SUMMARY

The use of contracts to maintain highways in Ontario has been proven to be advantageous in many circumstances. It is possible to reduce expenditures and staff, resulting in a leaner, more flexible organization. The Ministry is now in a position to utilize new technology and is less restricted by obsolete equipment or by staff with the inappropriate expertise or capabilities. Employee morale may be improved if dangerous or unpleasant jobs can be done by contractors who specialize in this type of work.

On some projects, quality control has suffered because the contractor's employees were unskilled or because MTC inspectors were not adequately trained. The Ministry has lost its expertise in operating crushing and asphalt plants, and these operations will have to be contracted in the future. This loss of expertise will certainly be encountered in some other operations in the future. Employee morale may suffer if the employees perceive that their jobs are in jeopardy or if they believe that their opportunities for advancement are restricted because of reduced staff levels.

There are some risks involved with increasing contract maintenance, and these potential problems must be analyzed. During the 1982-1983 winter, two of the Ministry's contractors experienced financial difficulties and were not able to continue operating. In these cases the Ministry was able to obtain some replacement equipment and to relocate some of its own equipment so that there was no reduction in service. As the percentage of maintenance work done by contract increases, the consequences of this action could be more serious, especially if specialized equipment is involved. There were no problems when it was necessary to terminate the contract trucks used for winter sanding, because most of these were standard dump trucks on which a Ministry-owned sand spreader was mounted. There are a large number of these trucks available, and the spreader can be moved from one truck to another in one day. It would be much more difficult to obtain specialized equipment such as snowplows. The consequences of a contractor's being unable to fulfill his contract or of the Ministry's having to cancel a contract because of poor performance will have to be considered for the various types of contracts.

The trend toward increased maintenance by contract will require changes in the future. Patrol supervisors will require different skills to inspect contractors' work and to deal with contractors' staff. As a result, training programs will be necessary to instruct Ministry personnel in the use of contract diaries and reports and in interpreting and administering specifications and contracts. It will also be necessary to prepare operating instructions for many jobs. In the past, the expertise of the patrol staff was relied on, but in some cases this is likely to be lost because of the small crews. More descriptive operating instructions and quality standards will be required in order to tender work.

A more comprehensive maintenance management system will be required in order to document the accomplishment and related costs of contract work, as well as work by the highway department. When the Ministry's maintenance management system was initially developed, there were few contracts, and data relative to contracts were not included in the reporting system. Because an extensive amount of maintenance work is now being done by contract, the decision to use contracts or Ministry forces will depend on having adequate records of all costs.

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Problem Solving—Key to Successful Contracting for Maintenance

JOHN C. WHITMAN

ABSTRACT

Interest in contracting for highway maintenance has increased rapidly in recent years. With this increasing interest have come more and more demonstrations of contracting. Highway agencies are encountering problems that they may not have previously experienced as they begin to demonstrate contracting for highway maintenance. The key to successfully contracting for maintenance is to solve those problems as they arise. Described in this paper are many of the common problems that have been encountered in demonstrations of contracting for maintenance and the solutions that have been developed and successfully applied. These common problems include planning realistic maintenance work programs, encouraging contractors to participate in the procurement process, fostering an atmosphere of cooperation, and monitoring work as it is being performed. Practical guidance is provided to the middle manager and the careful planning processes are described along with the positive approach necessary to ensure that contracting for highway maintenance attains its full potential.

Interest from all levels of government in contract-
ing for highway and other public services maintenance continues to rapidly increase. Federal agencies have increasingly taken actions to comply with federal legislation by requiring a comparison between services performed in-house and services provided by contractors. Many state highway and transportation agencies are in the process of conducting demonstrations or expanding the scope of previously conducted demonstrations of contracting for highway maintenance. Local government agencies are also using an increasing number of private contractors to provide a wide range of maintenance and public services—from highway maintenance to refuse collection and from fire fighting to park maintenance. Industry-related organizations such as the Transportation Research Board and the World Bank are also demonstrating increasing interest.

Private-sector organizations, such as the Associated General Contractors and the American Road and Transportation Builders Association, have also taken steps to generate interest as maintenance spending increased and more attention is focused on the condition of existing facilities. This interest will continue because these organizations have realized the benefits to their member companies of performing maintenance work.

The concept of managing and performing highway and street maintenance by contract has been demonstrated as having the potential for substantial savings. As contracting for maintenance has succeeded, more agencies have begun to experiment with the concept. Not all of the experiments have been successful. Some failed because of inappropriate applications. Others experienced the types of problems inherent in any application of established concepts to new activities. As organizations consider their own demonstrations of maintenance contracting, it is important for them to anticipate those problems and to take steps to avoid them.

The most common problems encountered in several demonstrations of contracting for street and highway maintenance and the solutions that have been developed and successfully applied are discussed in this paper. These demonstrations have proven that contracting is a management approach to maintaining highways that cannot be discounted. Each of these problems has been solved by creative management and other problems that may arise can be solved as well.

MAINTENANCE WORK PROGRAMS NOT REALISTICALLY DEFINED

To undertake contracting a maintenance agreement must have a realistically defined work program—or in federal A-76 jargon a statement of work. A-76 is the commonly used name for a federal-legislative action that requires federal agencies to determine whether the services they provide can be contracted to a private sector contractor at a lower price and if the findings indicate that they should contract for those services. This work program must identify all work that will need to be undertaken during the planning period. The work program must accurately reflect the condition of the road system and the agency’s ability to fund maintenance work. Unrealistic work programs lead to numerous changes in contract amounts after bidding which in turn can discourage contractors from bidding or encourage contractors to bid conservatively. In addition, unrealistic work programs make comparisons of in-house versus contractors’ costs difficult and misleading.

For agencies that do not have maintenance management systems in place, the identification of a maintenance work program will require a concerted effort. These agencies will need to develop the following system elements:

1. Lists of work activities, 2. Inventories of physical features that relate to each work activity, and 3. Levels of service for each work activity.

These system elements can be used to define realistic maintenance work programs.

For agencies that have maintenance management systems in place, the identification of a maintenance work program should not be a major undertaking. However, each of these agencies must determine how well they have been able to implement their previous work programs. If the levels of actual work performance have not been closely tracking the levels of planned work performance, the agency should review its procedures for establishing levels of service and for scheduling and controlling work.

LIMITING APPLICATION TO SELECTED WORK ACTIVITIES

A number of attempts at contracting for maintenance have limited application to a few selected work activities, such as mowing, chip sealing, or pothole patching. In doing so, the cost evaluations were necessarily restricted to a comparison of the unit price bid by the contractor with the unit cost of in-house performance. No consideration was given to the costs and benefits of contracting as related to the effects on work-load balancing, work-force balancing, and equipment balance. Experience indicates that these factors are frequently the most significant in comprehensive evaluations.

Without a bottom-line evaluation including these real economic costs and benefits, force account maintenance may appear to the agency to be the most advantageous alternative. However, when all factors are considered, it is often the case that contracting, even at a higher unit price for some work activities, will be the most economic alternative.

To effectively conduct an analysis of the real economic opportunities for applying contracting to the work load of an agency it is necessary to first realistically define and seasonally distribute the work load in quantifiable terms. For agencies that have comprehensive maintenance management systems, this is routinely accomplished. For those agencies without defined work programs, development of a realistic work program represents the first step. Given a maintenance work program that is seasonally distributed, identification of valid evaluations of contracting opportunities can occur.

Within this framework, seasonal work load, manpower, and equipment resource peaks and valleys become apparent. Elimination of these peaks and valleys in agency work force and resource requirements offers the first and frequently the best opportunity for significant economies from contracting. Only when these kinds of determinations are made is an objective, well founded basis for work activity selection and the evaluation of contracting potential possible.

CONTRACT DOCUMENTS AND PROCUREMENT PROCEDURES NOT SPECIFICALLY DEVELOPED FOR MAINTENANCE WORK

It is common practice for highway agencies, as they begin to develop maintenance contract documents and procurement procedures, to use existing contract specialists to prepare the contract. Contract specialists have expertise in contracting for large projects involving permanent facilities which require rigorous quality control and protection against contractor default. These contract clauses take the following forms.

- Typical prequalification requirements have re-
required certified accountancy statements. It is not uncommon for these statements to cost a contractor more than $10,000.

- Typical performance bonding is for the entire amount of dollars covered in the contract. These bonds are difficult to obtain and costly for small and new contractors.
- Typical quality control specifications demand costly and time-consuming testing procedures and limit sources of material supplies. High quality portland cement concrete passing rigorous test requirements is essential for pavements and structures but may not be needed for anchoring of replacement fence posts.

Because of the generally smaller volumes of maintenance work and the repetitive nature of such work, contract documents do not have to be as rigorous in quality control or default protection. For example:

- Prequalification requirements can be waived,
- Performance guarantees may be in the form of partial withholding of payment for work, and
- Quality control testing may only be required if the inspector-maintenance manager determines that the contractor is not using prudent judgment.

These approaches are not intended to imply that quality control is not important in maintenance. Procurement and quality control procedures must be developed specifically for maintenance contracting rather than simply adopting existing construction-oriented procedures.

For agencies that have not successfully performed maintenance contracting, training of maintenance managers in contract preparation, contract administration, and contract inspection may be necessary. An alternative approach would be to engage a manager contractor who has maintenance experience to fulfill this role.

CONFRONTATIONAL ATTITUDES BETWEEN AGENCY AND CONTRACTOR

Often attitudes of distrust exist between government agency managers and contractor managers. For example, agency managers believe contractors are intent on shortchanging the taxpayer. Conversely, contractors believe agency managers are interested in bureaucratic procedures—not well-run operations.

In the absence of mutual respect and a common understanding, contractors are discouraged from bidding. If they do bid in an atmosphere of mutual distrust, their bid prices reflect sizable margins of safety. Agency managers may elect to protect their position under a contracting situation by retaining duplicate labor and equipment resources as insurance. The combined effect of these two actions can have a sizable negative impact on the cost effectiveness of contract opportunities.

Obviously neither the actions of the contractor nor the actions of the agency manager are rational. However, where attitudes of mistrust do exist, there is a real need to improve understanding of each party's objectives and interests. Such an understanding must include a recognition by agency managers that appropriate contracting efforts will result in a savings to the taxpayer and a profit to the contractor. Equally important is the recognition by the agency manager that for a viable, efficient, and responsible contracting industry to exist, contract terms must be developed, applied, and interpreted with practicality and reason.

At the same time, contractors must recognize the government agency's responsibility to protect the broadest interest of the taxpayer. That interest includes economy in the use of tax dollars. This understanding must be achieved through top management policy direction and then as an on-going hands-on learning experience for employees of both the public agency and the contractor.

In addition, both parties must recognize inherent inaccuracies in maintenance planning and be willing to share the risks of estimating unit costs. For example, both parties must understand the need and value of contract provisions which recognize that work loads vary significantly in magnitude from year to year. These provisions should be designed to allow for increasing unit costs if the work plan overstated the amount of work or decreasing unit costs if the work plan understated the amount of work.

REDUCING IN-HOUSE MAINTENANCE STAFFS

Contracting out existing maintenance work reduces the need for in-house maintenance resources. If staffing and equipment fleet reductions are not made in conjunction with issuing maintenance contracts, the total cost of maintenance will increase. The cost of contracting is additive to the cost of maintaining fixed staffs and equipment fleets. Therefore, agencies have to reduce in-house maintenance staffs to achieve the economies that have resulted and been documented from contracting for maintenance.

A clear understanding of existing staffing, policy, personnel rules, and union agreements is necessary in advance of beginning the contracting process. To overcome obstacles and smooth the transition from in-house to contractor staffing, maintenance managers will need to take some or all of the following measures:

- Publicize the benefits of contracting;
- Educate elected officials and top level administrative personnel about the economic benefits of contracting;
- Begin the contract process within a demonstration area—all in-house forces can be reassigned from the demonstration area to other areas where in-house forces continue to be used;
- Begin to reduce overall staffing through attrition and reduced or zero hiring;
- Provide early retirement incentives paid for from budget savings;
- Renegotiate union agreements to allow contracting;
- Require contractors to give preferential treatment to existing maintenance workers; and
- Provide retraining for maintenance workers to allow them to transfer to other areas of agency responsibility such as construction inspection.

Staffing issues must be dealt with early in planning for contract maintenance. These issues can be successfully resolved.

LACK OF UNDERSTANDING OF HOW TO PERFORM MAINTENANCE WORK

A common problem in establishing maintenance by contract is often a lack of understanding of how to perform maintenance work—both on the part of the contractor and agency personnel. This problem occurs because (a) contractors have not previously performed maintenance work, and (b) contracts administrative personnel in many agencies assume responsibility for developing contract documents.

Contractors will prepare a bid that will cover costs and profit for the job as they understand it. If contractors do not have an accurate understanding
of the maintenance work to be performed, the result may be an under- or over-priced bid. In either event, this situation is not constructive to the contracting process.

If agency contracts administrative personnel do not have a thorough understanding of the maintenance work to be performed, they may develop contract specifications that are too restrictive or unrealistic from a maintenance perspective. Examples include:

- Requirement of strict gradation and testing of aggregate where the stone is to be used for leveling shoulders;
or
- Requirement of survey control of shoulder cross sections for a simple shoulder blading operation;
or
- Requirement of pay items that are difficult to measure, record, or verify, such as number of passes along a highway segment during a snow storm.

Clear communications among all parties involved in contracting maintenance will solve the problem of lack of understanding of maintenance work. Some examples of communicating how maintenance work is to be performed before a contract is bid are included in the following sections.

**Work Method Definition**

The contracting agency should have a written definition of the method of performing each task that is to be contracted. Figure 1 shows a work method description for pothole patching that has been successfully used in Rancho Palos Verdes, California. The contracting agency should dictate the work method as shown on the form (Figure 1). However, the agency should only provide the resource information for the convenience of the contractor, not as a contractual requirement. The agency should also, from time to time, discuss ideas for improvements to work methods with interested contractors. If a more productive work method that achieves acceptable work results is found, the agency should adopt the new method and encourage its use.

**Prebid Conferences**

The contracting agency should conduct a prebid con-

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**FIGURE 1** Maintenance management system for city of Rancho Palos Verdes, California.
ference for each maintenance job to be bid. A mainte-
nance person from the contracting agency should
explain the work to be performed, the desired re-
sults, and problems that have been encountered in
past operations. If possible, similar ongoing main-
tenance operations should be available for con-
tractor viewing. If contracts administrative per-
norme are to prepare the contract documents, they
should participate in the prebid conference. If con-
struction inspection personnel are to be respon-
sible for quality control, they should also partici-
pate in the prebid conference.

Preparation of Contract Documents

In many highway agencies, separate lines of author-
ity for maintenance, design, and construction have
led to jurisdictional problems. Maintenance man-
gers must overcome these artificial barriers and
provide input to developing contract documents.
The following example of a highway agency at-
tempts to demonstrate contracting of maintenance
illustrates the point. Design personnel decided
that as a part of a routine shoulder grading opera-
tion, 4 inches of aggregate should be placed and
compacted. This, of course, would be acceptable
practice for construction of new shoulders. However,
proper maintenance practice required only minor
amounts of aggregate. Maintenance personnel were
reluctant to point out this problem until a confer-
ence between design and maintenance personnel was
held and realistic maintenance practices were dis-
cussed.

Prebid Meeting with Individual Contractors

The contracting agency may arrange individual meet-
ings with interested contractors to explain the spe-
cific maintenance operation and to review agency
training materials. This process serves to clear up
any misunderstandings that potential bidders may
have before actual bidding.

Scheduling the Work Efforts of Maintenance
Contractors

Two types of scheduling problems have arisen as
highway agencies have begun to contract for main-
tenance: (a) unnecessarily stringent response re-
quirements for routine maintenance work, and (b)
lack of specificity about location and amount of
work to be scheduled. In the first case, contrac-
tors are required to have crews dedicated to respond
to agency requests. Because these crews are held in
reserve to respond to these strict scheduling de-
mands, they are not available to perform work for
other clients of the contractor and they are not
allowed to have nonproductive time. The contractor,
therefore, must bid unit costs that will cover not
only direct operating costs and profits, but also
indirect costs resulting from nonproductive time.
In the second case, contractors' crews are delayed
from productive work while they locate specific job
sites and determine exactly how much work is to be
performed. These inefficient scheduling techniques
cause delays and low productivity which result in high unit bid
prices and either incomplete job performance or per-
formance of work that may not be necessary or de-
sirable.

Good agency maintenance work scheduling proce-
dures will reduce contractor scheduling problems to
a minimum. The following scheduling procedures must
be in place to ensure successful operations:

- Scheduling procedures and response requirements
  must be defined before bidding the work,
- Routine checks of the road system must be made
  to stay abreast of maintenance needs,
- Maintenance jobs that are to be scheduled must
  be evaluated to define the location and to de-
  termine exactly how much work is to be per-
  formed, and
- Scheduling information must be clearly communi-
  cated to the contractors' representative.

An ancillary benefit of undertaking contracting is
that agency managers have more clearly understood
the need for good scheduling procedures and in some
cases have improved scheduling of their in-house
forces.

Monitoring Maintenance Work from a
Construction Perspective

In some highway agencies that have undertaken main-
tenance by contract, construction inspection person-
nel have been given full responsibility for monitor-
ing maintenance contracts. Construction inspection
personnel are accustomed to (a) rigid control and
testing procedures, (b) large projects involving
survey and specialized inspection personnel, and (c)
continuous construction operations with established
schedules for specialized survey or testing person-
nel and equipment.

Because of their training and work experience,
construction inspectors who monitor maintenance may
tend to cause some undesirable situations. For ex-
ample, maintenance repairs are usually in-kind re-
pairs. When a drainage culvert is replaced by main-
tenance forces, the length of pipe and inlet-outlet
treatment are probably not modified. Construction
inspection personnel unfamiliar with this practice
may expect additional length of pipe and updated
inlet-outlet treatments to comply with the latest
construction practices. Although this additional
work would no doubt be an improvement at the spe-
cific site, it might not improve the safety or oper-
ation of the road section. Other culverts that are
in place on the same road section might continue to
present width restrictions for shoulder sections.

Similarly, acceptable maintenance of earth
shoulders in many areas consists of annual or semi-
annual blading with a motor grader to ensure proper
drainage away from the pavement. Construction in-
spection personnel unfamiliar with these practices
may try to require accurate horizontal and vertical
test established by surveying. Coordinating a
survey party, setting and checking grade would cause
delays in an otherwise high-production maintenance
operation.

Another disadvantage of having construction per-
sonnel inspect contract maintenance operations may
be underutilization of agency staff. Maintenance
managers would still be required for such tasks as
inspecting conditions on the highway network, deter-
mining proper solutions to maintenance problems, and
scheduling contractor work. It may not be possible
to fully use both maintenance and construction per-
sonnel.

Monitoring of contract maintenance operations can
be handled smoothly and efficiently with properly
trained staff. However, to do so, several ideas need
to be incorporated into the organization of the
monitoring effort. These ideas are discussed in the
following paragraphs.

- Use of maintenance managers for quality control
  of many contract operations is effective. Main-
tenance managers can certainly monitor contract opera-
ations such as snow removal and shoulder blading dur-
ing their routine inspections of the highway network.

- Flexibility in approval of work quality is neces-
sary for reasonable maintenance operations. As an
example, the contracting agency should identify gradation specifications for aggregate to be used on spot shoulder repair. However, gradation testing may not be necessary for satisfactory job performance. Inspection personnel can require testing to ensure that gradation specifications are met if the stone appears to be contaminated with undesirable debris. On the other hand, visual examination should be sufficient if the aggregate is free of debris.

Start-Up Monitoring

Where construction inspection personnel are responsible for quality control, the contracting agency can have staff with a thorough working knowledge of the specific maintenance operation closely monitor the contractor's initial operations. This monitoring by maintenance managers should continue only until the contractor is performing the work satisfactorily and the inspection personnel understand maintenance objectives for the operations.

Contractors' Reluctance to Participate in Procurement Process

Agencies have sometimes been reluctant to contract for maintenance because of an actual or perceived lack of contractor interest in the procurement process. This idea originates from perceptions that (a) contractors are not interested in smaller maintenance-type jobs; (b) contractors are not knowledgeable of maintenance work; and (c) even if contractors become interested in maintenance during a construction slow-down, they would not continue to perform maintenance as construction funds began to increase.

In properly planned and managed contract maintenance operations, contractors have demonstrated an eagerness to perform contract maintenance work. This eagerness is created by the following factors:

- Contractors want to expand their markets,
- Maintenance work is continuing in nature,
- Much maintenance work has scheduling flexibility and can be used as fill-in work for contractors' workforces,
- Funding for maintenance has been growing rapidly, and
- Contractors can perform maintenance work profitably.

By taking the lead in informing and educating contractors, agency managers can have a major impact on the number of contractors participating in the procurement process. This impact is particularly significant in the initial efforts to begin contract maintenance.

The manager can take the lead in identifying potential contractors through a contractor survey. An effective survey would include identifying potential contractors for each maintenance job, both on a local and a regional basis; contacting potential contractors to ensure that they are aware of the upcoming procurement contracts; briefly explaining the upcoming project; and projecting a positive point of view about the likely success of the upcoming project. After this initial contact, the contract manager may need additional communications with potential contractors. During these communications, the contract manager should continue to encourage and act as a problem-solver for contractors who have not previously performed maintenance work.

Inability to Compare Force Account and Contract Maintenance Costs

Many agencies in analyzing the feasibility of contracting out maintenance have attempted to compare force account versus contract work costs. The inability of agency managers to ascertain true costs of either force account or contract work has caused the agency to decide not to attempt contracting or to refrain from contracting demonstrations.

Some of the difficulties in making comparisons between force account and contract work cost have been:

- Overhead costs per unit of in-house work has been difficult to define,
- Unit costs for in-house work has not been stated on the same basis as unit costs for contract work (i.e., in-house payroll benefits are not included in labor rates),
- Contractor work areas overlap with in-house work areas which obscures cost data, and
- Unit costs for in-house work vary widely between operating units.

Complete solutions to some of these difficulties may require development of entirely new accounting systems over a period of several years. This would cause delay in the agency developing sound and workable contracting procedures. A more positive approach is to proceed with a demonstration of contracting for maintenance in an existing field office area. All maintenance work in the selected area can be contracted.

Either of two approaches could be used for comparing bottom-line costs of the demonstration. The first approach would involve establishing a control area where all maintenance work would be performed by agency forces. Results from the control area would be compared to results from the demonstration area.

The second approach would be to compare bottom-line costs in the previous reporting period (while work was performed with agency forces) with a similar reporting period after the demonstration had begun. Some adjustments to the two costs might be necessary to account for inflation.

Issue of the Future

Successful experience in contracting for maintenance—as discussed in this paper—depends on the agency's commitment to a well-planned and positive approach. Considerable experience has been gained in the last few years in successfully contracting for highway maintenance. Effective solutions to the problems initially faced have been developed and are being applied.

The state of the art is still developing, but it has advanced to the stage where the question is no longer, Is contracting for maintenance appropriate and practical? The key question maintenance managers must now focus on is: How can transitions from agency force to contractor performance be accomplished most smoothly?