the small and dispersed nature of work and the absence of small contractors; (h) a genuine belief, in some cases, that force account is less costly; and finally, (i) lack of adequate and consistent flow of maintenance funds. On the other hand, a major cause of the poor road maintenance performance in the region is, frequently, the low productivity and poor work quality of force account establishments which have not improved much in spite of more than a decade of assistance from various lending agencies. Using contractors not only increases productivity and work quality, but also frees the road agencies from the burden of managing a large workforce and dispersed fleet of equipment.

The paper’s findings and recommendations are based on submissions from road authorities in two Canadian provinces (British Columbia, B.C., and Ontario), Spain, the USA (Pennsylvania), and the Bank’s experience, in Argentina, Brazil, Chile, Colombia and Jamaica. RMBC in the former cases were for paved roads only, while in the LAC countries both paved and unpaved roads were considered. For the LAC countries, except Argentina, field visits were made by the Study Team or its consultants. For the other countries the necessary information was obtained through completed questionnaire and follow-up telephone conversations. Figure 1 shows the percentage of routine maintenance work done by contract by these road agencies. A summary of the

4/ all 20 LAC countries surveyed, carried out major construction by contract, 16 executed rehabilitation by contract and 7 performed periodic maintenance predominantly by contract.

5/ the Study Team comprised of Peter Gyamfi and Guillermo Ruan, assisted by Waleed H. Malik, all of LATIE.
relevant experience of the above countries, except Jamaica, is provided in Annex 1. The completed questionnaires and samples of bidding documents are available in LATIE files.

1.05 The countries under study were selected on the basis of their experience with different forms or scopes of maintenance by contract. The Canadian provinces are good examples of full (B.C.) and partial (Ontario) RMBC implementation; Spain provides good insight into road concessions; Pennsylvania has made the most rigorous comparison of force account and RMBC costs; Brazil has used RMBC the most extensively of all LAC countries; Chile provides a good example of RMBC by activity and Colombia has had excellent success with micro empresas.

II. EXPERIENCE WITH RMBC

2.01 This section reviews the experience of the countries studied under the following headings: first, factors that affect the decision to move to RMBC and second, implementation experience. The former include: (a) the reasons for adopting RMBC and (b) the factors that made its introduction or implementation easy or difficult; the latter comprise: (a) the preparatory work undertaken before the introduction of RMBC and its effects on success or the lack thereof; (b) contract maintenance administration, the type and scope of contracts and the methods of payment; (c) the benefits of RMBC as revealed by the case studies; (d) the experience of the countries in overcoming some of the fears preventing the adoption of RMBC in some LAC countries and (e) the lessons to be learned from the above.

Decision Influencing Factors

(a) Reasons for Adopting Routine Maintenance by Contract

2.02 The reasons that have led the LAC and other selected countries to adopt RMBC include (Box 2):

(i) making up for mandated staff reduction and/or the inability to attract and retain qualified personnel in the road agency

(ii) responding to increased or peak workloads without increasing the number of staff

(iii) obtaining, when not available in-house, specially trained professionals and equipment

(iv) reducing costs
(v) providing opportunities to the private sector; and

(vi) helping to improve the agencies' credibility with the public by ensuring that some roads are, at least, well maintained.

2.03 Brazil (DNER) and Chile provide the best examples of road agencies forced to adopt RMBC as a result of staff reductions mandated by executive orders. Chile's Vialidad, for example, went from 10,650 in 1974 to 4,500 in 1990. Both Brazil and Chile had to resort to RMBC for the additional capacity needed to keep the national road networks in reasonable shape. The DNER has, so far, enjoyed high success and is aiming to increase the RMBC proportion on its network from the current 60% to about 90% within the next two or three years. Chile appears to be less enthusiastic about increasing RMBC. Even for road agencies which have not committed themselves to RMBC per se, loss of key staff is forcing them to use the private sector for equipment repair and selected road maintenance activities.

2.04 In general, due to the overall neglect of maintenance and the surplus of staff in the LAC road agencies, the need to accommodate increased or peak workloads has not been an important reason for their adopting RMBC. That has been more of a factor in the developed countries studied where strong attempts are being made to avoid carrying under-utilized staff permanently. For example, the British Columbia (B.C.) and Ontario provinces both list this reason as important for their adopting RMBC. In LAC, the agencies' maintenance staff is often used for rehabilitation and construction work which should generally be contracted to the private sector.

2.05 Acquiring specialized professionals and equipment has also not been a significant factor in LAC where road agencies aim to be self-sufficient in both expertise and equipment. On the other hand, the developed countries have long recognized the wastefulness in maintaining little used specialists or equipment in their agencies.

2.06 Whatever other factors have motivated the road agencies to adopt RMBC, the expectation of superior cost effectiveness and work quality has been a central objective. In some cases where RMBC has not been adopted for all routine maintenance, such as the UK and Pennsylvania, legislation has been introduced to require force account establishments to compete with private contractors for routine maintenance work with the objective of making force account more cost effective.

2.07 The objective of providing opportunities for the private sector was adopted voluntarily by the road agencies in Colombia (for traditional equipment-intensive contractors, the micro empresas and the rural population in the
lengthman system and Jamaica (the rural communities in the lengthman system). In some of the more developed countries pressure from contractor groups or associations played a role. There was no evidence in the latter case, however, of any negative effects on the success of RMBC.

2.08 In Brazil, where the DNER was between 1971 and 1990 carrying out routine maintenance using force account, private contractors and delegation to the state highways agencies, only RMES has been able to sustain good performance and enabled the agency to maintain its credibility with the public. In Colombia, after years of frustration with the ineffectiveness of the force account establishment, the national road agency has finally built up some credibility through the micro empresas.

2.09 In summary, the road agencies studied have had various reasons for adopting RMBC. The review of their experience shows that the reasons outlined in paragraph 2.02, either by themselves or in combination, have proven sound.

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5/ lengthman system: road maintenance system under which light road maintenance of approximately five km is contracted with a person who resides along the road in question.
(b) Factors Favorable for RMBC

2.10 The factors which have favored the adoption of RMBC include (Box 3):

(i) a clear governmental or agency policy supporting it;
(ii) the existence of a capable local construction industry with sufficient capacity for RMBC; and
(iii) the ability of the road agency to administer and manage RMBC.

2.11 Declared and actual government and road agency support, through the provision of the necessary resources, is a prerequisite to make RMBC work. This was clearly the case with the DNER where the federal government’s strong support allowed the agency the long, but necessary, experimentation period to arrive at the optimum type, scope and size of contract and work definition and measurement. By contrast, in Chile, progress towards RMBC has been slow while in Argentina RMBC was completely stopped when a new road administration withdrew its support for it.

2.12 In the cases of Brazil, Colombia and Chile, the existence of well established and capable local construction industries during the introduction of RMBC contributed greatly to its initial successes. On the other hand, the introduction in Colombia of the micro empresa system, a novel approach, went through considerable growing pains.

2.13 Adequate capability within the road agency to develop good quality contracts, to prepare contract documents, to manage, simplify and expedite the bidding process and to supervise the contract execution facilitated the introduction and implementation of RMBC in Brazil, Chile, Colombia and Jamaica. The problem has been the availability of sufficient qualified staff to carry out the additional workload. In all the above cases, the problem has been alleviated or resolved by the use of private domestic consultants.
(c) Factors Detrimental to the Successful Introduction of RMBC

2.14 The absence of any of the factors mentioned in paragraph 2.10 above would automatically hinder the successful implementation of RMBC. In addition, the review showed that the absence of fair competition, the lack of proper preparation and undue political pressure on behalf of contractors can jeopardize RMBC's success.

2.15 The absence of fair competition either due to the lack of sufficient numbers of interested qualified contractors or collusion among contractors can obliterate any potential gains in cost effectiveness and quality from RMBC. For example, in Guyana, the state-owned Guyana National Construction Company (GNCC) is the only roadwork contractor in the country and, although the road agency goes through a rigorous process of open local competitive bidding, the GNCC always ends up winning the bid at close to its asking price! After that, the road agency is at its mercy to deliver the services. In Brazil, collusion was a major problem at the initial stages of maintenance contracting when the works in the same road residency were divided into several contracts. By including all the works in a residency in one contract, former collusion partners have been forced to compete fiercely for that single contract.

2.16 Lack of adequate preparation for RMBC was a problem in Brazil where the somewhat abruptness of the decision to go for RMBC did not allow the district offices, DNER's executing arms, to be prepared to manage it. Subsequent staff training in contract administration and management and the extensive use of consultants has greatly alleviated the problem. In Colombia, the first attempt at RMBC in 1977 failed because of insufficient study of contractual arrangements and work definition and supervision. In most of the cases of RMBC in LAC, it would have been advisable to start with pilot districts or regions and extend the system nationwide only after more experience had been gained from implementation.

2.17 Political pressure on behalf of contractors was a problem in Colombia during its first attempt at RMBC. It is likely to be a major problem in those LAC countries where contractors wield considerable political leverage because of their important role in funding political campaigns.

Implementation Experience

(a) Adequate Preparation

2.18 Adequate preparation prior to the introduction of RMBC has proved to be one of the most important determinants of its success. Such preparation includes: clear decisions on the activities to be contracted; the types, scope and
sizes of contracts; the forms of bidding and the bidding documents to be used; the methods of payment; development of a work program and division of the program into contracts; training of agency staff in the preparation of bidding documents, bidding and award of contracts, in contract supervision and in cost accounting. In the preparation of bidding documents, bid administration and work supervision, private consultants were used successfully to manage RMBC when insufficient capacity existed in the road agencies, as was the case in Brazil, Colombia and Chile.

2.19 Jamaica and Costa Rica, with lengthman systems financed by USAID, and British Columbia, Ontario and Spain also prepared well for RMBC and had good success with its introduction and implementation. In Brazil (DNER), where the introduction of RMBC was precipitous, various types, forms and sizes of contracts as well as different contractual arrangements had to be experimented with, at a high financial cost to DNER, before arriving eventually at a workable solution. In Chile, which started RMBC under similar circumstances, the experimentation to find an effective system still continues. Vialidad is still undecided whether to contract RMBC by specialized activities or by all activities on a defined road section.

(b) Maintenance Administration

2.20 Planning and execution of maintenance activities, including RMBC, are accomplished based on annual programs and budgets prepared by the road agencies studied. In Brazil and Chile, the DNER and Vialidad respectively develop their annual programs, after detailed road condition evaluation using objective measurement-based ratings, and traffic counts. The World Bank's Highways Design and Maintenance Model III (HDM III) is used to assist in developing the maintenance strategies and budgets. In Colombia and Jamaica, the annual programs are based on detailed physical inventory from field surveys and the use of fixed maintenance policies to determine the volume of work. In Pennsylvania, British Columbia, Ontario and Spain, the annual programs are based either on detailed field surveys and objective ratings from sufficiency criteria or on long-standing maintenance policies on the frequency and volume of different maintenance activities. With the concessions in Spain, the maintenance plan is prepared by the concessionaire for the approval of the road agency. In general, the Brazilian and Chilean approaches are preferable: they result in maintenance and rehabilitation programs based on economic priorities and optimum intervention strategies.

2.21 Budgeting. In Brazil, Chile, Colombia and Jamaica, the budgets are centrally prepared by the road agencies based on programmed needs. The provincial, departmental and district road agencies participate in the identification of needs. However, in all the above cases, the maintenance
budgets approved by the central government are not necessarily based on needs. The road agencies are typically authorized an overall budget which they have to distribute among all road activities and branch offices. In those cases where maintenance contracts are pluriannual, such as in Brazil (DNER), the contracts receive an automatic allocation from the road agencies' budget. This ability to ensure automatic receipt of allocations has been a strong argument for contract maintenance. Also RMBC makes it harder for the road agencies to divert funds and resources to other activities.

2.22 Contract Scope and Types. The scope and type of routine maintenance contracts have varied with road agency and type of activity. In Brazil (DNER) the tendency is to include routine maintenance contract in the same contract with periodic maintenance and minor improvement works for a designated section of road; this facilitates contractor's programming and use of equipment. The DNER has about 160 such contracts with an average length of contract of about 240 km. At the other end of the scale, but also contracting all activities on designated highway sectors, are the micro empresa contracts of about 50 km. average length for 11-15 persons per empresa and the lengthman contracts in Colombia and Jamaica of some 3 km. average length. In Chile, on the other hand, maintenance contracting is by activity for a given area or specific location. In British Columbia, Ontario and Pennsylvania, where contractors tend to be more specialized, maintenance contracts have been awarded and executed both by specialty work and by designated highway section. In Spain, contracts are for designated highway sections. All the above types of contract scopes have been successful.

2.23 The contract types and method of solicitation and award of bids have varied for the seven road agencies studied. In the Brazilian and Chilean cases, unit price contracts, awarded to the lowest-priced bidders after open competitive bidding, are used, with some allowance in the Brazilian case for up to 10% of the contract value to be done on a cost plus fixed fee basis for activities for which unit costs cannot be reasonable predicted. For the lengthman system in Jamaica, contracts are negotiated with the individuals or communities in the areas traversed by the road sections on a lump sum basis. For the micro empresa in Colombia, the road agency uses its own unilaterally-determined schedule of rates. In British Columbia, Ontario and Pennsylvania, unit price contracting, awarded after competitive bidding to the lowest price bidder, has been the most efficient way to contract. Although these agencies have sometimes also used lump sum contracts, it has involved additional work in specifying and measuring work quantities more accurately and in bid preparation and evaluation, but the gains in lower contract prices, estimated to be up to 15%, in the case of the DNER for example, compared to cost-plus contracts, far outweigh the cost for the additional work which is estimated to be not more than 2 percent.
2.24 **Contract Documents:** For the development of the RMBC contract documents, contract administration and supervision, the road agencies have used a mix of own staff resources and private consultants. The essential part of the preparatory work and analysis prior to the introduction of RMBC is an assessment of agency staff capacity for RMBC contract development and administration and a decision on the use of consultant’s assistance where necessary. DNER’s experience is that three inspectors are sufficient to measure the quantity and verify the quality of work for minor improvements, periodic and routine maintenance over a 200 km length of roads. British Columbia’s is that work specification and measurement for RMBC is not significantly more stringent than for force account. Pennsylvania’s experience is that it costs up to 3 to 8% of the price of contract, depending upon how extensively RMBC is being used by the road agency, to manage the entire RMBC process.

2.25 **The payment provisions, procedures and efficiency for RMBC** greatly influences its success in achieving its objectives. In the cases studied, there was wide variation among road agencies on some aspects and commonality on others. Except for Jamaica and Colombia (micro empresas) payments for RMBC have been on a monthly or quarterly basis and for work performed. The Jamaica lengthman contract payments were quarterly on the basis of compliance with the pre-agreed road condition standards. In Colombia, for the micro empresas, an advance payment of 20% is made to the contractors for the purchase of tools and initial expenses. Thereafter, payments are monthly for work done. None of the road agencies has any payment adjustments (incentives) for quality of work, except that no payments are made for substandard work. Again, except for British Columbia, Colombia (micro empresas) and for Jamaica where the RMBC contracts were for prefixed lump sum, the RMBC contracts contain adjustments for inflation. Those adjustments typically come into effect on the presentation of payment invoices by the contractor. In the case of Brazil and Argentina, which have suffered from high inflation, delays in certifying works, sometimes up to three months after work completion, has been very costly to contractors who have over time either adjusted tender prices to cover their potential losses or abandoned the RMBC market altogether. This problem is compounded by payment delays due to unavailability of funds which has similarly been a significant problem in the LAC countries. Chile appears to be the exception, in this case, with expeditious certification and prompt payment (on the average, a month in between work completion and payment). As mentioned earlier, the adoption of proper payment provisions and procedures in RMBC contracts and the road agency’s adherence to them is fundamental, especially since the contractors are generally small-sized and unable to withstand the cash flow problems resulting from late payments.
(c) The Benefits and Lessons from the Study Cases

2.26 The experiences of the road agencies give a fairly complete picture of the benefits of RMBC and the lessons to be learned to facilitate its introduction and improve the efficiency of its implementation. The benefits include (Box 4):

2.27 **Supplementing Agency Capacity:** Neither Brazil nor Chile could have preserved their road network following the drastic mandated staff reductions without recourse to RMBC. In British Columbia, Ontario and Spain, RMBC has aided the road agencies to cover peak work loads, *inter alia.*

2.28 **Providing Superior Cost-Effectiveness:** In Brazil, Colombia, Spain, Canada and the U.S, (Pennsylvania) the use of RMBC has led to lower cost of routine maintenance services. RMBC by the DNER is currently estimated to be some 20%\(^2\) cheaper than the latest DNER’s force account costs and about 15% cheaper than the force account costs of the DER of the state of Parana (Brazil) which has one of the best force accounts maintenance operations in LAC. In Colombia, the micro empresa cost is about half the maintenance rates by force account. In the counties reported for Pennsylvania RMBC is about 23% cheaper than force account if the tax breaks to the counties’ road agencies are removed. The Vialidad in Chile is the only agency reporting RMBC costs higher than force account costs; this is apparently due, at least in part, to the lower quality of force account work (Box 5).

<table>
<thead>
<tr>
<th>Road Agency</th>
<th>Brazil</th>
<th>Chile</th>
<th>Colombia</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>75</td>
<td>140</td>
<td>50</td>
<td>77</td>
</tr>
</tbody>
</table>

Box 5: RMBC Costs as Percentage of Force Account Costs

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\(^2\) the comparison takes into account the full cost of RMBC, but only the cost of the actual inputs used in force account i.e. it does not take into account the cost of redundant workforce and unavailable equipment in the force account case.
2.29 **Quality of Works:** Generally, the quality of RMBC work, as reported by the agencies which have tried it, has been superior to force account work which is not surprising since the performance standards under RMBC are more clearly and closely set and their compliance better supervised.

2.30 **Avoidance of Diversion of Funds:** The award of RMBC contracts for up to five year periods in Brazil (DNER) has "locked" in the funds for those activities, thus making it difficult for diversion of those funds to other road activities. The same is true for Chile and Colombia and was the case for Jamaica as far as the potential diversion within the annual road budgets are concerned.

2.31 **Increasing Job Opportunities for the Private Sector:** In Brazil, Chile and Colombia as well as in the developed countries studied, the road agencies' increases in RMBC has greatly increased the number of small to medium-sized private road contractors and concomitantly more useful employment. For example, in the case of Brazil, the number of contractors in RMBC has increased from 18 in 1970 to 160 at present while the number of micro empresas in Colombia has gone from 28 in 1984 to about 362 in 1990 providing employment for some 4400 workers (Figure 2).

(d) **Experience with the Fears of RMBC**

2.32 **Perceived Loss of Power:** The power which comes with supervising and controlling large force account resources and the ability of road agencies to respond to political demands are advantages which their managers are unwilling to give up easily. On the other hand, the inability of these same agencies to deliver on routine maintenance in spite of these resources, mostly because of lack of funds for materials and in-built inefficiencies in the civil service systems, have been strong arguments for them to go for RMBC which has yielded good results and increased the credibility of the agencies. Moreover, by adopting RMBC, most agencies have been able to have their staff concentrate on the more attractive tasks of contract administration, maintenance planning with all its modern sophistication and roads management.
2.33 **Inability to Dispense with Force Account Resources:** Reducing force account staff and dispensing with a large equipment fleet require both good planning and very deliberate implementation. Where such planning is not possible, because the decision to adopt RMBC is precipitous, the Brazil experience offers a feasible solution with some costs. Initially contracts were awarded for two years on a cost plus basis with contractors using same DNER equipment and plant. An additional advantage of this approach was that it reduced the initial capital requirements of contractors and made it possible to attract and retain a large number of medium-sized contractors for RMBC. However, after consolidating the contract maintenance philosophy for a number of years, Brazil (DNER) then introduced payment by unit price forcing the contractors to participate in planning, scheduling and administration of maintenance activities. In the case of Chile and Colombia (after 1980), better planning was possible. In the former case, the government offered retirement to staff with financial incentives to facilitate the formation of small contracting companies. In the case of Colombia, staff being laid off were given "seed" capital to band together with colleagues to form companies for road maintenance with some guaranteed initial work from the road agency. This system has resulted in a very marked improvement in Colombia's road maintenance performance. Whichever the approach adopted, care should be taken to adequately compensate those being laid off. It is not difficult to establish that, in the long run, it is more cost-effective to pay staff off than to keep them on the payroll indefinitely with no significant output from them.

2.34 **Difficulties in Responding Quickly to Emergencies:** When a force account organization is operating efficiently, it is able to respond more quickly to emergencies than RMBC since no prior contractual discussions are necessary. On the other hand, few force account systems in LAC work well enough for such early response to be possible. Again, the Brazilian experience gives us some insight into ways of reducing the reaction time of contractors. Within DNER contracts, there is provision for the execution of emergency works at DNER's request at hourly rates. Even though initially this might appear to be disadvantageous to the contractors, they have been able to reflect their experience in their bid prices. Moreover, as will be discussed later, road agencies in LAC should retain a minimal force account maintenance capacity to respond to such emergencies, *inter alia.*

2.35 **Insufficient Response for Works in Remote Areas:** Contractors will work in remote areas if the price is right. In any case, where such price becomes unreasonably high, it is advisable for the road agency to keep sufficient force account capacity to respond to such needs.

2.36 **Possible Collusion Among Contractor:** In most LAC countries collusion is a potential problem; it was in the Brazilian case initially and, may
perhaps still be. Where collusion is evident, the road agency may choose to give contractors its own estimate as a guide and stipulate a ceiling above which it would not accept bids or go in for the other types of contracts such as cost plus, lump sum or target price or, in the extreme case, use a published schedule of rates not to be exceeded for the major items of the contract.

2.37 **Difficulties in Specifying and Measuring Works:** The experience in Brazil, Chile, Colombia, British Columbia, Ontario and Spain have demonstrated that it is possible to provide reasonable specifications for RMBC works and to measure them acceptably accurately. It does initially take much more work and time to do so properly, compared to the usual requirements for force account maintenance but, since routine maintenance by nature is repetitive, these costs are high only during the initial period after RMBC’s introduction. Later on, with more experience, it can be made quite routine as was the experience in some counties in Pennsylvania where the costs of administering the entire RMBC process was as low as 3%. Moreover, for works which are really difficult to specify accurately, DNER has been successful in accepting, up to 10% of the total cost of the contract, the use of cost-plus profit for such work.

2.38 **Lack of Interest From Larger and More Experienced Contractors:** In general, RMBC is not for large, equipment-intensive contractors. The small and dispersed nature of the works gives considerable advantage to small contractors. In those countries where the policy to do routine maintenance by force account in the past has not permitted the growth of small contractors in that field, considerable effort would be required to develop the small road contracting industry. Such efforts have yielded very good results, e.g. in Ghana. Also, it is possible to interest medium-sized and large contractors by either grouping small contracts into medium-sized ones or including in the same contract some rehabilitation and periodic maintenance works, *a la* Brazil.

2.39 **Lack of Management Expertise in the Road Agency for RMBC:** The benefits of RMBC would be far from realized in the absence of good management within the road agency, especially as regards the cost reduction benefits. Initially road agencies that have this problem would need to use private local consultants as is being done both in Brazil and Chile. As a longer-term solution, the agency would have to train its staff in all aspects of contract management.

(e) **Other Forms of Maintenance Contracting**

2.40 Over the past decade or so, some European countries, notably France and Spain, have moved to a slightly more radical form of road maintenance contracting. This subject is discussed here because it has generated
considerable interest in some LAC countries such as Argentina, which is making an attempt to use it, Brazil, Chile, Colombia and Mexico. The approach consists of having the private sector finance the construction, upgrading, improvement, rehabilitation and subsequent maintenance of selected high trafficked roads. Typically, the private interest is given the right to collect tolls for the use of the road to defray its costs over a long period of time. The approach, which requires agreement between the road authority and the private interest on minimum road surface and structural condition to be maintained by the private interest is reported to have worked well in France and is proving effective in Spain. No experience has as yet been gained in LAC with this approach, but it appears to offer considerable scope in such LAC countries as Brazil, Mexico, Chile and Colombia, in addition to Argentina (Box 6). A separate study on the subject is warranted.

III. RECOMMENDATIONS

3.01 There is scope for the use of RMBC in one form or the other in all LAC countries: success with widely different countries such as Argentina, Brazil, Colombia and Jamaica attests to that. Also, RMBC has proven to be more cost effective than force account maintenance, has ensured that maintenance is actually done when the funds are spent and has helped in alleviating the diversion of funds to other activities. It is strongly recommended that all road agencies in the LAC countries gradually move towards executing the bulk of their routine maintenance by contract.

3.02 In terms of actually adopting and implementing RMBC, the following guidelines, based on the experience of the road agencies studied, would be useful, depending on the stage it is at in introducing RMBC.

(a) Making the Policy Decision

3.03 A list of possible reasons for moving to RMBC is given in para. 2.02. The authorities in the road agency should study the list, decide on the objectives they intend to achieve with RMBC and design their approach accordingly. In the conduct of the exercise, it is imperative that the views and concerns of agency staff be considered and the support of Government,
especially the Ministries of Finance and Planning be sought and secured. Before a final decision is made to move full force with RMBC, the agency might wish to introduce pilot schemes to obtain experience both on costs, as compared with force account maintenance, and on the possible implementation problems. The road agency of the Sao Paulo state in Brazil is currently going through such a pilot process.

(b) Preparatory Work Prior to Introduction of RMBC

3.04 Assuming that the local construction industry has the capacity and capability for RMBC, the agency needs to assess its internal capacity to manage and administer RMBC contracts over and above the capacity required for other road activities. Based upon this the agency should decide on the need for staff training and the use of consultants to complement agency staff. The agency should also decide on the type, scope and duration of contracts, procurement procedures for contracting, payment provisions and procedures and bidding documents. Where local road contractor capacity is limited or nonexistent the introduction of RMBC requires more work since it involves the development of that capacity, an exercise which is beyond the scope of this paper.

(c) Implementation of RMBC

3.05 Even when road agency staff reductions are not mandated, the introduction of RMBC will often result in staff redundancy and excess equipment in the road agency. The Brazilian approach of initially arranging for contractors to manage staff and equipment, while by no means ideal, has proven the most feasible one so far. Agency staff could also be laid off, with adequate severance pay, and the excess equipment converted into a plant pool for leasing. This study recommends these approaches over the one of summarily firing of staff as some countries have attempted to do without success.

3.06 This study recommends the use of unit price contracts with some allowance, up to a given financial ceiling, for works to be done on a cost plus profit basis for work items for which unit prices are inapplicable. Road agencies may however, wish to consider other types of contracts where the contracting environment, such as the risk of collusion among contractors, favors those forms. A sample of bidding documents calling for unit price offers in Brazil, Colombia, BC and Spain are available in LATIE files.

3.07 The most convenient scope of contract is the one which includes all the roadwork on a given section or on all the roads within an administrative division. Depending on the degree of specialization of contractors in the country, however, contracts for specialized activities may be the most efficient.
The study recommends that the choice of contract scope be based on the particular situation of the road agency involved.

3.08 The study recommends the award of contracts based upon the lowest evaluated bid after local competition. Where there are obvious signs of collusion, however, the road agency may wish to consider other forms of contracting including, in the extreme cases, negotiated bids.

3.09 Since most LAC countries suffer from high inflation, prompt payment to contractors for work done and the inclusion of price adjustment for inflation are essential: Contractors will over time more than recuperate their losses from late payments through higher future bids. A balance, however, needs to be stricken between the contractors’ interest in more frequent payments and the cost of certifying and getting the necessary signatures for payment. Monthly payment works well for the small-sized contractors prevalent in RMBC.

3.10 The administration of RMBC during its initial stages of introduction can be time consuming. Also, since the road agencies would be taking on an additional new function, the study recommends that strong consideration be given to the use of private consultants, albeit higher paid than agency staff, to supplement in-house capacity and capability.
ANNEX 1
EXAMPLES OF ROUTINE MAINTENANCE BY CONTRACT (RMBC)

1. This Annex provides information on highway routine maintenance by contract (RMBC) operations in the following countries: Brazil, Colombia, Argentina, Chile, and the Province of British Columbia, Canada. Generally speaking, the experience with RMBC has been positive.

Brazil

2. The highway system in Brazil is divided as follows:

(a) Federal Highways: 66,297 km under the jurisdiction of the Departamento Nacional de Estradas de Rodagem (DNER). These are the major interstate highways and highways in remote regions of the country.

(b) State Highways: 188,648 km under the jurisdiction of the Departamentos Estaduais de Estradas de Rodagem (DER). These are the inter-municipal and regional highways.

(c) Municipal Highways: 1,250,000 km of municipal roads excluding urban streets.

3. In 1971 DNER began using RMBC on the main arterial roads of the federal network while delegating the maintenance of secondary roads to the states (DERs). Prior to that, all maintenance work on this network was carried out by force account. The decision to move into contracting and delegating, was prompted by the need to cut DNER staffing and labor force. By 1984, the size of the network maintained by DNER forces decreased from 41,000 to 10,000 km while the work force of DNER was reduced by approximately 60%; today, the split between contracted maintenance, delegated maintenance, and maintenance by force account on the federal network is 62%, 26%, and 12%, respectively.
The rehabilitation work on the federal and state networks is largely done by contract.

4. Delegated maintenance peaked in 1984 when approximately 22,700 km or nearly 33% of the federal network was maintained by the DERs. From then on, the delegated maintenance program lost ground falling back to 26% of the network. On the other hand, contracting may eventually replace both force account and delegated maintenance on the road network under the jurisdiction of the DNER. The failure of delegated maintenance was due, in part, by inadequate transfer of funds to the DERs by DNER.

5. In 1988 Brazil abolished earmarking of road user charges for highways and transferred fuel, passenger and freight taxes to the states leaving DNER with the federal road network responsibilities but without independent source of funds other than the newly established (December 1988) "selo pedagio" which is a monthly toll charged to users of the federal highway system. During the implementation of the toll system, changes were made to the toll rates and their administration which reduced the revenues considerably and delayed the transfer of collected funds to DNER. The current administration eliminated the toll system. Congress has approved a surcharge on motor fuel for the maintenance of federal highways. However, this has yet to be implemented and is currently being questioned in the courts as double taxation (unconstitutional).

6. With the loss of revenue to the states, the Federal Government is analyzing the transfer of part of the network to the State Highway Departments. Three options are being studied to reduce the DNER network from its current length of 66,297 km, to either 50,769 km, 43,405 km, or 38,703 km.

7. Initially, Brazil used cost plus contracts for RMBC work. Starting in 1979, these contracts were slowly replaced by unit cost contracts following a recommendation by the World Bank. By 1986, all MBC contracts were based on unit price. This change reduced the supervisory role of the DNER personnel allowing them to concentrate on the higher level management functions of planning, work identification, scheduling, quality control, measurement, and payments, and increased the productivity of the contractors. Training on unit price contracting was provided to the DNER and contractor staff.

8. By 1981 DNER had let out 264 routine maintenance contracts with lengths ranging between 90-130 km and prices between US$ 400,000 and US$ 1,400,000 per year. The size of contracts was later increased to an average of 270 km per contract to reduce costs through better equipment utilization. Contracts are let for a period of one year renewable up to a maximum of five years. At the end of the 5 year period, a public bid is held for selecting a new
contractor based on the lowest bidder. In 1989 DNER had 160 contracts with an average of 244 km and billings of US$ 625,000 per year.

9. Contractors must meet the following criteria to bid for DNER maintenance projects:

(a) have at least two years experience in maintenance work on no less than 100 km of paved roads.

(b) own or be able to lease the equipment specified in the bidding documents.

(c) meet the legal and financial requirements specified in the bidding documents.

10. DNER publishes, as part of the bidding documents, a unit price table as a guide to contractors. Unit prices quoted by the contractor may exceed those published by DNER. However, the overall cost cannot exceed that included in the work plan prepared by DNER.

11. DNER’s experience with maintenance by contract indicates that a staff of three inspectors can cover adequately the supervision and quality control requirements of 200 km of road provided the following conditions are met: (i) the supervisory team is qualified, (ii) the team is provided with adequate and timely transportation, and (iii) funds are made available to pay the per diem of the supervisory team.

12. The Ministerio de Obras Publicas y Transporte (MOPT) of Colombia, began contracting road maintenance work in 1977. At that time, four contracts averaging 100 km each and covering both routine and periodic maintenance, were let out. This first experiment was unsuccessful, in fact, contracts were canceled; the main reasons for the cancellations were:

(a) work programs were not well defined.

(b) contractors were given the responsibility to identify and schedule work which led to the selection of more profitable work first (periodic maintenance).

(c) inadequate penalties for non-compliance and poor work supervision on the part of MOPT.
(d) payment to contractors was through tolls collected by the contractors themselves. Toll collection fell behind to cost increases. Unit price adjustments were left to MOPT's discretion who did not apply them on a regular basis.

(e) contractors were required to maintain equipment on site exceeding the requirements of the contract size.

(f) contract wording permitted contractors to delay the execution of the work and thus allowing their use of collected funds for purposes other than contract work.

13. In 1980 contracting was reintroduced when nine contracts, averaging 130 km each, were let out. The following procedural improvements were made:

(a) toll collection was placed in the hands of a third party.

(b) contractors were paid using normal progress payments with funds from the toll and MOPT budget.

(c) consultants were hired to program and supervise the work.

14. This time, greater flexibility of contracting over force account was demonstrated. The contractors adjusted their work pace according to budget restrictions. Under budget restrictions, force account projects had to forego the purchase of supplies and materials affecting the work progress.

15. The procedures used, however, still had some problems: the supervision of work using consultants engaged on a cost plus fixed fee basis over the duration of the contract, did not lend itself to adjustment to changing work loads. Also, contractors faced some difficulties in the re-deployment of equipment in cases where work load reductions were unplanned.

16. Routine maintenance was subcontracted to local residents who were supervised by a "mobile" foreman. This arrangement was very successful to the point that MOPT restructured in 1985 the maintenance system based on the following tasks and responsibilities:

(a) routine maintenance - highway system: "micro-empresas" (micro-enterprises)
(b) routine maintenance - feeder roads: local residents.
(c) periodic maintenance and rehabilitation: contractors.
(d) mechanized routine maintenance & material supply to "micro-empresas": MOPT, by force account.

17. Road maintenance by micro-empresas was introduced in 1984 with UNDP’s assistance. Micro-empresas are made up of 10 to 14 men (12 on average) who carry out manual routine maintenance activities on approximately 50 km of road. They are organized as cooperatives with members having equal rights and obligations. Contracts with MOPT (Fondo Vial) are for one year with the micro-empresas providing their own tools and MOPT providing, on site, the materials and equipment, when needed. If MOPT assists in the purchase of tools, the micro-empresas pay back through deductions from their monthly payments.

18. The development of micro-empresas since 1984 is shown in figure 4, figure 5 and in the table below; in 1990, there were 362 micro-empresas with 4432 associates giving routine maintenance to 19,541 km of roads (76% of the national road network) at an approximate annual cost of US$400.00/km. This cost is about one half the force-account cost.
### Table 1: Development of Micro Empresas

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Micro-Empresas</th>
<th>Number of Members</th>
<th>Average Membership</th>
<th>Total Road Length Under Maintenance</th>
<th>Average km per Micro-Empresa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>28</td>
<td>340</td>
<td>12</td>
<td>1531 km</td>
<td>54.7</td>
</tr>
<tr>
<td>1985</td>
<td>85</td>
<td>997</td>
<td>12</td>
<td>4554</td>
<td>53.6</td>
</tr>
<tr>
<td>1986</td>
<td>127</td>
<td>1431</td>
<td>11</td>
<td>6820</td>
<td>53.7</td>
</tr>
<tr>
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<td>203</td>
<td>2516</td>
<td>12</td>
<td>10855</td>
<td>53.5</td>
</tr>
<tr>
<td>1988</td>
<td>268</td>
<td>3308</td>
<td>12</td>
<td>14486</td>
<td>54.1</td>
</tr>
<tr>
<td>1989</td>
<td>333</td>
<td>4112</td>
<td>12</td>
<td>17966</td>
<td>54.0</td>
</tr>
<tr>
<td>1990</td>
<td>362</td>
<td>4432</td>
<td>12</td>
<td>19541</td>
<td>54.0</td>
</tr>
</tbody>
</table>
Argentina

19. Argentina began contracting road maintenance, both periodic and routine, in 1979. At that time, the Dirección Nacional de Vialidad (DNV) announced that within 18 months, 70% of the routine maintenance of the 47,000 km national highway system was to be contracted out, with the remaining 30% to be done by force account. However, management changes and economic difficulties prevented the full implementation of the maintenance scheme at that time. In fact, contracting was eliminated; the last maintenance contract which expired in September 1984, was not renewed. The main reason for the decline in contracting activity was institutional rather than budgetary; the new DNV management was unwilling to give out direct participation in field work. Maintenance by contract peaked in 1981 when the expenditure split between contracting and force-account was 35% and 65% respectively.

20. Contracting was reintroduced in 1989 when the Ministry of Public Works put out bid documents for the privatization of road rehabilitation and maintenance through concessions to the private sector. Twelve highway lots covering nearly 10,000 km were identified. Under this scheme, the prospective concessionaire bid for a highway lot and upon selection, he was responsible for the rehabilitation of the highways to a pre-established condition and for their maintenance for the duration of the concession contract. To cover these costs, toll stations were established upon completion of the rehabilitation works. Toll rates to be charged in each of the highway sections were included in the bid documents for the corresponding highway lot. Non-compliance on the part of the concessionaire is penalized according to a pre-established set of fees. As way of example, the presence of pot holes for more than 24 hours is penalized with the daily payment of the cost of 500 liters of diesel.

Chile

21. Since the late 70s, Chile has worked extensively on the rehabilitation of its 79,000 km road network of which some 10,000 km are paved (1989).

22. The first and second highway reconstruction projects partially financed by the Bank (1981 and 1983), were directed to the reconstruction of Route 5 which runs from the border with Peru in the north, to Quellon in the south. The second highway reconstruction loan financed some maintenance work and the acquisition of maintenance equipment.

23. In 1985, with the first road sector project, more emphasis was placed on road maintenance work and training. Under this loan, the road
maintenance administration under the Roads Directorate of the Ministry of Public Works (vialidad) was strengthened to include the implementation of an information and cost accounting system comprising all cost factors. At that time, Vialidad increased the size of the maintained road network from 23,000 km (basic road network) to 47,000 km (basic + primary road networks) and sought the help of municipalities for the maintenance of the remaining 32,000 km (secondary road network).

24. Consistent with these changes, the maintenance budget was increased from US$ 48 million in 1985 to US$ 116 million in 1988. Albeit the substantial increase in the maintenance budget, the amount was insufficient.

25. During the execution of the second road sector loan, the issue of using maintenance by contract for the basic road network was raised and as a result of this, a study was commissioned to look at the whole issue of contracting maintenance and of seeking the assistance of the municipalities in the maintenance of local roads. With regards to the involvement of municipalities in maintenance operations, the study concluded that the municipalities lacked the equipment, personnel, and funds necessary to perform the supporting role adequately. As a result of this, Vialidad assumed the responsibility of most of the road network.

26. In 1988, Vialidad compared the costs of maintenance operations by contract to those by force account. The results of this comparison were documented in a paper prepared by Vialidad entitled "Sistema de Control de Costos de Mantenimiento por Administracion Directa, Comparacion con Costos por Contrato". The paper compares unit costs for 24 routine and 7 periodic maintenance items. Contracting came out more expensive in 19 items in the case of routine maintenance and in all except one of the periodic maintenance items.

27. The report qualifies the results as follows:

(a) there are elements of cost for which it was impossible to establish a direct comparison as the specifications used for these elements under work by contract differ from those used in force account.

(b) some other items were difficult to compare because the units of measurement between contracting and force account, differed.
(c) some materials used for force account work were not included in the cost as they were supplied at no cost to Vialidad.

(d) bulk buying of items such as tires and fuel resulted in a lower cost to Vialidad. The same principle applies to equipment purchases. The hourly cost of equipment was found to be 30% cheaper for Vialidad.

28. Because of the above, the study concludes that it is necessary:

(a) to bring the specifications of force account work to the level of those used in contracted;

(b) to standardize the units of measurement;

(c) to monitor results in order to detect mistakes; and

(d) to carry out routine maintenance by force account and to contract periodic maintenance.

Province of British Columbia

29. As of 1988, the Province of British Columbia, Canada, is doing all of its road maintenance work by contract (compared to 35% in 1987). Obtaining the services at a lower cost and encouraging the development of the private sector, were the main reasons given to move to full contracting. Labor and political pressure also played an important part in that decision.

30. The contracted work is carried out according to work specifications prepared by the Province which include: materials to be used, performance standards, work methods, response time, frequency of operations, and work scheduling.

31. Lump sum contracts are used for both routine and periodic maintenance. Similar type work such as clearing and mowing or pavement patching and sealing, are combined into the contracts. Contracts provide detailed estimates of work quantities for periodic maintenance work.
32. Contracts are multi-year and contractors are paid monthly based on the time spent on the job by the contractor. The Province is in the process of re-negotiating the contracts let in 1988.

33. During the past three years, the number of contractors involved in road maintenance increased from 38 to 77, the amount of equipment owned by the Province has been reduced to about half, the Ministry's maintenance garages are being leased, and the mechanics have all been hired by the maintenance contractors.
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