NATIONAL COOPERATIVE
HIGHWAY RESEARCH PROGRAM REPORT 344

MAINTENANCE CONTRACTING

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM
REPORT 344

MAINTENANCE CONTRACTING

R. B. NEWMAN and J. E. GARMONG
Bergstralh-Shaw-Newman, Inc.
Frederick, Maryland
and
H. P. HATRY
The Urban Institute
Washington, D.C.

RESEARCH SPONSORED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS IN COOPERATION WITH THE FEDERAL HIGHWAY ADMINISTRATION

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL
WASHINGTON, D. C.

DECEMBER 1991

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

Note: The Transportation Research Board, the National Research Council, the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the individual states participating in the National Cooperative Highway Research Program do not endorse products or manufacturers. Trade or manufacturers names appear herein solely because they are considered essential to the object of this report.

NCHRP REPORT 344

Project 14-9(3) FY '90

ISSN 0077-5614

ISBN 0-309-04867-2

L. C. Catalog Card No. 91-68144

Price $11.00

Areas of Interests

Maintenance

Mode

Highway Transportation

NOTICE

The project that is the subject of this report was a part of the National Cooperative Highway Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation officials, or the Federal Highway Administration, U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical committee according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

Published reports of the

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

are available from:

Transportation Research Board
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Printed in the United States of America

FOREWORD

By Staff
Transportation Research Board

This report contains an assessment of current practices and provides general guidance on contracting for highway maintenance. The state-of-the-art assessment is based on data obtained from 58 highway agencies (42 states, 7 Canadian provinces, 6 counties, 1 city, and 1 regional agency), the U.S. Forest Service, and 29 contractors. The guidelines contain information and direction for deciding when and how to contract for maintenance. Maintenance engineers or managers throughout a highway agency will find the report of interest. This report along with the recent NCHRP Synthesis of Highway Practice 125, "Maintenance Activities Accomplished by Contract," should be useful to highway agencies and other organizations involved in similar work.

Highway departments are challenged by increasing levels-of-service demands and the deteriorating infrastructure at a time of constrained resources (funds, equipment, materials, and personnel). As the resulting workload enlarges, the contracting of maintenance activities is being used as an alternative to the expansion of in-house resources. However, limited in-house resources may not be the only reason for engaging in contract maintenance. Decisions for contracting can also be based on such factors as the need for specialized equipment and expertise, more cost-effective procedures or techniques, better quality, public demand for new services, statutory requirements, agency policies, seasonality of work, and contractor availability.

Most state highway departments have gained experience in various contracting relationships with private industry and, in some instances, other governmental agencies that collectively include many aspects of performing highway maintenance. Contract maintenance has been used to perform both functional contracting (e.g., guardrail repair) and general contracting (e.g., overall maintenance of a designated highway section). Contracts for maintenance can also be based on repair, restoration, or services connected with a single project or provided over a specified period of time. Current practices used for contract development (including the decision to contract), implementation, and administration need to be collected and shared through practical guidelines for use by state highway departments.

Under NCHRP Project 14-9(3), "Maintenance Contracting," Bergstralh-Shaw-Newman, Inc., was assigned the objective of preparing guidelines for the development, implementation, and administration of maintenance contracts. When formulating the original scope of work, recognition was given to the existence of NCHRP Synthesis of Highway Practice 125, "Maintenance Activities Accomplished by Contract." Consequently, this research was designed to extend the state of the art represented by the Synthesis and, then, based on that information, develop guidelines. Now that NCHRP Project 14-9(3) is completed, this report and the Synthesis should be an excellent resource to highway (and other) maintenance engineers and professionals contemplating or engaged in contracting for maintenance activities and services.

CONTENTS

ACKNOWLEDGMENTS

This research and guideline preparation was performed under NCHRP Project 14-9(3) by Bergstralh-Shaw-Newman, Inc. (B-S-N) and The Urban Institute. B-S-N was the prime contractor, and the Urban Institute was a subcontractor.

Robert B. Newman was the principal investigator. Harry P. Hatry, of the Urban Institute, was the co-principal investigator. Jeffrey E. Garmong, of B-S-N, assisted with the writing of the report. John Short, a consultant to the Urban Institute, reviewed and commented on all writings for the project. Kenneth M. Mellinger, of B-S-N and formerly with the Indian Department of Highways, helped formulate the questionnaires, reviewed the writings, and chaired the Agency Advisory Committee. In addition to Mr. Mellinger, the Agency Advisory Committee included: Ed Erxleben, Director, Arkansas Office of State Purchasing; McRaney Fulmer, Director of Maintenance, South Carolina Department of Highways and Public Transportation; James C. Porritt, Managing Director, Kent County Road Commission, Michigan; and George Russell, Assistant State Engineer for Maintenance, Arizona DOT and former Director of the Highway Maintenance Division, New York DOT.

The comments and advice from the Advisory Committee were used to improve the report and ensure practicality.

The authors also wish to express their appreciation to all those who responded to the questionnaires, the officials of the six agencies selected for in-depth interviews, and the contractors who gave their time to meet with us.

MAINTENANCE CONTRACTING

SUMMARY

Staffing for maintenance in state highway agencies declined by 9 percent between 1977 and 1989. This reduction reflects the efficiencies achieved through implementation of maintenance management systems as well as imposed staffing limitations. Staffing data were not available for local governments. At the same time, traffic volumes for all jurisdictions—local as well as state—increased over 25 percent and maintenance expenditures for those agencies, expressed in constant 1977 dollars, increased over 40 percent. Agencies must increase staffing to provide needed maintenance services or seek help from others outside the agency. Because of imposed staff limitations, outside assistance is the only practical solution for most agencies.

While agencies use services from other agencies, adopt-a-highway programs, prison labor, offender programs and landowners, most outside assistance is from private contractors. Few agencies have developed contracting manuals or standard maintenance specifications. Guidelines are needed to assist agencies in contracting for maintenance services. This project was initiated to provide those guidelines. Key research findings are summarized in the following.

1. Many attempts have been made to define maintenance. The items defined as maintenance or construction vary significantly among agencies. However, on the basis of the project results, the researchers conclude that for the purposes of contracting maintenance services, the common denominator is funding. All items funded through the maintenance budget should be considered maintenance items.

2. The major reasons for contracting for maintenance services are: (a) to supplement in-house staffing, especially for peak work loads; (b) to obtain the use of specialized equipment; (c) to obtain the services of specialized personnel; (d) to obtain services at lower cost; (e) to meet executive policies; (f) to perform emergency work; and (g) to improve responsiveness.

3. Comparisons of work quality and costs between in-house and contractors can provide a constructive competition to improve productivity for both. For costs to be fairly compared, the work must be performed to the same quality standard and all costs for in-house performance and contractor performance must be included in the comparisons. For in-house work, cost calculations should include: (a) labor and fringe benefits, including nonproductive time; (b) equipment rental costs; (c) materials costs; and (d) overhead costs (shop and yard facilities, supervision). The costs of contracting include: (a) contract development costs (preliminary engineering, advertising and award); (b) payments to contractors; (c) the cost of any agency-furnished materials; and (d) inspection costs.

4. The amount of maintenance work contracted, as reported by the state, provincial, city and county agencies, varies from none to 100 percent. Essentially all maintenance activities are contracted by at least one agency. It appears that the absolute minimum in-house staff is that required to administer the contracts. Sixteen agencies have guidelines for determining the minimum in-house maintenance staff. Of these, seven base the minimum staffing on their needs for snow and ice control. The remaining agencies use a variety of methods. A major concern in determining the amount of work to

contract and that to remain in-house is the desired response times. Many agencies are concerned that contractors will not respond to snow and ice and other emergencies as quickly as in-house staffs. Reported experience on actual contractor response times varied from unacceptable to excellent, depending on the agency and the contractor. Improved response time specifications and enforcement are needed to overcome this problem.

5. While there have been problems in contracting some maintenance items in some agencies, contracting has worked reasonably well overall. Changes in specifications, withholding payments, requiring rework at contractor's expense, increasing the level of inspection, reducing the contractor's prequalification rating and excluding contractors from bidding on future work have resolved most of the problems. Employee acceptance of and public reaction to contracting have generally been good. The use of contractors for maintenance can be expected to continue or increase as agencies gain more experience and continue to resolve procedural problems. Limitations on the size of maintenance staffs are expected to continue.

6. Guidelines were developed for contracting maintenance services (see Appendix A). These guidelines were assembled from information collected through the questionnaires and visits with personnel from selected agencies and contracting firms. The guidelines address such major topics as: (a) deciding to contract for maintenance services (each agency must determine which activities and the amount of those activities that can be contracted most effectively; for various reasons it may be effective to contract for an activity in one agency but not in another); (b) preparation for contracting, including defining the work, contract provisions, soliciting bids, and analyzing and awarding bids; (c) administering contracts, which includes prework conferences, inspection, documentation, training, quality assurance, evaluating contractor performance, periodic payments, contract time administration, incentives and disincentives, recognition of performance, liquidated damages, and final payments; and (d) modifying contracts for time extensions, change orders and supplemental agreements, contract cancellation, contractor default, contractor debarments, and contract renewals.

7. Contract maintenance is one more tool that agencies can use to help manage maintenance. It is not a panacea; it will not solve all problems, but it is a viable alternative for accomplishing needed work.

8. A few agencies have developed standard maintenance specifications for activities that are normally contracted. Such specifications are needed by many agencies. National standard specifications—similar to those for highway and bridge construction—should be developed for agencies to use or adapt to their local conditions.

9. Relatively few agencies have training programs for contract maintenance inspectors. The training needs vary widely because of the background of those assigned to inspection. Some are experienced construction inspectors; others come from maintenance crews. Both may need training: construction inspectors in maintenance work methods and maintenance employees in contract administration. Much of the contract maintenance is performed by small or disadvantaged contractors. Many have limited experience in contracting with government agencies. They frequently need training in bidding procedures as well as the technical aspects of the work. Very little training is available to meet these needs. While training, to be effective, must address the specific needs in each agency or contractor specialty group, the development of a series of model courses for selected training needs on a national basis could reduce the total costs of providing the needed training. The model courses should be designed so agencies can adapt them to fit their particular needs and conditions.

CHAPTER ONE

INTRODUCTION AND RESEARCH APPROACH

INTRODUCTION

Staffing for maintenance in the state highway and transportation departments decreased 9 percent between 1977 and 1989 (based on data from 35 states—all for which data were available in both years) (*1,2*). This reduction in forces reflects the efficiencies achieved through implementation of maintenance management systems as well as staffing limitations imposed on maintenance divisions. (Staffing data were not available for local agencies.) During that same time period, the number of lane-miles maintained by the states increased slightly—1½ percent. Statistics collected by the Federal Highway Administration for the years 1982 through 1988 show that, while the total centerline miles for all highways—local as well as state—were relatively constant, the total traffic volume increased over 25 percent and maintenance costs, in 1977 constant dollars, increased over 40 percent (*3*). The trends are shown in Figure 1.

With these imposed staffing limitations, the increased demand for services and increased funding, many maintenance managers cannot maintain the roads to the needed quality levels entirely with agency forces, despite improved productivity. Managers who were involved with reductions in force in the past are reluctant to go through it again. Because of the trauma of laying off good employees, they are reluctant to increase staff even if there were no restrictions on hiring. They have increasingly sought help from outside the agency—from other agencies, adopt-a-highway programs, prison labor, offender programs, landowners, and contractors—with most of that assistance from contractors.

In addition to supplementing in-house staffs, there are other reasons for seeking outside help. These include the need for specialized equipment or personnel, statutory requirements, public demand for new services, agency policies, the potential of more effective procedures or techniques and better quality, seasonal peak workloads, and contractor availability.

OBJECTIVE

This research was initiated because of the increased interest in and need for contracting of maintenance services. The primary objective was to prepare guidelines for the development, implementation, and administration of maintenance contracts. The guidelines are presented in Appendix A. The remainder of the discussion in this chapter constitutes the approach taken to fulfill the research objective.

RESEARCH APPROACH

An *agency advisory committee* was appointed to assist the investigators. Committee members selected included state and county maintenance engineers and a state purchasing expert.

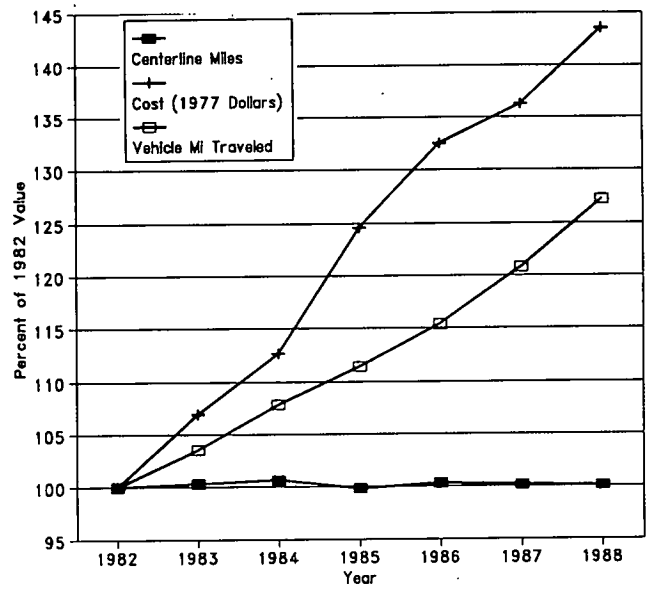


Figure 1. National totals for all jurisdictions.

Committee members reviewed the questionnaires prior to submitting them to the agencies and contractors. The questionnaires were revised in response to their comments to improve the coverage, quality, and do-ability. They met as a group to review and comment on the final report. Special emphasis was placed on the review of the guidelines to ensure that these guidelines are applicable to everyday highway practice.

A *literature search* of TRIS (Transportation Research Information Service) was initiated through a computer link. Of the 53 publications identified in the search, only 10 were applicable to this research. The best sources of applicable literature were the highway agencies. Some very good references were submitted with the questionnaires or were obtained during the visits to the selected agencies. All publications collected are listed in the bibliography in Appendix D.

Two questionnaires were prepared to collect data on current practices in contracting maintenance: one for highway agencies and one for maintenance contractors. Following approval by the NCHRP Project Panel, the questionnaires were sent to agencies and contractors. The number of agencies responding to the questionnaires are given in Table 1.

The two responses in the "Other Agencies" category were the U. S. Forest Service and the Massachusetts Metropolitan District Commission.

Many of the agencies attached sample contracts, inspection manuals, and other useful materials to their questionnaires. The number of responses from the contractors was disappointing. Because of the limited response to the questionnaires, an extra

Table 1. Questionnaire responses.

Agencies	Questionnaires Sent	Responses
States*	52	42
Provinces	10	7
Counties	9	6
Cities	8	1
Other Agencies	5	2
Total Agencies	84	58
Contractors	25	5

* Includes the District of Columbia and Puerto Rico

effort was made to meet with contractors during the visits to the selected agencies.

On-site *visits to selected agencies* were made following a review of the completed questionnaires. They were British Columbia, Florida, Iowa, Texas, Virginia, and Washington. The criteria for selecting agencies for visits included having staffing guidelines, standard maintenance specifications, contracting guidelines, inspectors' manuals, and the like. Geographical representation was also considered in making the selections.

In each agency, the principal investigator and co-principal investigator of NCHRP Project 14-9(3) met with representatives from central maintenance and district maintenance. In most agencies, they also met with area or residency supervisors. In addition, meetings were held with local maintenance contractors to get their perspective. These meetings were held separately from those with agency personnel to encourage participants to speak freely. Twenty-four contractors participated in the meetings in the six agencies.

CHAPTER TWO

FINDINGS

DEFINITION OF MAINTENANCE

Essentially all state and provincial highway and transportation agencies, as well as many counties and cities, contract for some portion of their highway maintenance work. The amount contracted ranges from none in Puerto Rico and West Virginia to 100 percent in British Columbia. (West Virginia plans to contract for maintenance services in the near future.) In general, it was found that although such a large percentage of agencies contract for maintenance services, few agencies have developed well-defined maintenance contracting policies or procedures.

Defining maintenance is difficult. Items characterized as maintenance vary from agency to agency. Consequently, the project researchers used the AASHTO definition (*4*) as the basis for developing the following for use in the questionnaire:

> Highway maintenance is typically defined as including work such as the repair of travelway surfaces, shoulders, roadsides, drainage facilities, bridges, tunnels, signs, markings, lighting fixtures, and truck weighing and inspection facilities; traffic services such as lighting and signal operation, and snow and ice control; and operation of roadside rest areas, movable span bridges, and the like.

Agencies were asked to add to this definition to ensure that all maintenance activities were included. The major additions included ferry operation and repair, roadway inspections and some construction and reconstruction activities. A complete listing is presented in Appendix C. Resurfacing and seal coats are maintenance items in some states but are part of the construction program in others.

The development of an exact definition that fits all highway agencies is not possible. Fortunately, for the purposes of this study and the preparation of guidelines for contracting maintenance, an exact definition is not needed. The common denominator is funding. If an item is funded through the maintenance budget, it is a maintenance item.

DECISION TO CONTRACT

Reasons for Contracting

Fifty-one of the fifty-three agencies who responded to the question on the factors considered in deciding to contract for maintenance cited limitations on in-house staffs as one of the reasons. Other factors listed and the number responding were: the need for specialized equipment (50), the need for specialized personnel (44), to cover peak work loads (42), to obtain services at lower cost (38), executive policy (37), emergency work (35), to improve responsiveness (31), legal restrictions on the amount of work performed by agency forces (16), legal restrictions on contracting (16), and employee contract restrictions (11). (Note: Many agencies listed more than one factor.)

Contractibility

It appears that there are no maintenance activities which absolutely cannot be contracted. Every maintenance activity listed in the questionnaire is contracted by at least one of the responding agencies. A summary of the responses for each activity is presented in Appendix C.

Florida performs at least 10 percent of nearly all activities with its own forces to retain some in-house expertise so that they are not totally "at the mercy of the contractors." Texas plans

to contract for at least 10 percent of most activities to obtain comparative prices. Texas is required by statute to contract for any activity where the estimated contract cost is at least 10 percent less than in-house costs.

A major concern with contract maintenance is the ability to respond quickly in emergencies. Agencies prefer to perform work that requires a quick response with in-house crews. Most agency personnel do not think contractors can or will respond as quickly as in-house forces do. Reports from agency personnel indicated that actual responses by maintenance contractors varied from unacceptable to excellent, depending on the agency's experience with contractors' work. Agencies have found that some contractors do respond well for snow and ice control and other emergency work.

Texas is in the process of developing a "contractibility" rating procedure for selected maintenance activities. The Department has identified seven factors for rating activities as to their contractibility: cost comparisons from the Maintenance Efficiency and Analysis Report (MEAR), labor intensity, availability of contractors, the volume of work, time sensitivity, the need for special skills or equipment, and the amount of inspection required. The procedure is in the testing phase and has not yet been approved for implementation.

Each of the selected activities is rated in each district using the multipliers and scores for each factor presented in Table 2. In use, the weight for each factor is multiplied by the value to determine the rating. For example, the Labor Intensity rating for an activity for which in-house labor costs are 50 percent of the total activity costs would be 4 times 2 or 8. The activities with the highest Contractibility Ratings are the best candidates for contracting. A portion of a contractibility summary for one district is shown in Figure 2.

Table 2. Texas contractibility rating values.

Factor	Weight	Score	Maximum
MEAR Value 0 = + % (State cost effective) 1 = 0% or no score 2 = -0.01 to -9.99 % 3 = -10% or greater (Contractor cost effective)	5	0 to 3	15
Labor Intensity 1 = 0 to 39.99% of Activity Cost 2 = 40 to 59.99% of Activity Cost 3 = 60 % or Greater	4	1 to 3	12
Availability of Contractors 1 = Low or none available 2 = Good availability	1	1 or 2	2
Work Volume 1 = Less than $100,000 annually 2 = $100,000 or more;	3	1 or 2	6
Time Sensitivity 1 = Not easily planned 2 = Easily planned	1	1 or 2	2
Special Skills/Equipment Needed 1 = None required 2 = Required	1	1 or 2	2
Intensive Inspection Required 1 = Yes 2 = No	1	1 or 2	2

The MEAR report compares in-house costs with contract costs for the maintenance activities included in the contractibility ratings. A sample cost comparison or MEAR for the same district as the contractibility summary (Figure 2) is shown in Figure 3. The items included in the cost comparisons are given at the bottom of the figure. It should be noted that the MEAR cost comparison is only one factor in the contractibility rating. Although it has the most weight of the factors, it is possible that

Funct.	Description	MEARS Rating	% Labor Rating	Availability of Contractors Rating	Work Volume Rating	Time Sensitivity Rating	Special Equipment & Skills Rating	Intensive Inspection Rating	Contract-ibility Score	Projected % to be Contracted in FY 92
110	Base Removal & Replacement	5	8	1	6	1	1	3	25	10.0
120	Base in Place Repair	5	12	1	3	1	1	3	26	15.3
211	Mn Ln Overlay w/Laydown	5	4	2	6	2	2	3	24	10.0
212	Mn Ln Overlay w/Blade	5	4	1	6	2	1	3	22	10.0
220	Sealing Cracks & Joints	5	12	2	6	2	1	3	31	42.0
231	Mn Ln Aggregate Seal Coat	5	4	2	6	2	1	3	23	10.0
232	Mn Ln Aggr Strip & Spot Seal	5	4	1	3	2	1	3	19	10.0
233	Mn Ln Aggr Fog/ Sheet Sealing	5	4	1	6	1	1	6	24	10.0
240	Mn Ln Potholes	5	12	1	6	1	1	3	29	31.3
252	Milling or Sawing	5	8	2	6	2	2	6	31	42.0
260	Treat Bleeding Pavement	5	8	1	3	1	1	6	25	10.0
270	Mn Ln Edge Repair	10	12	1	6	2	1	6	38	79.3
310	Concrete Leveling or Overlay	5	12	2	3	2	2	3	29	31.3
320	Sealing Cracks & Joints	5	12	2	3	2	1	3	28	26.0
340	Repair Spalling	5	12	2	3	1	1	3	27	20.7
360	Concrete Remove & Replace	5	12	2	3	2	1	3	28	26.0
410	Shld Leveling or Overlay	5	8	2	3	2	1	3	24	10.0
420	Sealing Cracks & Joints (Shld)	5	12	2	3	2	1	3	28	26.0
431	Shld Aggr Seal Coat	5	8	2	3	2	1	3	24	10.0
432	Shld Strip or Spot Seal Coat	5	12	1	3	2	1	3	27	20.7
433	Shld Fog or Sheet Sealing	5	4	1	3	1	1	6	21	10.0
441	Shld Pothole Repair	5	12	1	3	1	1	3	26	15.3
442	Shld Edge Repair	15	4	1	3	2	1	6	32	47.3
451	Recondition Sod Shoulders	5	8	1	6	2	1	6	29	31.3
452	Blade Flexible Base Shoulders	5	8	1	6	2	1	6	29	31.3
460	Shld Base or Subgrade Repairs	15	12	1	3	1	1	3	36	68.7
470	Side Road Approaches & Drives	5	8	1	6	2	1	3	26	15.3
511	Mowing	15	4	2	6	2	1	6	36	68.7
521	Litter	15	12	2	6	2	1	6	44	90.0
522	Routine Street Sweeping	5	8	2	6	2	2	6	31	42.0

Figure 2. District contractibility summary—Texas.

MMIS.6103 STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION PAGE 21
MAINTENANCE MANAGEMENT INFORMATION SYSTEM 12/07/90

MAINTENANCE EFFICIENCY AND ANALYSIS REPORT
FOR YEAR 1990

DISTRICT 21 (PHARR)

FUNCTIONS	INHOUSE AMOUNT	INHOUSE UNIT PRICE	CONTRACTED AMOUNT	CONTRACTED UNIT PRICE	PERCENT VARIANCE
110 - BASE REMOVAL AND REPLACEMENT	238,501.01	2.66/SQYD	0.00	0.00/SQYD	+ 0.00
120 - BASE IN PLACE REPAIR	2,582.65	0.41/SQYD	0.00	0.00/SQYD	+ 0.00
211 - MN LN OVERLAY W/LAYDOWN MCHN	137,088.98	2.85/SQYD	185.55	0.00/SQYD	+ 0.00
212 - MN LN OVERLAYW/BLADE	1,804,838.71	2.21/SQYD	0.00	0.00/SQYD	+ 0.00
231 - MN LN AGGR SEAL COAT	136,102.50	0.18/SQYD	0.00	0.00/SQYD	+ 0.00
232 - MN LN AGGR STRIP OR SPOT SEAL	85,140.76	0.57/SQYD	0.00	0.00/SQYD	+ 0.00
233 - MN LN FOG OR SKEET SEALING	199,025.67	0.05/SQYD	0.00	0.00/SQYD	+ 0.00
240 - MN LN POTHOLES	116,947.87	4.90/EA	0.00	0.00/EA	+ 0.00
270 - MN LN EDGE REPAIR	123,067.33	0.56/LFT	312,477.82	0.52/LFT	- 7.14
310 - CONC LEVELING OR OVERLAY	798.05	3.76/SQYD	0.00	0.00/SQYD	+ 0.00
360 - CONC REMOVE AND REPLACE	180.21	15.02/SQYD	0.00	0.00/SQYD	+ 0.00
410 - SHLD LEVELING OR OVERLAY	39,948.77	3.12/SQYD	0.00	0.00/SQYD	+ 0.00
431 - SHLD AGGR SEAL COAT	31,410.36	0.13/SQYD	0.00	0.00/SQYD	+ 0.00
432 - SHLD STRIP OR SPOT SEAL COAT	282.88	0.00/SQYD	0.00	0.00/SQYD	+ 0.00
433 - SHLD FOG OR SKEET SEALING	34,423.06	0.06/SQYD	0.00	0.00/SQYD	+ 0.00
441 - SHLD POTHOLE REPAIR	10,029.93	5.05/EA	0.00	0.00/EA	+ 0.00
442 - SHLD EDGE REPAIR	8,945.97	0.53/LFT	57,263.15	0.47/LFT	- 11.32
460 - SHLD BASE OR SUBGRADE REPAIRS	254.28	6.05/SQYD	28,373.43	3.23/SQYD	- 46.61
511 - MOWING	85,716.31	28.19/ACR	1,168,090.62	14.86/ACR	- 47.29
521 - LITTER	36,753.15	28.64/ACR	242,022.22	3.82/ACR	- 86.66
524 - LITTER, SPOT	63,199.81	3.99/EA	0.00	0.00/EA	+ 0.00
531 - PICNIC AREAS	57,446.72	**********	234,175.25	**********	**********
532 - REST AREAS	44,948.05	**********	78,588.74	**********	**********
535 - REST AREA FACILITY MAINT.	12,421.02	**********	0.00	**********	**********
541 - HERBICIDE, EDGES	47,260.28	27.65/ACR	0.00	0.00/ACR	+ 0.00
542 - HERBICIDE, OVERSPRAY	63,320.72	50.04/ACR	0.00	0.00/ACR	+ 0.00
543 - HERBICIDE, SPOT	100,072.24	22.76/ACR	0.00	0.00/ACR	+ 0.00
560 - SILT AND EROSION CONTROL	247,564.21	0.09/LFT	71,522.07	0.78/LFT	+ 766.67
711 - PAINT AND BEAD STRIPING	400,461.14	0.03/LFT	304,763.08	0.04/LFT	+ 33.33
721 - DELINEATORS	119,454.18	6.78/EA	0.00	0.00/EA	+ 0.00
722 - GUARD FENCE	13,817.81	2.43/LFT	508,338.33	5.51/LFT	+ 126.75
732 - INSTALL OR RE-INSTALL SIGNS	618,472.89	7.60/SQFT	78,041.32	5.46/SQFT	- 28.16
750 - RAISED PAVEMENT MARKINGS	18,162.90	1.87/EA	121,955.72	2.15/EA	+ 14.97
951 - FUNCTION CODE NO LONGER EXISTS	0.00	**********	400,369.52	**********	**********
MMIS SUBTOTALS:	4,898,640.42		3,686,166.82		
999 - NON MMIS FUNCTION CODES	4,099,980.57	**********	23,631.44	**********	**********
TOTALS:	8,998,620.99		3,709,798.26		

INHOUSE - INCLUDES LABOR, EQUIPMENT, & MATERIALS
CONTRACTED - INCLUDES CONTRACTOR PAYMENTS, MATERIALS FURNISHED TO CONTRACTOR, INSPECTION, PLAN PREP., & DIV. PROCESSING
951 THESE DOLLARS REPRESENT INSPECTION COSTS FOR CONTRACTS FOR WHICH NO PAYMENTS HAVE BEEN MADE

Figure 3. Texas activity cost comparison.

an activity that has a lower in-house unit cost could still have a relatively high contractibility rating.

Decision Trees

The Virginia Research Council developed a process for analyzing in-house maintenance costs versus contract costs (*5*). A flowchart for that process is presented in Figure 4.

The portion of Iowa's process for selecting projects, which is applicable to maintenance contract work, is summarized in the flowchart shown in Figure 5 (*6*). The flowchart provides for work to be performed in-house, assigned to construction programs or let as a maintenance contract.

COST COMPARISONS

Frequency of Comparisons

Sixty-one percent of the agencies compare costs for work performed by in-house staff versus that performed by contractors. The frequency with which comparisons are made varies widely. The range is given in Table 3.

Cost Items

The items that typically included in-house cost calculations

Table 3. Frequency of cost comparisons.

Frequency	Number of Agencies	Percent of Responses
Annually	11	34
Once per Project	8	25
As needed	7	22
Ongoing/Continuous	3	9
Monthly	2	6
Program Level	1	3
Total	32	99

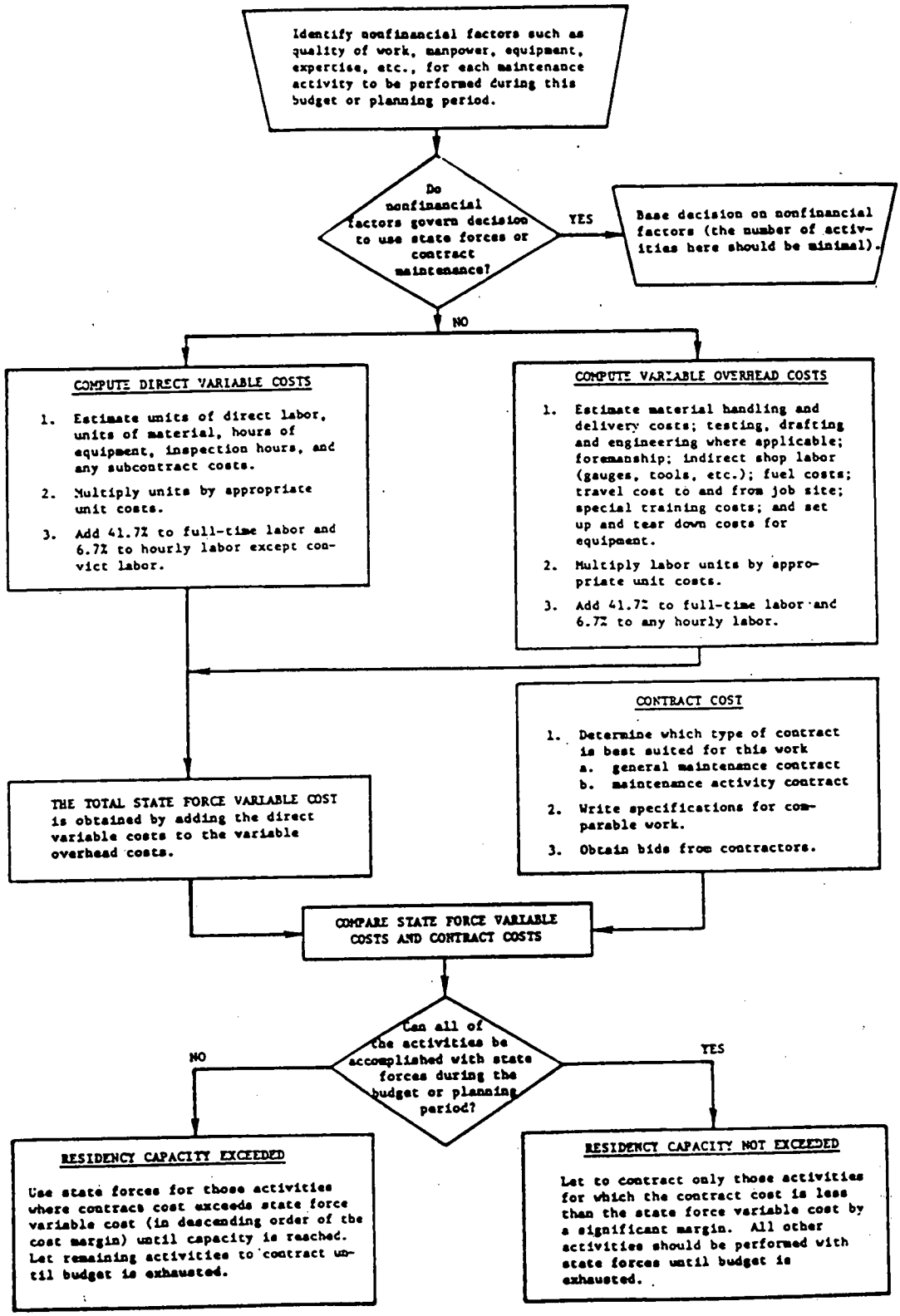


Figure 4. Virginia contract maintenance decision tree.

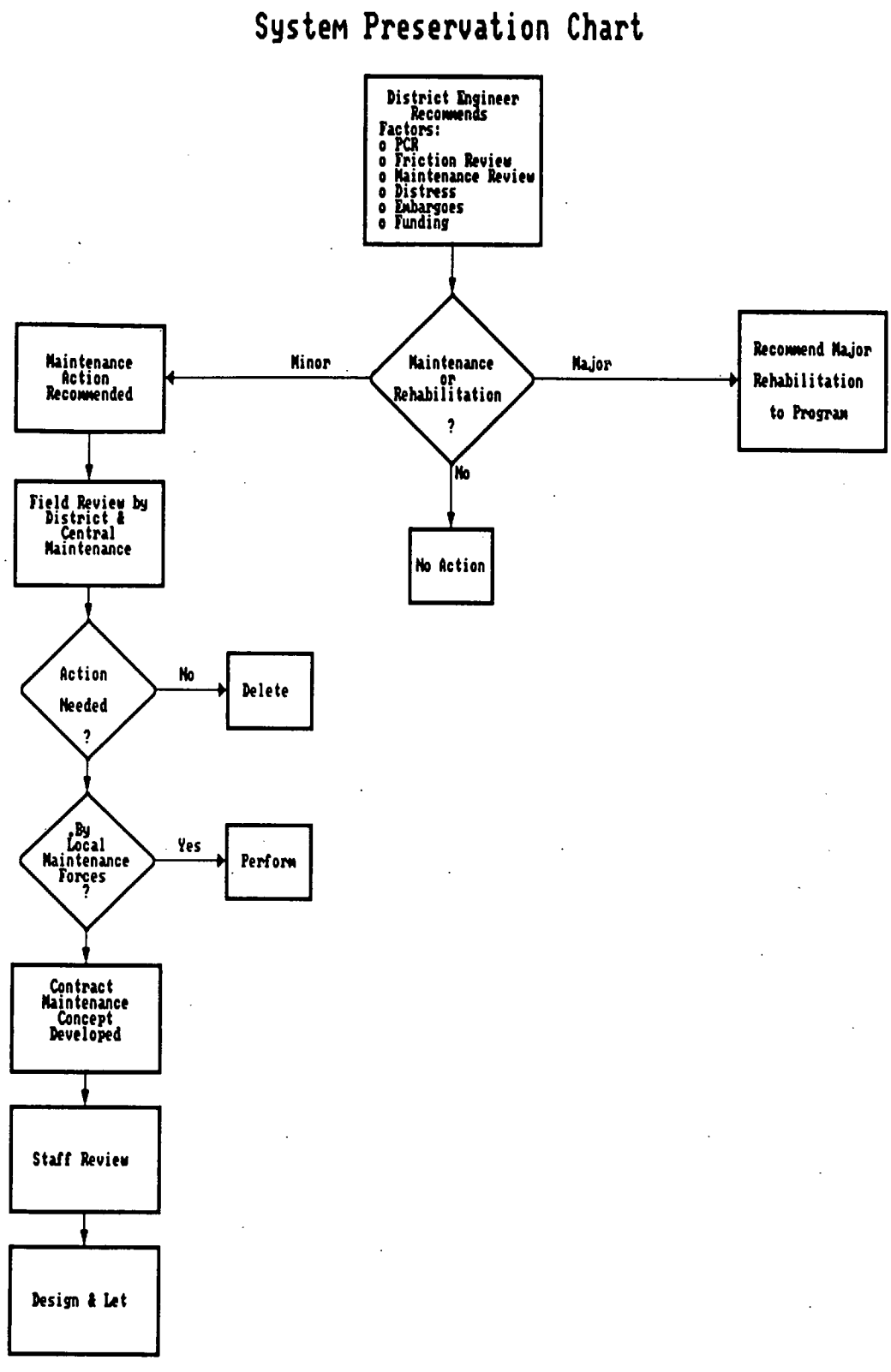


Figure 5. Iowa contracting decision tree.

are: direct labor, equipment rental, materials, fringe benefits (leaves, etc.), retirement plans, including social security, and overhead. Somewhat fewer agencies include the costs of the following items: office and shop rental, support services, utilities, amortization of capital assets, and insurance.

The primary cost for contracting is the bid price. Materials furnished to the contractor by the agency is included by two-thirds of those responding to this question. About half of the agencies include the cost of administering contracts.

Cost Comparison Methods

Several agencies routinely make cost comparisons for selected activities. The methods used by Oregon and Texas are presented below, followed by a description of a cost comparison study in Washington.

Oregon

The Oregon Department of Transportation conducted studies of maintenance work performed by contract and in-house forces from 1983 to 1988 (*7*). The costs and quality of work were compared in the studies. In conducting the cost comparisons, costs for contract work were computed as follows. Direct costs were the actual amounts paid to the contractor. Indirect costs were estimated for:

1. Preliminary Engineering (PE)	5% of the Total Bid
2. Contract Administration	
a. DGS Contract Fee (CF)	5% of the Total Bid
b. Government-wide Overhead Factor	8.7% of PE & CF

Preliminary engineering costs of 5 percent for maintenance contracts compares with 10 to 15 percent for conventional highway construction contracts. Contract administration includes fees paid to the Department of General Services (DGS) and a government-wide overhead factor. Except for the blade patching and chip seal projects, no costs were added for inspection or monitoring of contracts by state personnel, even though such work was accomplished. The overhead factor (GWOF) covers accounting, legal, insurance, central services and similar costs of services provided by various DOT sections. Because GWOF is applied to PE and CF only, it generally amounts to less than 1 percent of the bid price.

Costs for Department work were computed as follows. Direct costs for labor, materials, and equipment were obtained for each activity through the Department's Maintenance Management System. Indirect costs included:

1. A Unit Overhead Factor for the district offices and district maintenance sections which was applied to the reported direct labor costs. These factors varied by district and section but ranged between 30 and 40 percent.
2. The government-wide overhead factor of 8.7 percent which was applied to the direct labor costs.
3. Equipment standby charges. Equipment rental rates were adjusted to include standby time or time that the equipment was not in use.

CONTRACTING DECISION WORKSHEET

DATE:_____

DECISION: Should the Department contract the following activity or perform it with State Forces?

ACTIVITY:_____

AMOUNT OF WORK PLANNED:_____

LOCATION -- District_____ Maint. Sect._____ County_____

COST ELEMENT	COSTS STATE	CONTRACTOR
DIRECT COSTS		
1. Salaries (use Composite Rate)	$_____	N/A
2. Equipment	_____	N/A
3. Materials	_____	N/A
4. Contract cost	N/A	$_____
5. Material Furnished to Contractor	N/A	_____
SUB-TOTAL	$_____	$_____
1. Proposal Preparation, Letting & Management (_____%)	N/A	_____
2. Inspection (_____%)	N/A	_____
3. Division Management, Processing, Payment, etc. (_____%)	N/A	_____
SUB-TOTAL	$_____	$_____
TOTAL	$_____	$_____

NOTE: This analysis should not include the unavoidable overhead costs that would be incurred when performed by State Forces or Contractor.

Figure 6. Texas cost comparison worksheet.

Texas

Texas uses a Contracting Decision Worksheet for comparing costs. A copy is shown in Figure 6. Inspection costs, contract development costs, such as preliminary engineering, advertising and award, and division processing are charged to clearing accounts and prorated to the contracts in proportion to the total costs of the contractor payments plus state-furnished material. An in-house study was initiated in December 1990 to evaluate cost comparisons and work methods. The study has two objectives: (1) to evaluate cost and work methods of selected work activities performed by contract and by state forces; and (2) to establish standard state force work methods, standard contract specifications, and guidelines for contracting these selected activities.

Specific guidelines have been developed for conducting the studies for pavement marker replacements, guardfence and median barriers, pothole repair, and ditch maintenance. The study will continue at least through fiscal year 1992.

Washington

The Washington State Legislature's Joint Legislative Transportation Committee (LTC) initiated a study of roadway project costing in 1985 (*8*). Deloitte and Touche were engaged to conduct the study. The study resulted in the development of the Project Cost Evaluation Methodology (PCEM) for use in determining if road maintenance and construction projects should

be undertaken by agency labor forces or contracted to the private sector. While the study was directed primarily to cities and counties, two Department of Transportation districts participated in a limited way. The methodology was pilot-tested in volunteer agencies within the state in 1988 and 1989. The basic criteria for development of the method were: a level playing field—the methodology had to capture all costs, both direct and indirect; practicality—the methodology had to be relatively simple and practical to use; verifiable results—the results had to be open to review and decision-makers would be accountable; allow for real-world constraints—the methodology must accommodate emergency conditions, manpower constraints, project timing, and other factors which may affect how roadway services are provided; and assure cost savings—use of the new methodology had to produce cost savings.

Following the test, several agencies adopted the methodology for use in determining which activities were cost effective for performance in-house or by contract.

IN-HOUSE MAINTENANCE STAFFING

Minimum Staffing Guidelines

Is there a minimum size of maintenance staff for highway agencies?

Twelve states, three provinces, and one county reported having guidelines for determining minimum maintenance staffs. Of these: 7 agencies base the minimum staffing on their needs for snow and ice control, 2 on the workload, and 2 on their maintenance management system calculations; 2 have determined a core staff; 1 bases the minimum staff on the results of a special study; 1 has an assigned maximum quota; and 1 bases its needs on the number of maintenance inspectors required.

A major concern is the contractors' ability to respond quickly in emergencies. Most agencies do not think contractors can or will respond as quickly as in-house forces and that, thus, contracting for all maintenance services is not feasible. They see a need for an agency staff of at least minimum size to ensure timely responses for emergencies. Reported experience shows that actual contractor responses varied from unacceptable to excellent, depending on the agency and the contractor. Response times must be defined in the specifications and enforced to ensure that desired response times are met.

All of the maintenance activities listed in the questionnaire are contracted by at least four of the agencies responding to the questionnaires and many by more than 20 agencies. It can be concluded that, with proper specifications and contract administration, any maintenance activity can be contracted—if contractors are available or can be developed.

Winter-Based Guidelines

The most common staffing guidelines were developed for staffing winter maintenance. Two examples of minimum staffing methods based on needs for snow and ice control are presented here: Iowa and Wyoming. The use of contract snow equipment reduces the need for in-house staff.

Iowa

Iowa developed an analysis to determine the needs for trucks and personnel to control snow and ice. The needs in each maintenance area are based on the following calculations:

1. The number of snow removal trucks is equal to the "Location Factor" times 1.11 for average deadheading times the equipment downtime factor. Currently, the equipment downtime factor is 1.0681, which indicates an equipment up-time rate of about 93 percent.
2. The number of operators and mechanics equals the "Location Factor" times the "Staffing Factor." The staffing factor is currently set at 1.54338. This factor increases the staffing level to provide for mechanics during storms and for operators for the night shift.
3. The Location Factor is the sum of:
   a. the lane miles of service level A, Urban Area Interstate divided by 20; plus
   b. the lane miles of service level B, Rural Area Interstate divided by 25; plus
   c. the lane miles of service level B divided by 30; plus
   d. the lane miles of service level C divided by 40; plus
   e. the lane miles of service level D divided by 50; plus
   f. the lane miles of park and institutional roads divided by 50; plus
   g. the number of interchange ramps divided by 12; plus
   h. the number of rest areas divided by 4; plus
   i. the number of weigh stations divided by 4; minus
   j. the lane miles of park and institutional roads under contract maintenance divided by 16; minus
   k. the lane miles of primary extensions under contract maintenance divided by 150.
4. The Staffing Factor is set by experienced maintenance staff members.

Wyoming

Wyoming also bases its minimum staffing on the needs for snow and ice control. Roads assigned to snow removal contractors are excluded from the calculations. The number of trucks is determined for each foreman's area by applying the following ratios: high service interstate—8 centerline miles per truck; high service primary—15 centerline miles per truck; medium service highways—30 centerline miles per truck; and low service highways—50 centerline miles per truck.

The number of operators is determined by applying these criteria: high service highways—2 operators per truck (to cover 2 full shifts); medium service highways—1.5 operators per truck (1 for the day shift and ½ for the off shift); and low service highways—1 operator per truck. Special conditions may warrant varying from the criteria.

Other Guidelines

Massachusetts

Massachusetts developed and implemented a staffing plan based on standard crews. Standard crew sizes were established

for each maintenance specialty: Highway Repair, Bridges, Roadside, Traffic, and Equipment (*9*). The report did not address the effect of contract maintenance on staff size. Massachusetts contracted for 70 percent of its highway maintenance in 1989 (*1*).

A basic highway repair crew consists of: a Highway Repair Foreman, a Highway Maintenance Working Foreman, a Maintenance Equipment Operator I, and 5 Maintenance Workers. A basic crew is expected to handle a repair section of 125 lane-miles of highway. An additional Maintenance Equipment Operator I is added for each repair section with more than 200 lane-miles. The number of Maintenance Workers authorized for a crew in each repair section is increased in proportion to the highest ADT in the section to a maximum of ten. This method is used to establish the total staffing in each district. The districts may adjust the crew sizes for individual crews within the total authorized staffing.

A basic bridge crew includes: 1 Bridge Repair Foreman, 3 Bridge Craftsman I, 3 Bridge Craftsman II, 1 Bridge Welder, 1 Maintenance Equipment Operator II, and 6 Maintenance Workers. The number of bridge crews per district is based on the number of square yards of bridge, deck with a factor for ADT.

One building maintenance crew is assigned to each district. A basic crew includes: a Building Repair Working Foreman, a Carpenter, an Electrician, a Painter, a Plumber, and a Maintenance Worker.

One roadside maintenance crew is assigned for each 175 linear miles of highway. Each basic roadside crew includes: a Roadside Maintenance Supervisor, a Roadside Maintenance Working Foreman, a Maintenance Equipment Operator I, a Roadside Maintenance Worker I, and a Roadside Maintenance Worker II. In addition, one Maintenance Equipment Operator II is assigned to each district to assist the roadside crews.

The basic traffic maintenance crew consists of: a Traffic Section Foreman, a Traffic Section Crew Chief (working foreman), a Maintenance Equipment Operator I, a Maintenance Equipment Operator II, 3 Traffic Maintenance Worker I, and 3 Traffic Maintenance Worker II. The number of basic crews is based on 375 lane-miles per traffic section crew.

An equipment crew is assigned to each district. A district equipment crew includes: a District Highway Equipment Supervisor, a Heavy Duty Mechanic (garage foreman), 3 to 6 Motor Equipment Repairmen, 1 Metal Worker, and 2 to 4 Mechanical Handymen.

In addition, one Motor Equipment Repairman is assigned to each Highway Maintenance Supervisor. An additional Heavy Duty Mechanic is assigned to two districts.

British Columbia

The British Columbia Ministry of Transportation and Highways has concluded that the minimum in-house force is that required to inspect the work of the contractors. The Ministry contracts for all maintenance services for its highway system of approximately 45,000 kilometers (28,000 miles) (*10*). The Ministry reorganized to better handle contract maintenance and now has 6 regions, 26 districts, and 141 areas for administering maintenance. The district managers are the contract administrators for the 28 maintenance contracts (two districts each administer two contract areas). Both the district and regional staff have program development and administrative roles in the capital construction and rehabilitation programs, in addition to their maintenance roles. Total staffing for the Ministry was reduced from 7,100 full-time equivalent positions to 2,600. The area managers are responsible for inspection and quality assurance within their assigned areas. A small central staff spot checks the districts and areas.

PREPARATION FOR CONTRACTING

Defining the Work

Work to Be Performed

The most common method of contracting maintenance is to define specialty work at a specific location. Contracting for specialty work in an area or district is the next most common method.

Types of Contracts

Three types of contracts were identified for contracting with the private sector: project, maintenance and purchase agreements. The use of each of these is discussed in Appendix A.

Most contracts are awarded to the lowest bidder. However, special expertise is required to perform some maintenance activities. Operation, maintenance and repair of movable bridges is one example. Two districts in Florida requested proposals for these services. Contractor selection was based on the qualifications of the firm and proposed personnel as well as the costs.

When British Columbia decided to contract for all highway maintenance, the request-for-proposals approach was used. Contractors were required to submit proposals which included: a business plan; unit prices for quantities of annual work items preset by the Ministry; a total lump-sum cost bid which included all the annual items, as well as all routine work necessary to achieve the standards throughout the term of the contract; and unit prices for emergency and additional work (beyond the required as part of routine maintenance).

When new proposals are solicited, proposers will be required to submit plans for meeting response times, dealing with the public, and management of maintenance in addition to those listed above. A more detailed description of British Columbia's experience is provided in Appendix B.

Types of Contractors

The types of contractors that agencies use for each activity are summarized in Appendix C. Most contracts for maintenance are with regular highway contractors or specialty contractors.

Agencies also contract for maintenance work using these methods: (1) Agreements are made with counties, cities and other governmental agencies. For example, Wisconsin contracts all maintenance on state highways to the counties. Michigan contracts with 153 cities and 62 of its 83 counties for maintenance of state trunkline highways. (2) Prison labor is used by as many as 21 agencies, either because it is required by law or through agreements with the prisons. The primary activity is

litter pickup. A few agencies employ them for brush and tree cutting, sign fabrication, landscape maintenance, and erosion control. (3) Adopt-a-highway programs are used primarily for litter pickup, but one or two agencies also use this program for mowing, brush and tree cutting, landscape maintenance and trash collection. (4) Individuals in offender programs are used for litter pickup in 9 agencies. One agency uses them for rest area maintenance and one for brush and tree cutting. (5) Five agencies permit landowners to mow the rights of way to harvest hay. Some agencies, such as South Dakota, include interstate and other access-controlled highways in the permit system. (6) Handicapped set-aside programs are used for rest area maintenance, trash collection and litter pickup. (7) The use of hired equipment was reported by only two agencies for snow removal. However, based on the researchers' interviews, this method of contracting is used more extensively than the reports indicate. Had hired equipment been included as a choice on the questionnaire, the responses would have been greater. (8) Other types of contractors include hiring a utility company to maintain lighting, a consultant for weather forecasting, materials producers for aggregate and asphalt mix production, and commercial garages for equipment servicing and repairs.

Basis for Payment

The most common units of measurement for maintenance contracts are unit prices followed by hourly rates and lump sum. The types of units used for each activity are summarized in Appendix C.

Contract Provisions

Bid Bonds

The purpose of bid bonds or proposal guaranties is to recover the agency's costs of readvertising the project if the low bidder does not accept the contract.

Tennessee requires a bidder's bond in the amount of 5 percent of the bid. A cashier's check, certified check or an irrevocable letter of credit may be substituted for the bid bond.

Prequalified contractors in Florida do not have to submit bid bonds. Texas requires bid bonds for all contracts which require a performance bond—those over $25,000.

Performance Bonds

A performance bond provides a guarantee that the contractor will complete the work in accordance with the terms of the contract. Forty-six agencies (85 percent of those responding to this question) require performance bonds for maintenance contracts. Of these, 17 require that bonds cover 100 percent of the contract amount. An additional five agencies require 100 percent bonding if the contract amount is above a preset limit. These limits varied from $10,000 to $100,000. The amount of the bond required by the remaining agencies varied. Performance bonds are usually not required for equipment rental contracts. Eight of the fifty-four agencies accept letters of credit in lieu of performance bonds.

The contractors reported that bonding companies consider the full amount of the contract rather than the amount of the bond in assessing a contractor's bonding capacity and that, in some instances, no allowance is made for completed work in determining bonding capacity. This severely limits contractors from bidding new work until current contracts are completed.

Payment Bonds

A few agencies require payment bonds in addition to performance bonds. Payment bonds are used to protect claimants supplying labor and materials from nonpayment by the contractor. The use of payment bonds eliminates the need for the agency to withhold funds to cover these claims.

Insurance Requirements

Of the 53 agencies that responded to this question, 49 require insurance for property damage, 49 for liability, 48 for workman's compensation, 9 for bodily injury, and 10 for automobile coverage. Other types of insurance required include liability for bridge painting, liability for bridge operation, and marine liability. Where work is within or adjacent to railroad rights-of-way, contractors may also be required to have railroad protective public liability and property damage insurance coverage. (Contractors reported that railroad insurance was specified on some contracts where there was no real need for it. This requirement increased their costs unnecessarily in their view.)

Workman's compensation requirements are usually set by law or regulation and the limits are outside of the control of the agency.

Liability insurance requirements vary from $100,000 to $10,000,000, with the most prevalent being $1,000,000. Property damage coverage ranges from $25,000 to $10,000,000. As with liability coverage, the most prevalent requirement is $1,000,000.

Because of the current tendency of claimants to sue, adequate insurance coverage is recommended; however, the amount of coverage should be related to the potential risk to avoid excessive costs.

Retainage

The amount of money retained from contractor's progress estimates ranges from none to 10 percent. Virginia withholds the same retainage on maintenance contracts as on construction, but does not withhold retainage on purchasing agreements.

Specifications

The purpose of specifications is to define the work to be performed and communicate that definition to the contractor and the inspector. Most state agencies use their standard construction specifications and supplement them with special provisions. A few have developed standard maintenance specifications.

Traffic control for maintenance contracts is typically assigned to the contractor. About half of the agencies assign all traffic control to the contractors. In the other agencies, traffic control

responsibilities are defined in the plans and standards and may vary by type of work. Only one agency provides all traffic control with agency forces for contract maintenance.

Warranties

A few agencies require contractors to guarantee their work for a set period of time, usually 1 to 3 years. Local agencies, especially those with no engineering staff, sometimes use warranties to ensure that contractors provide quality products.

Nine agencies have used performance bonds or warranties for some projects.The primary use of warranties is for manufactured items such as catch basins, traffic controllers, raised pavement markers, and sign materials—items that are normally warranted by the industry. Warranties may also be required for such items as building repairs, electrical and mechanical repairs for buildings and drawbridges, bridge painting and landscape plantings. A few states—Maryland, South Dakota and Washington—require a warranty or bond in effect for 1 year after acceptance. The Massachusetts Metropolitan District Commission specifies a 1-year warranty for all work. Kansas City requires a 1-year bond for slurry sealing and crack sealing and a 2-year bond for cold milling and resurfacing and for concrete rehabilitation. Bonds and warranties are not used extensively in maintenance contracts.

Florida requires that contractors warrant raised pavement markers for 45 days after the project is accepted. The retainage is held until the 45-day warranty period is over. Texas specifications require the contractors to warrant pavement markings for 30 calendar days after installation (*11*).

Florida is also experimenting with requiring a warranty on seeding to ensure growth and a warranty on striping materials that is based on reflectivity measurements taken at specified times after the material is placed.

Contract Time

Contract time is specified in calendar days, working days, and completion dates. The length of contract time for maintenance contracts is determined in three main ways: experience of the individual setting up the contract, through historical data, or for a preset time period. Through experience, the time required to perform work can be reasonably estimated—considering the location, the type of work the size of the project, the time required for in-house forces, and the seasonal limitations. Collection of historical data and applying it along with judgment can improve the accuracy of the contract time estimates.

Response Time

Thirty-six agencies reported some problems with contractors' responsiveness. Of these, five said the problems were not significant and 19 did not describe the problems. The problems described were each listed by only one or two agencies and included: failure to commence work on time, failure to commence work at all, poor production, and failure to complete work on time.

The agencies resolved response problems through: meetings with the contractors, canceling contracts, withholding payments, assessing liquidated damages and penalties, removing contractors from prequalified lists and debarment, increasing supervision, and issuing written warnings.

On mowing contracts, Florida specifies the minimum acceptable daily production in acres per day to ensure that contractors provide sufficient equipment to complete each cycle within the specified number of days. Texas specifies the minimum number of mowers that are acceptable to complete the mowing of each cycle within the specified time.

Florida specifies the response time for guardrail repairs in the contracts.

Iowa reported poor response times when they tried contract snow removal some 10 years ago. One of the problems was that drivers drawing unemployment compensation and working part-time caused disruptions in benefits. The trial lasted two winters. The Department furnished the plows, radios, and sanders; the contractors furnished trucks and drivers. Cities and counties in Iowa contract for graders and loaders to supplement their crews.

SOLICITING BIDS

Prequalification of Contractors

Some agencies—60 percent of those responding—require maintenance contractors to prequalify prior to bidding; others allow any contractor who obtains a bond to bid. The size of the project is considered by some agencies in setting prequalification requirements. Florida, for example, requires prequalification only on projects costing more than $250,000. Virginia requires prequalification for projects that are let through its regular contracting procedures. Those let through purchasing do not require prequalification. The criteria for prequalification cited by most agencies were: financial capability, equipment available, competency, and staff available. Most agencies that require maintenance contractors to prequalify use the same prequalification procedures for maintenance contractors that were developed for construction contracts.

Past performance of the contractor is the primary criterion for determining competence. Other criteria listed were: experience of the firm and its personnel, references, and ability to obtain a bond.

Two major problems in measuring performance are the development of meaningful criteria and obtaining objective evaluations that meet legal requirements.

Typically, contractors must resubmit prequalifications annually or every 2 years. An optional interim submission is sometimes permitted when contractors want to update their qualifications.

Prebid Conferences

Two-thirds of the 54 agencies responding to this question reported holding prebid conferences for at least some of their maintenance contracts. The most frequent responses as to the types of work for which prebid conferences are held are given in Table 4. Because many agencies listed more than one criterion for holding prebid conferences, there are 53 responses tabulated in the summary.

Table 4. Prebid conference summary.

Criteria	Number of Responses	Percent of Responses
Unique, unusual or complex work	14	26
Specialty work	14	26
All types of work	10	19
Work not previously contracted	7	13
Rest area maintenance	6	11
Other	2	4
Total	53	99

Table 5. Maintenance contracting locations.

Agencies	Central	District	Both
States	22	5	12
Provinces	2	1	4
Counties	4	1	
Cities	1		
Others		1	1
Total	29	8	17

Generally, attendance at the prebid conference is not mandatory for contractors to be allowed to bid. However, attendance may be specified on selected projects. Required attendance is typically specified for emergency contracts and projects that are difficult to understand. One reason that prebid conferences are not made mandatory in some agencies is that anyone can be sent as a contractor's representative and that individual may not understand any of the presentation.

Agencies that do not hold prebid conferences rely on the bid package, specifications, and advertisements and make staff available to answer questions to inform contractors of contract conditions.

Soliciting Bids

Newspaper advertisements, direct mailings to contractors, telephone solicitations, advertisements in trade magazines and notices in state or department bulletins are used to advise potential bidders of maintenance contracts. More than one method is usually used. Generally, there is a legal requirement to advertise projects where the estimated cost is above a preset limit. That limit varies among agencies depending on the type of work.

Several innovative techniques for advising contractors of potential contracts were identified: (1) Contractors in Texas can call an 800 number to inquire about upcoming projects. (2) Virginia installed an electronic bulletin board that lists information about advertised projects. Contractors with computers equipped with modems can access the bulletin board to get specific project information on the scope of work, bid items and quantities. They can then order bid documents and plans for the projects that are of interest. Contractors have saved the cost of ordering plans and the agency has reduced its total printing costs significantly. (3) Florida maintains a list of contractors in each area and district by specialty. A contractor need only call in to get on the list. A general contractor information sheet is available for contractors interested in maintenance contracts. The four-page form provides space for contractors to specify the types of work and the districts which interest them. (4) Texas sends a representative to job fairs to explain maintenance contracting opportunities to potential contractors. A handout, "Questions and Answers Concerning Routine Maintenance Contracts," was developed for distribution at job fairs and other meetings with potential contractors. (5) Texas also conducts workshops and training sessions for small businesses, including DBE firms, covering such subjects as the contracting procedures, how to propose, how to get bonded, and insurance requirements. Work methods training is not provided because contractors are expected to know how to perform the work.

Bid Submissions

Bids may be received in the central office or the districts. The responses are summarized in Table 5.

Where bids are solicited in both central and district offices, the districts are usually limited to smaller, less complex contracts. In Texas, for example, the districts open bids for projects estimated to cost less than $100,000; the central office opens those larger than $100,000. The Commission must approve the award of all contracts.

The bids are opened in the districts in Florida. The district executive committee, consisting of the district secretary and the district directors, review all procurements.

Adequate Number of Contractors

Seventy-five percent of the agencies reported no problems in attracting an adequate number of qualified contractors to ensure competition. There was no consensus in the responses as to the reasons that an insufficient number of contractors bid maintenance work. Reasons cited included: lack of qualified personnel or contractors, especially in remote areas; the complexity of bid documents and documentation: environmental regulations; bonding and insurance requirements; and contracting work items that had not been previously contracted.

There was also no consensus as to the solutions for attracting bidders, but suggested solutions included: deleting requirement for performance bonds; committing to long-term contract maintenance; advertising in other states; contacting potential bidders; conducting prebid meetings; and revising specifications and bid documents.

AWARDING CONTRACTS

Contract Award

Most agencies encourage competition for all contracts—construction or maintenance. A few give in-state contractors a preference in bidding for nonfederal aid projects. The low bids are determined by adding the amount of the preference to the bids from out-of-state contractors. Arkansas law gives a 3 percent preference to a contractor who has satisfactorily performed one or more contracts within the state within the last 2 years, maintains a staffed office in the state and has paid taxes for at least 2 consecutive years immediately prior to submitting a bid.

Bid Analysis

Most agencies check bids for signs of collusion among bidders. In addition to reviewing bids for possible collusion, bids must also be checked against the engineer's estimate for reasonableness. Usually, low bids in excess of the estimate by more than a preset limit are thoroughly reviewed before accepting or rejecting the bids.

Iowa analyzes bids when they exceed the engineer's estimate by (a) 10 percent on projects of less than $2,000,000; (b) 7 percent on projects between $2,000,000 and $5,000,000; and (c) 5 percent on projects above $5,000,000 in value. Essentially all maintenance contracts are less than $2,000,000.

Florida has a committee in each district. Any bid that exceeds the engineer's estimate by more than 7 percent is reviewed by the committee. A justification is required for recommending award of contracts above the limit.

Virginia has an anti-trust section in its Construction Division, which analyzes all bids. The AASHTO Bid Analysis and Management System (BAMS) software is used for these analyses.

CONTRACT ADMINISTRATION

Inspection

Most agencies assign the responsibility for administering maintenance contracts to field maintenance personnel, as shown in Table 6. (Note: Many agencies assign different types of work to different management levels; thus, the total number of responses exceeds the number of agencies reporting. Generally, project-type contracts are assigned to construction and all others are administered by maintenance. Field construction and maintenance usually administer the contracts with oversight by central office.)

Materials used in most maintenance contracts must be tested or certified. This can be time-consuming, especially for contracts with short durations. Testing can also be costly. Sampling and testing for small quantities takes nearly as much time as for larger quantities. To overcome the time and cost factors, Texas furnishes nearly all materials for maintenance contracts. In addition to reducing the sampling and testing costs, materials costs are reduced through quantity purchases not available to small contractors.

Documentation

Diaries are the most common method of documenting inspections of maintenance contracts. Where construction inspectors administer the contracts, regular inspectors' daily report forms are used.

Training for Inspectors and Contractors

Very little training is provided to contractors by agencies. Contractors are expected to train their own employees.

Virginia conducts certification schools for inspectors in: flagging, asphalt construction, concrete, aggregate, nuclear gauge, and bridge painting.

Contractors are permitted to attend all of the Virginia training courses except bridge painting. Certificates are issued to all graduates. In addition, VPI (Virginia Polytechnic Institute) conducts training in contract administration for inspectors and contractor personnel.

Table 6. Responsibility for administering contracts.

Responsibility	Number of Responses
District maintenance engineer	25
Central maintenance staff	19
Area supervisor	16
Resident maintenance engineer	12
Foreman	10
Field construction personnel	7
Others	14
Total	103

Quality Assurance

Some quality assurance procedures currently in use are: (1) All bridge painting contracts in Iowa are inspected about a year after completion by head office personnel to check the workmanship and paint thickness. Poor performance is identified, especially if there appears to be a trend for certain contractors. (2) Rest area inspectors in Florida alternate inspections to ensure that ratings are fair and that inspectors do not become complacent. (3) Cards are provided at Florida rest areas to encourage motorists to comment on the conditions found. (4)Virginia conducts inspections-in-depth on selected maintenance projects similar to those conducted for construction projects. Criteria for selection of projects for inspections are: pavement repair projects over $500,000; all bridge painting contracts; sidewalk, curb and gutter projects over $500,000; bridge and structure repairs over $200,000 per structure; and one inspection per district for each type of schedule for resurfacing projects. The inspection in-depth consists of a review of actual performance in the field with the contract requirements. Inspections are conducted while the project is under way. The purpose is to identify trends in performance rather than specific project deficiencies through statistical sampling. Joint meetings of state and contractor personnel are held each year to discuss, among other items, the problems found in these audits. (5) British Columbia has a three-phase quality assurance program that includes in-process, end-product and present-state inspections. See Appendix B for a detailed description of British Columbia's quality assurance program.

In addition, several agencies have developed procedures for evaluating the overall condition of highway facilities, whether maintenance is performed in-house or by contract. Those identified are: (1) Twice each year a head office maintenance employee inspects all rest areas in Texas maintained by either agency forces or contract. The objective of the inspections is to rate the condition of the facility, especially cleanliness. One person rates all rest areas to ensure uniformity of inspections. (2) Iowa uses a two-person team consisting of a central maintenance staff tech-

nician and a summer hire employee to drive all state roads, making observations on 10 percent of the roads to arrive at a subjective quality rating. (3) Florida's quality assessment program was initiated 4 to 5 years ago to measure performance of in-house maintenance crews but is now used for contract maintenance as well. Computer-generated randomly selected sites in each district are rated on all characteristics of maintenance condition. Conditions are rated for such items as drainage; roadways including joints, rutting and potholes; roadsides; vegetation and aesthetics; and traffic services. Reflectivity of striping and signs is measured. Ratings are conducted three times per year—once in each 4-month period. Eight two-man teams conduct the ratings. The objective of the ratings is to measure the relationship between the amount spent on maintenance and the actual results on the roads. A numerical rating is assigned to each key item and summarized for five categories: roadway, roadside, vegetation/aesthetics, traffic services, and drainage. The summary ratings are compared with level of maintenance standards for the classification of highway being rated. An example area summary is shown in Figure 7. The statewide trend is shown graphically in Figure 8 (*12*). Ratings of the Florida Turnpike will begin this year. Because all maintenance on the Turnpike is contracted, comparing costs with conditions is expected to be easier.

Contractor Performance

Iowa requires the resident maintenance engineer or the resident construction engineer to complete a performance evaluation form for all contracts completed within the year. All evaluations for each contractor are averaged. If there are fewer than three evaluations for the year, prior year evaluations are included to

DATE 07NOV90 FLORIDA DEPARTMENT OF TRANSPORTATION
MAINTENANCE RATING PROGRAM

UNIT NAME: BARTOW COST CENTER NO.: 190
FACILITY TYPE: RURAL LIMITED ACCESS
GEOGRAPHIC AREA: BARTOW MILAGE EVALUATED: 22.7
EVALUATION PERIOD : JUL THRU OCT 1990-1991

ROADWAY

	#	YES	%
POTHOLE	30	30	100
JOINT-CONC	0	0	0
PAVT VOID	0	0	0
EDGE RAVEL	0	0	0
RUTTING	30	23	77
CRACKING	30	17	57
DEPRESSION	30	26	87
STRIPPING	30	30	100
SHOVING	30	19	63
PAVED SHLDER	30	16	53

ROADSIDE

	#	YES	%
SHOULDER-SOIL	30	6	20
FRONT SLOPE	30	17	57
TURNOUT	0	0	0
SIDEWALK	0	0	0
BIKE PATH	0	0	0
FENCE	30	30	100

VEGETATION - AESTHETICS

	#	YES	%
ROADSIDE MOW	30	30	100
SLOPE MOWING	2	2	100
LANDSCAPING	0	0	0
TREE TRIMMING	20	10	50
CURB/SW EDGE	0	0	0
LITTER REMOVE	30	29	97
TURF CONDITION	30	2	7

TRAFFIC SERVICES

	#	YES	%
RAISED MARKER	30	0	0
STRIPING	30	2	7
PAVT SYMBOL	1	0	0
GUARDRAIL	3	0	0
ATTENUATOR	0	0	0
BARRIER WALL	0	0	0
WARNING SIGN	1	1	100
REGULAR SIGN	3	2	67
INFO SIGN	13	6	46
OBJECT MARKER	12	4	33
SIGN LIGHTING	0	0	0
HWY LIGHTING	1	1	100

DRAINAGE

	#	YES	%
STORM DRAIN	0	0	0
SIDE DRAIN	2	1	50
CROSS DRAIN	11	5	45
ROADSIDE DITCH	19	15	79
MEDIAN DITCH	30	29	97
OUTFALL DITCH	0	0	0
CURB INLET	0	0	0
OTHER INLET	5	3	60
MISC DRAIN ST	6	4	67
RDWY SWEEPING	0	0	0

LEVEL OF MAINTENANCE ON EACH ELEMENT :

ROADWAY	78
ROADSIDE	59
TRAFFIC SERVICES	16
DRAINAGE	77
VEGETATION - AESTHETICS	67

LEVEL OF MAINTENANCE:

RURAL LIMITED ACCESS	61

Figure 7. Florida maintenance rating for a maintenance area.

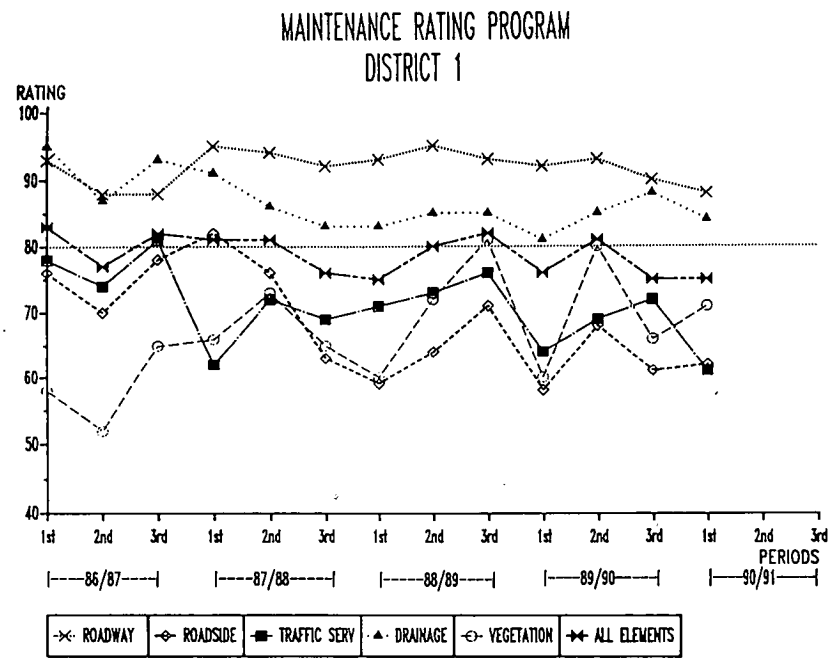


Figure 8. Florida maintenance rating—statewide trends.

avoid basing averages on too few evaluations. Contractors with no prior experience with the Department are assigned an average value until they establish a track record. A poor average rating can be used to decrease a contractor's bidding capacity. Iowa's evaluation form is shown in Figure 9.

Florida requires the completion of contractor performance evaluations for construction projects, but not for maintenance contracts. Texas also does not prepare contractor performance evaluations for maintenance contracts.

If contractor performance evaluations are used, the contractors prefer that written explanations be required for all ratings—not just the high and low ratings—to discourage raters from giving all average ratings.

British Columbia rates contractor performance periodically using three reports to supplement the quality assurance reports: (1) Contractor Reporting Assessment, (2) Contractor Public Relations, and (3) Contractor Response Time Assessment. The ratings from these reports are somewhat subjective. They are combined with the in-process, end-product, and present-state inspection results to determine an overall rating number each month. Forty percent of the overall rating is the result of the end-product and present-state inspections; forty percent on the in-process inspections and twenty percent on the above management ratings. The ratings are presented on graphs which show the trends for the last 3 months.

Examples of British Columbia contractor evaluation forms are presented in Figures 10 through 13 (*13*).

Recognition for Contractor Performance

No awards for outstanding performance by maintenance contractors were identified. Contractors' reactions as to the effectiveness of awards such as "Snow Remover of the Year," "Truck Driver of the Month," or "Smoothest Patches of the Year" were mixed. Some felt that any recognition for a job well done would be desirable. Others did not see that such awards would achieve anything. One question is the ability to avoid the appearance of favoritism in award selections.

Virginia is working on criteria for a "best pavement placed on a maintenance project" award to be made annually.

Progress Payments

Progress payments are made monthly, bi-monthly, weekly or when a cycle is completed, depending on the agency and the bid item.

Some agencies have provisions for payment of interest for late payments. Payment of interest, even though it is due, is not always automatic. Contractors may have to submit a claim to receive interest on late payments.

CONTRACT TIME ADMINISTRATION

Charging Time

As noted earlier, contract time may be specified in calendar days, working days, or completion dates. Typically, a working day definition is provided in the specifications. The following definition is typical:

> A working day is defined as a calendar day, not including Saturdays, Sundays, or legal holidays defined by the state, in which weather or other conditions not under the control of the contractor will permit the performance of the principal unit of work underway for a continuous period of not less than 7 hours between 7 a.m. and 6 p.m. . . . (*14*)

Specifications provide cut-off dates in the fall for most asphalt-related items, such as resurfacing, seal coating, and the

Iowa Department of Transportation
CONTRACTOR EVALUATION REPORT

County _____ Project Engineer _____

Project No. _____ Contract No. _____

Prime Contractor _____ Prime Contract Amount $ _____

Subcontractor _____ Subcontract Amount $ _____

Address _____

Type of Work Being Rated _____ Construction Year _____

The Contractor Evaluation Report is to be completed on every bridge painting contract and every other contract or subcontract amounting to $20,000.00 or more. For contracts or subcontracts less than $20,000.00 the project engineer has the option of completing or not completing the form.

When the report covers a prime contractor the name is entered in designated space. The space for the subcontractor is left blank. When the report covers a subcontractor both the prime and subcontractor's names are entered in the designated spaces and the subcontractor's address is completed.

ORGANIZATION/MANAGEMENT: 30%	* Rating	Point Range
A. Superintendent in charge with authority.		0-5
B. Coordination with suppliers, other contractors and utilities.		0-5
C. Adequate and competent labor force.		0-5
D. Processing paperwork.		0-5
E. Attitude and cooperation.		0-10
WORK PERFORMANCE: 45%		
F. Completion on schedule.		0-20
G. Compliance of work.		0-10
H. Quality of the finished product.		0-15
SAFETY PRACTICES: 15%		
I. Administration and general project safety.		0-5
J. Signing and traffic control.		0-10
EQUIPMENT: 10%		
K. Equipment on the project.		0-10
Total		0-100

**(Instructions for completing form on back)*

Remarks:

_____ _____ 19____
Signature of Project Engineer Date Submitted By Project Engineer

_____ _____
Signature of Assistant District Engineer Signature of Construction Engineer

Figure 9. Iowa contractor evaluation report.

like, because of temperature requirements for quality work. Many states do not charge time in the winter months, typically from November 15 to April 1.

Virginia permits flexible starting dates such as Iowa uses. However, they require paving contractors to complete 50 percent of each project by August 1, to ensure completion by the fixed

CONTRACTOR EVALUATION REPORT—DETERMINING FACTORS FOR RATING POINTS

Evaluate contractor based on the following guidelines. The full range of values should be used. Intermediate values in the range may be used. Place the points in the appropriate box on the front of this form.

PROJECT ORGANIZATION AND MANAGEMENT:

A. Superintendent in charge with authority.
- 5 Contractor has knowledgeable superintendent on project, start to finish, with authority to solve problems and schedule the work.
- 3 Contractor superintendent available most of the time, with limited authority.
- 0 Contractor failed to properly designate authority for project supervision or superintendent is routinely unavailable on the project site.

B. Coordination with suppliers, other contractors and utilities.
- 5 All coordinating done at proper time by contractor.
- 3 Some coordinating necessary by contracting authority with timely notification in all instances.
- 0 Lack of timely coordination.

C. Adequate and competent labor force.
- 5 Contractor has adequate number of people; labor force is knowledgeable of proper procedures and consistently does complying work with limited supervision.
- 3 Number of people is adequate, some training is needed, supervision of routine items is necessary occasionally.
- 0 Insufficient number *or* inadequate training *or* lack of proper supervision for many portions of the project.

D. Processing paperwork.
- 5 All paperwork completed and submitted in a timely manner throughout project. Pay item disputes/EWO's are resolved with no delay to progress of the work.
- 3 Minor delays in finalizing out the project, some disputes/EWO's have delayed resolution, but most of paperwork is consistent and timely.
- 1 Pattern of unnecessary delays in paperwork; contractor needs to improve in more than one area.
- 0 Contractor was unable to provide all required paperwork.

E. Attitude and cooperation.
- 10 Quick response to concerns of the contracting authority, extra effort made by contractors personnel in public relations, problems are resolved amicably.
- 5 Periodic delays in responding to engineer/inspector, public concern. Most problems resolved friendly.
- 0 Pattern of slow response of concerns, *or* poor public relations effort.

WORK PERFORMANCE

F. Completion on schedule.
- 20 Work completed in less than 90% of working days.
- 15 All project work is completed within contract time period *(including number of working days).*
- 10 Completion date met, some problems with working days or intermediate dates.
- 5 Contract time period is exceeded by at least 10% of working days.
- 0 Contract time period is exceeded by at least 50% of working days.

G. Compliance of work.
- 10 Minor non-compliances only, with immediate corrective action and no repeats.
- 5 Minor non-compliances, with some delays in resolution or some repeated violations. No individual price adjustments exceed 5%.
- 0 Price adjustments exceed 5% of individual prices or corrective work required on much of the project.

H. Quality of the finished product.
- 15 Excellent appearance of all portions of the work. No deducts for deficient work. Only one final check necessary on each portion of the work.
- 10 Adequate appearance of the work with some non-uniformity. No more than 5% of the items have deficient work in the finished product.
- 5 Poor appearance of work, *or* more than 5% of the items have deficient work, *or* repeated final checks necessary.
- 0 Much of the project is borderline acceptable or life of finished project has been shortened due to poor workmanship.

SAFETY PRACTICES

I. Administration and general project safety.
- 5 Active safety officers. Timely inspection and reports without prompting. No non-complying equipment. Safety concerns are addressed and corrected promptly. All personnel trained and following good safety practices.
- 3 Safety is adequate. Minor problems with paperwork, equipment, training or practices.
- 0 Documented need for improvement that did not occur by completion of the project, *or* any failure to immediately repair/correct unsafe equipment, *or* any repeat violation of a safety rule or practice.

J. Signing and traffic control.
- 10 Signing is properly placed and maintained at all times. Signing material is above average. Contractor makes documented routine and night checks of signs. Flaggers and pilot car meet standards at all times. No non-compliances for signing or traffic control.
- 7 Some minor problems with sign placement or maintenance, *or* lack of consistent documented routine and night sign checks, *or* some instances of failure to meet standards in flagging or pilot car operation.
- 4 One or more major problems with signing or traffic control, *or* failure to document signing, *or* any repeat non-compliance on a safety item.
- 0 Contractor showed repeated total disregard of signing and traffic control.

EQUIPMENT

K. Equipment on the project.
- 10 Equipment sufficient for timely completion of the work. Good repair and upkeep. No work delays due to equipment problems.
- 5 Only minor work delays due to equipment problems. Reasonable efforts made to obtain needed equipment. No repeat use of non-complying equipment.
- 0 Lack of equipment necessary to adequately perform the work, *or* excessive down-time of available equipment so work is delayed, *or* repeat use of non-complying equipment.

Figure 9. Continued

completion date. If work is not completed by the fixed date, the state may penalize the contractor 10 percent of the contract value of the incomplete work and permit completion of the work the following year; or penalize the contractor 10 percent as noted above, take the unfinished work away from the contractor and readvertise it the next year.

Incentives and Disincentives

One-third of the agencies include performance incentives or disincentives in their contracts. Most are disincentives.

Florida includes disincentives in its rest area maintenance and bridge tending contracts that have provisions for deductions in

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

QUALITY ASSURANCE PROGRAM
ITP30

CONTRACTOR REPORTING ASSESSMENT

CONTRACTOR REPORT RECORD

	N/A	Unacceptable	Poor	Fair	Good	Excellent
Are work reports received on time?	☐	☐	☐	☐	☐	☐
Are Locations being reported correctly in work reports?	☐	☐	☐	☐	☐	☐
Are Quantities of work being reported correctly in work reports?	☐	☐	☐	☐	☐	☐
Are Material type and quantity being reported correctly in work reports?	☐	☐	☐	☐	☐	☐
Does the Contractor supply material certification documents promptly when requested?	☐	☐	☐	☐	☐	☐
Are the Contractor's weather reports on time, accurate and complete?	☐	☐	☐	☐	☐	☐
Are the Contractor's Highway Condition reports on time, accurate and complete?	☐	☐	☐	☐	☐	☐
Are Highway/Bridge inspection frequencies being adhered to?	☐	☐	☐	☐	☐	☐
Are the Contractor's Highway/Bridge inspections identifying needed maintenance?	☐	☐	☐	☐	☐	☐
Is the Equipment P.M. schedule being adhered to for "A" units?	☐	☐	☐	☐	☐	☐
Is the Contractor supplying Sub-Contracting information that is timely, accurate and complete?	☐	☐	☐	☐	☐	☐
Is the Contractor supplying public communication information that is timely, accurate and complete?	☐	☐	☐	☐	☐	☐

Comments: _____

_____

DHM Signature _____ Reg./Dist. ☐ Date ☐☐☐☐ Year Month Day

H-819 (90/05)
HB-1170

Figure 10. British Columbia contractor reporting assessment.

compensation for nonperformance. South Carolina includes a similar disincentive in its rest area maintenance contracts.

Texas includes a payment penalty for its rest area janitorial maintenance services: "For any day when janitorial maintenance services required for that date are not satisfactorily completed as determined by the Engineer or his designated representative,

QUALITY ASSURANCE PROGRAM

ITP31

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

CONTRACTOR PUBLIC RELATIONS

CONTRACTOR PUBLIC RELATIONS

	N/A	Unacceptable	Poor	Fair	Good	Excellent
Number of complaints received this month by M.O.T.H. regarding highway conditions.						
Number of complaints Contractor has discussed with or brought to the attention of M.O.T.H. this month.						
Rate the Contractor's responsiveness in dealing with M.O.T.H. requests for work action.	☐	☐	☐	☐	☐	☐
What is the Contractor's performance in relation to repeated complaints or complaints where the Contractor has not responded?	☐	☐	☐	☐	☐	☐
Rate the Contractor's fleet and premises? (neat, tidy, clean condition)?	☐	☐	☐	☐	☐	☐
Rate the Contractor's responsiveness in providing M.O.T.H. with information on request.	☐	☐	☐	☐	☐	☐
Rate the Contractor's efforts to promote positive communication with M.O.T.H.	☐	☐	☐	☐	☐	☐
Rate the Contractor's manner in dealing with other Contractors or Branch operations, etc.	☐	☐	☐	☐	☐	☐
Number of complaints received from Sub-Contractors (equitable, prompt payment, etc.) this month.						

Comments _____

DHM Signature _____ Reg./Dist. ☐ Date ☐☐☐ YR MO DY

H–920 (90/05)
HB-1149

Figure 11. British Columbia contractor public relations assessment.

one day's pay shall be deducted from the Contractor's monthly payment. One day's pay will be determined by dividing the monthly bid price by 30 days." (*11*, pp. 61–62)

CONTRACT MODIFICATIONS

Time Extensions

Time extensions may be granted to complete the original contract quantity of work when situations occur beyond the control

QUALITY ASSURANCE PROGRAM
ITP32

Province of British Columbia
Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

CONTRACTOR RESPONSE TIME ASSESSMENT

Activity #	Location	Source	Defect	Date First Detected by or Notified to the Contractor	Date of Work	Response Period		To Standard	Not to Standard
						Actual	Specified		

Area Manager's Signature _____ Date YR MO DY

Region/ Dist/Area

H – 921 (89/09)

Figure 12. British Columbia contractor response time assessment.

of the contractor, preventing the regularly scheduled completion of the work.

Change Orders/Supplemental Agreements

To expedite completion of emergency work, Florida often adds this work to existing contracts by change order.

Contract Cancellation

More than 80 percent of the agencies reported having provisions for terminating contractors for poor performance. These provisions typically require documentation of poor performance, a first warning either orally or in writing with a 5- to 15-day correction period, and a written notice of default if performance does not improve. In the five state agencies where in-depth interviews were conducted, contracts had been terminated, but the number of contractors was small.

Contractor Debarments

One solution cited for problem contractors was excluding them from bidding on future work for the agency. Although this step is needed infrequently, it is an essential requirement in the specifications.

Contractors in Virginia may be removed from the bidders' list for new contracts if the percent of contract time on a current contract exceeds the percent of work completed by more than 10 percent for over 2 months. The contractor can be reinstated on the bidders' list if progress improves sufficiently.

AGENCY SATISFACTION WITH CONTRACT MAINTENANCE

Quality of Work

While there have been some problems in contracting for maintenance services, most of the problems have been minor, and agencies expect to continue or expand contract maintenance. Many agencies have undergone reductions in force in recent years. Nearly all are under some restrictions in the number of employees authorized. As one maintenance engineer said, "It is easier to cancel contracts than lay off employees."

Problems

Forty-four agencies responded to the request to describe any

problems experienced with contractors' quality of work. Eighteen did not specify the types of problems encountered. Twelve reported insignificant or no problems. Fourteen reported problems with work or materials quality. Noncompliance with specifications was reported by five agencies. Lack of equipment was a problem for two agencies, as was scheduling.

QUALITY ASSURANCE PROGRAM

ITP33

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

CONTRACTOR PLANNING ASSESSMENT

	N/A	Unacceptable	Poor	Fair	Good	Excellent
Annual Plan submission submitted promptly?	☐	☐	☐	☐	☐	☐
Annual Plan detailed and responsive to needs?	☐	☐	☐	☐	☐	☐
Annual Plan Schedule effective, with minimal change in timing?	☐	☐	☐	☐	☐	☐
Maintenance plan in place?	☐	☐	☐	☐	☐	☐
Planning responsive to needed change?	☐	☐	☐	☐	☐	☐
Preventative Maintenance Planning?	☐	☐	☐	☐	☐	☐
Planning presentation/communication to the Ministry?	☐	☐	☐	☐	☐	☐
Planning meetings and supervisor sessions?	☐	☐	☐	☐	☐	☐
Quality control plan in place?	☐	☐	☐	☐	☐	☐
Effectiveness of Contractor quality control?	☐	☐	☐	☐	☐	☐
Meeting response time?	☐	☐	☐	☐	☐	☐

Comments: _____

DHM Signature _____ Reg./Dist. ☐ Date ☐☐☐ YR MO DY

H-922 (90/05)
HB-1101

Figure 13. British Columbia contractor planning assessment.

Solutions

Thirty-three agencies listed methods for resolving the problems. These included: withholding or reducing payments for unacceptable work, requiring the contractor to correct work at its own expense, increasing the level of inspection, revising the specifications and contract documents for future contracts, reducing the contractor's prequalification rating, excluding the contractor from bidding on future work, and stopping work until the problem was resolved.

Employee Acceptance

Problems

Twenty-four of the forty-four agencies responding to this question reported no problems. Four agencies said problems were insignificant. Six others did not specify the types of problems. The problems described included: job security worries, morale problems, transition from workers to inspectors, union concerns about losing work, and timing of change to contract work.

Resolution of Problems

The problems were resolved through: ensuring employees of future employment through lateral transfers and reassignments, meetings with labor unions, retaining an adequate in-house work load, contracting "undesirable" maintenance activities early, contracting to coincide with employee attrition, encouraging employees to form maintenance contracting companies, and developing an inspector's handbook and providing training.

Public Reaction to Contracting

Two-thirds of the agencies reported either no reaction from the public concerning contract maintenance or that the reaction was insignificant. Eleven agencies reported positive reactions from the public, three negative and four little change from in-house work. One agency reported the public questioned the need for contract maintenance when an in-house maintenance staff is available. Another reported questions on why so much work was performed in-house.

Benefits of Contracting

The major benefit of contracting maintenance is the improvement in the use of in-house personnel. It enables agencies to operate within current staffing limitations or reduce staff, especially seasonal employees. It permits leveling work loads by supplementing in-house capability. Activities that require specialized personnel can be contracted to reduce the need for special training, meet environmental regulations, and serve remote areas.

Similarly, the need to acquire specialized equipment can be avoided by contracting. This allows expenditure of available equipment funds to upgrade equipment that has greater use. Contracting has allowed agencies to improve the levels of service by completing work that requires special skills or that agency crews can not perform because of staff limitations. Cost savings were achieved by avoiding overhead costs for specialized work, through bids by competitive contractors, and innovations by contractors.

Other benefits include: improving response times; improving public image and public relations by completing needed work that in-house forces could not get done; the ability to perform larger, more complex projects; and strengthening the contracting industry.

Other Problems with Contracting

Of the 26 agencies responding to this question, 17 reported no other problems. Problems with contract maintenance not listed elsewhere included the following: cost accounting and budgeting are more complicated; inspections are inconsistent, especially when untrained maintenance employees are assigned to inspection; the increased dependence on the private sector is causing the loss of some in-house expertise; and the administrative staff increased.

UNIQUE METHODS OF CONTRACTING

Two unusual methods of contracting for maintenance services were identified. The *British Columbia Ministry of Transportation and Highways* contracts for all of its highway and bridge maintenance. While contracting for all maintenance services is fairly common for cities, counties, and turnpikes, it is unusual for a state or provincial highway agency. A description of the Ministry's efforts and results is presented in Appendix B.

The *City of Phoenix, Arizona,* uses two unusual contracting procedures. The first is to encourage competition by contracting a portion of the work and performing part in-house—with the work being fairly comparable.The second method is more unusual; for some services, the public works and transportation agencies can submit bids for projects to directly compete with private contractors.

Performance—in-house vs. contract. The streets in about one-third of the City of Phoenix were patched by city employees and the remainder was contracted to private firms. The Phoenix Department of Transportation compared the costs and work quality for street patching. In this case, it was found that city employees did a better job at less cost. Agency officials believe that this occurred because contractor personnel were not fully trained in the methods and the teamwork required. As a result of this analysis, the city decided to undertake all patching with city employees.

Direct competition—city vs. contractor. Both the Department of Public Works and the Department of Transportation for the city have used the procedure of city crews competing with contractors for several years. The agency prepares the bid solicitation and advertises for bids in its usual way. The difference is that the agency can also bid for the work (*15*)(*16*).

The agency prepares its bid, which is reviewed by the city finance department. The cost estimates include such costs as labor and fringe benefits; building maintenance and utilities; vehicle depreciation, operation and repair; insurance; supplies and small tools; and allocated indirect costs. The independent auditor audits the city cost estimates to ensure accuracy and

reasonableness to assure that relevant differential costs are incorporated into the estimates.

To develop fair cost estimates, the city uses what it calls "go-away" analyses. That is, it considers two different scenarios: What cost would be incurred if the city provided the services and what would be deleted if the service is contracted? What costs would be added and which would go away? For example, the department head's salary would be required in either case. The crew foremen salaries would go away with contracting, but would be replaced by the contract manager's salary. The cost of additional inspectors is included for the scenario in which the city no longer provides the services directly. The cost of service yards would go away if the city rents the space or, if it is city-owned, the space could be rented or sold. The effect on capital costs is considered.

A key issue in evaluating this process is what happens to employees if the private firm wins the contract. Phoenix currently has a "no layoff" policy, but tight funding makes adhering to the policy more difficult. The city solicits bids and makes decisions well ahead of time, giving them several months to reassign employees. Typically, the contracts for the work in this category are multi-year. If the city loses work it is currently delivering, it stops relevant new equipment purchases and attempts to find other positions for the dislocated staff. Temporary employees are hired to replace transferred employees until the contract is started. The contractors are required to offer jobs to dislocated city employees, even if they have only temporary status. If the city wins back work from a contractor, contractor employees with prior city service can be reinstated.

Another key issue is, What happens if the city wins a contract and its costs exceed the initial cost estimate significantly? The city tracks costs and makes a determination as to whether the increased cost would have also occurred by the contractor. One example is unusual fuel cost increases that occurred in recent years. The city officials and the private sector both pay close attention to these costs. If the city's costs significantly exceed the initial estimate without valid reasons, supervisors are held accountable.

INNOVATIVE FUNDING FOR CONTRACT MAINTENANCE

Twenty-eight of the 54 agencies responding to this question budget contract maintenance separately from maintenance performed by agency forces. Of these, 19 agencies can transfer funds between contract and in-house maintenance. Most of the remaining agencies have one budget for maintenance, which includes both in-house and contract maintenance. Frequently, where there is only one budget, the decision to contract is not made until after the budget is approved.

Few innovative funding approaches for contract maintenance were identified in this research. One that has promise for relieving agencies of considerable maintenance effort is the privatization of rest areas.

Maintaining and servicing rest areas has become a significant cost to highway and transportation agencies. For example, rest area maintenance cost Caltrans $3,223,669 in fiscal year 1989. While this represented slightly less than 1 percent of its annual maintenance budget, it represented over 80,000 hours or 45 person-years of labor. In addition, the cost to build a new rest area that serves both directions of freeway travel to Caltrans standards ranges to about $5 million, plus the cost of the land (*17*). Crime has become a significant and growing problem at many rest areas. Also, commercial services are being provided quasi-legally or even illegally adjacent to or within a number of rest areas.

The provision of permanent commercial services within a rest area could provide Caltrans with rental income as well as reducing costs and eliminating quasi-legal and illegal activities.

Consequently, Caltrans is exploring ways to reduce these costs and eliminate the problems while continuing to provide the services. One approach is the privatization of rest areas. Currently, federal regulations prohibit privatization of rest areas within the right-of-way on federal-aid highways. To overcome this restriction, California legislation authorized a rest area joint economic development demonstration project. It requires that joint development contracts be awarded on a competitive bidding basis.

The authorization is for commercial facilities in up to six new rest areas. To deal with the interstate restriction, rest areas will be located outside the controlled access right-of-way. Locations accessible from existing interchanges are the most logical sites.

A lease was signed in late 1990 for the first rest area to include private commercial services. The new Traveler Services Rest Area (TSRA) will be located near the I-15/Route 395 Interchange in San Bernardino County. It will include all of the usual "public" services available at the State's other rest areas, such as rest rooms, parking for cars, trucks, buses and recreational vehicles; landscaped areas with walkways for people to stroll and walk pets; and picnic tables. Most of the 14 acres in the TSRA will be devoted to free public uses. Only a small portion of the site will contain commercial services that will include a restaurant, a fuel service facility and a convenience store. The sale of alcoholic beverages is prohibited within the rest area. A uniformed security guard will patrol the picnic area, and call buttons located throughout the site will allow motorists to summon emergency help.

To develop the TSRA, Caltrans is contributing only the land and $500,000 in cash. Caltrans initiated the project, performed the feasibility study and identified the site to be developed. The developer is responsible for all of the engineering and architectural designs, obtaining permits and environmental approvals, construction, maintenance, operation, security and insurance. The designs were approved by Caltrans and the operation will be monitored. At the end of the 35-year lease period, all facilities will revert to ownership of the State.

TSRAs are in the experimental stage. However, they hold great promise for providing services while reducing agency costs. Their use will necessarily be restricted to new sites unless federal regulations are revised to permit commercial services within the access control portion of the right-of-way. Privatization of rest areas will be practical only at sites serving sufficient traffic to be economically feasible.

CHAPTER THREE

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the research concerning contracting for maintenance services can be summarized as follows:

1. *The Need for Contract Maintenance*—There is a need for contract maintenance. Limits on the number of employees have been imposed on nearly all highway agencies. Because of this limitation of personnel, many agencies do not have the manpower to complete all needed maintenance work—even if funds are available. Some other means of accomplishing maintenance work must be found. Contracting for maintenance services is one option. Its use gives managers another method for accomplishing work that needs to be completed to keep the road network in shape and provide services to motorists. Contract maintenance is not a panacea; it will not eliminate all problems—but properly used, it provides managers with another tool to help manage maintenance.

Essentially all state and provincial highway agencies contract some portion of their maintenance work. The responses to the questionnaires indicated that there are no maintenance activities that cannot be contracted. However, it is more cost effective to contract some activities than others. Which activities these are vary by agency, depending on the availability of contractors, economic conditions, and in-house productivity. Each agency must determine for itself which activities are most beneficial to contract.

Agencies can evaluate the advantages and disadvantages of contracting for maintenance services as it affects their operations by contracting for a limited number of maintenance activities. If they find contracting advantageous, they can expand its use. If not, they can return to assigning the activities to in-house forces. However, if a decision is made to contract for all services, as British Columbia did, it may be very difficult to reverse that decision. Once equipment is disposed of and personnel are transferred or hired by the contractor, gearing up to again provide those services in-house can be a major undertaking. Obtaining the funds for the capital costs for equipment could be insurmountable, especially for small agencies.

2. *Cost Comparisons*—For comparisons between work performed by agency forces and that performed by contract to be valid, the total costs involved with each and the quality attained must be assessed. Are apples being compared with apples or with oranges? Are both in-house forces and contractors held to the same requirements for work quality? Are the activities comparable? Are the traffic control requirements the same? Are the materials specifications the same? If not, allowances must be made in any cost comparisons.

All of the costs must be included in the cost calculations. For in-house work, costs that should be included are: labor and fringe benefits, including nonproductive time; equipment costs based on agency rental rates; materials costs; and overhead, such as shop and yard facilities, utilities, and supervision.

The costs of contracting to be included are: payments to contractors, costs of any agency-furnished materials, inspection costs, and contract development costs (preliminary engineering, advertising and award).

Where maintenance supervisors administer the contracts and inspect the work in conjunction with their normal duties, their costs for inspections should be included for both in-house and contract work or omitted from both.

3. *Restrictions*—State and provincial laws frequently stipulate conditions for contracting work. The laws include such items as the maximum size of project that can be performed by agency forces, the requirements for bonds, the timing of payments, and methods of soliciting bids.

Most of these laws were enacted for the more typical construction contracts and may be more restrictive than necessary for maintenance contracts. Bidders for maintenance-type contracts, especially, are a different type of contractor than those traditionally bidding construction projects. These contractors are often smaller "Mom and Pop" businesses that have difficulty in coping with the red tape of project-type contracts. Simpler, straightforward contracts with qualification and bonding requirements that fit the risks are needed to attract sufficient contractors for these activities.

In some instances, laws should be changed to permit improvement of the contracting procedures for maintenance.

4. *Specifications*—Agencies have relied on their standard construction specifications in setting up maintenance contracts. Special provisions and supplemental specifications were used to modify the standards. This method is appropriate for project-type contracts such as pavement overlays, chip seals and the like.

This method is less desirable for maintenance-type contracts. It results in excessive paper in the bid proposals and causes confusion and misunderstanding for the contractors and inspectors.

A few agencies have developed standard specifications for the maintenance-type activities that they normally contract. All state and provincial highway agencies should develop such standard maintenance specifications. Use of the work methods in their maintenance management systems will provide a starting point for standards development.

National standard specifications for construction of highways and bridges have been developed by AASHTO and are available for agencies to use or adapt to local conditions. Similar standard specifications for contracting maintenance would be equally useful.

5. *Training*—Relatively few agencies have effective training programs for contract maintenance inspectors. Most rely on on-the-job training.

Training programs are needed to ensure that inspectors are knowledgeable in the procedures for contract administration, authority of the inspectors, conduct on the job, and the technical aspects of the item assigned for inspection. Unless contract administration procedures are significantly different for maintenance contracts, experienced construction inspectors need only the technical training in maintenance work methods. Maintenance employees understand the work methods, but need training in administering contracts.

Training is also needed for contractors and their personnel, especially for small or DBE firms. Traditionally, agencies have expected contractors to have the expertise to perform the work they bid. However, if skilled contractors and contractor personnel are not available, agency-provided training may be useful in developing industry capability.

To be effective, training must address the specific needs in each agency or contractor specialty group. As noted above, some inspectors need work methods training and others need training in contract administration. Similarly, the needs for contractors vary from how to bid to how to perform the work. The cost of developing such training programs individually by each can be expensive. Those costs can be reduced by developing model courses nationally for selected training needs. The model course should be designed so agencies can adapt them to fit their particular needs and conditions.

REFERENCES

1. "Progress Report on Maintenance and Operations Personnel." *Transportation Research Circular 360,* Transportation Research Board, National Research Council (June 1990).
2. "Progress Report on Maintenance and Operations Personnel." *Transportation Research Circular 188,* Transportation Research Board, National Research Council (Jan. 1978).
3. FEDERAL HIGHWAY ADMINISTRATION, "Highway Statistics," National Technical Information Service (1982 through 1988).
4. AASHTO, *AASHTO Maintenance Manual 1987,* American Association of State Highway and Transportation Officials, Washington, D.C. (1987).
5. ALLEN, G.R. AND LISLE, F. N., "Analysis of Maintenance Costing with Emphasis on Contracting versus Using State Forces." Virginia Highway and Transportation Research Council (Sept. 1982) p. 31.
6. IOWA DEPARTMENT OF TRANSPORTATION, "Guidelines for Selecting Projects for Maintenance Contract Work." (Sept. 1984) p. 4.
7. HUSBY, K., "Contract Maintenance Study (1987-88)." Highway Division, Oregon Department of Transportation (Jan. 1989) 61 pp.
8. KILEY, J., *Washington's PCEM: A Search to Provide More Cost Effective Roadway Services,* Deloitte & Touche (Feb. 25, 1991) 13 pp.
9. MONTCLAIR HIGHWAY SERVICES, INC., "A Study of Highway Maintenance Activities for the Commonwealth of Massachusetts." Department of Public Works (Oct. 1, 1986) 63 pp.
10. PROVINCE OF BRITISH COLUMBIA, MINISTRY OF TRANSPORTATION AND HIGHWAYS, *Annual Report 1988-89,* pp. 12–15.
11. TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION, *Routine Maintenance Specifications* (1990) 138 pp.
12. FLORIDA DEPARTMENT OF TRANSPORTATION, *Maintenance Rating Program Manual* (June 25, 1990), 78 pp.
13. PROVINCE OF BRITISH COLUMBIA, MINISTRY OF TRANSPORTATION AND HIGHWAYS, *Highway and Bridge Maintenance Quality Assurance Program* (Undated).
14. TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION, *Routine Maintenance Contract Inspectors Manual* (1990) 176 pp.
15. CITY OF PHOENIX, ARIZONA, "Management Procedure MP No. 5.501" (Jan. 29, 1985) 8 pp.
16. CITY OF PHOENIX, ARIZONA, "Instructions for Preparing Cost and Reconciliation Summary" (Undated) 7 pp.
17. KRESS, E. N. AND DORNBUSCH, D. M., "Commercialization of Rest Areas in California." Presentation at the Annual Transportation Research Board Meeting, Washington, D.C. (Jan. 13–17, 1990) 10 pp.
18. JURAN, J. M., *Managerial Breakthrough.* McGraw-Hill Book Company, New York (1964) pp. 43–54.
19. LUND, E. A., "The Privatization of Road and Bridge Maintenance in British Columbia." Presentation to 71st Annual Convention/Constructor Exposition, Associated General Contractors of America, San Francisco, Calif. (Mar. 15, 1990) 30 pp.
20. PROVINCE OF BRITISH COLUMBIA, MINISTRY OF TRANSPORTATION AND HIGHWAYS, *Highway Maintenance—Standards and Specifications* (1991).

Appendix A

Guidelines for Contracting Maintenance Services

Introduction

The items defined as maintenance vary from agency to agency. Resurfacing is a maintenance activity in one state and a part of the construction program in another. For the purposes of these guidelines, activities funded by maintenance are defined as maintenance.

These guidelines were developed to assist agencies in developing or improving their own contract maintenance practices and procedures. The various alternatives identified in the research are discussed in the appropriate sections, along with recommendations where selected alternatives are clearly better.

It is recognized that the laws and prevailing conditions that may impact maintenance contracting vary significantly from state to state, and agency to agency. Consequently, each agency -- state, province, city or county -- will have to develop its own procedures within the legal, political and policy framework in which it operates.

Deciding to Contract

Contract maintenance is one more tool that agencies can use to help manage maintenance. It is not a panacea; it won't solve all problems and will likely introduce some of its own. These guidelines are intended to assist managers with the decision to use contract maintenance, if they are given that opportunity, and in developing procedures, if the decision is to utilize contracting. They are not intended to either promote or discourage the use of contracting.

Goals and Objectives

The first step in developing the contract maintenance program is the development or identification of the goals, objectives and driving forces. They may include such diverse factors as:

- higher authority mandates to increase levels of contracting;
- demands for improved levels of service at lower costs;
- employment reductions;
- expanding workloads with employment ceilings;
- needs to balance seasonal or geographical workloads and resource demands;
- trial programs to identify potential problems, costs and benefits;
- efforts to avoid or minimize investments in expensive or specialized equipment;

- opportunities to test or reap the benefits of new equipment, materials or techniques with limited investments; and
- stimulation programs for small and disadvantaged businesses.

Strategy

Developing an effective contract maintenance strategy consistent with goals and objectives is a critical and usually more difficult second step. An agency mandate, for example, to contract half of its maintenance budget could, perhaps, be implemented by a strategy to contract all or most periodic activities (reseals, striping, blading unpaved roads and shoulders, etc.). The strength of the strategy would be the retention of the staff and basic equipment needed to meet many emergencies; retaining the capability to react more quickly than most contractors for routine activities; minimizing the demand for specialized equipment; contracting relatively high-cost activities that have major budgetary impacts and thereby advance the realization of the goal (contract half of the program); and limiting contracting to activities that are relatively easy to inspect and verify, thereby minimizing new staff and skill demands.

If the objective is to develop an information base to compare costs and effectiveness of contractor and internal operations, a much different strategy would be needed. It would require the selection of comparable work locations (terrain, weather, traffic volumes, materials, prevailing costs); identification of contractor capabilities and their locations; identification of activities contractors could be reasonably expected to perform in timely ways; and identification of direct and indirect agency costs that must be included to provide a reasonably comparable cost base.

And if the goal is to transition maintenance to the private sector, the initial strategy might be to contract all maintenance services in a limited rural geographical area, with later phasing to urban areas and entire districts or management units. The advantage of this strategy would be risk limitations in the early stages of the program as problems are worked out and techniques are developed. The major disadvantage would be the negative impacts upon employees and their legitimate needs for reasonable levels of job security. Requiring contractors to hire displaced agency personnel, as was done in a Canadian province, could help to minimize employee concerns, but certainly would not eliminate them.

The combinations of goals, objectives and strategies that agencies may adopt are nearly limitless. However, they can be generally classified, for guideline purposes, into two basic analysis categories: individual activity analysis and program analysis. When a relatively small portion of the workload is contracted, the individual activity approach is appropriate. If a substantial portion of the work is contracted, a more comprehensive analysis is warranted.

Goal and objective setting, and strategy development, are top management responsibilities. Typically maintenance managers will be expected to develop draft statements, but at least initial top-management approval should be sought before more detailed analyses are started.

Activity Analyses

Steps to be taken in completing the maintenance contracting activity analyses are summarized in six progressive decision-making discussion categories: identify candidate activities; make cost comparisons; identify candidate work locations; model (estimate) the impacts of contracting on agency forces and capabilities; prepare initial work activity and quantity estimates; and prepare the contract maintenance work program. Contracting procedures that sequentially follow the development of the work program are discussed in later sections of these Guidelines.

1. Candidate Activities.

Maintenance activities that can be contracted will be heavily impacted by local conditions and attitudes, and by contractor capabilities. Still, there are essentially none that cannot be contracted given the proper circumstances and conditions.

Many agencies have developed maintenance management systems. These systems typically use activity descriptions, performance standards and workload inventories to estimate and prepare performance and object-of-expenditure budgets. These systems can provide shortcut ways to identify candidate activities. Most performance standards provide descriptions of the work covered by the activity (or function), as well as providing estimates of activity staffing, equipment and materials requirements. And, as noted in a later section, these systems can be used to model contracting impacts upon the agency.

Agencies that have not developed these systems nearly always have activity definitions used for reporting and summarizing costs. And these systems typically identify activity costs by objects of expenditure at varying levels of detail. Typical minimum object-of-expenditure cost categories include labor, equipment, materials and contracts. More detailed classifications frequently show types of materials used (liquid asphalt, aggregate, salt, etc.) and equipment cost components (gas, oil, rental, repair, etc.) and, perhaps, costs incurred by equipment type (trucks, graders, distributors, etc.).

The objective of this first analysis is to identify the activities that are potential candidates for contracting. The first list will normally be long. It will include all activities that could be contracted within the agency's goals, objectives and strategy decisions. Subsequent analyses will sort and narrow the list. Initial activity selections should be guided by these types of considerations:

a) In many and probably most cases, contractors will not be able to react as quickly as agency forces unless given sufficient work to mobilize at least a skeleton full-time crew. In making initial potential contract maintenance activity selections, careful consideration should be given to minimum response time demands and initial levels of contract maintenance strategies. Activities requiring less than full-time contractor commitments, and fairly short response times, should normally be rejected. Examples of activity rejects for response time considerations could include pavement blow-ups; pothole patching; emergency, as opposed to routine, drainage corrections; traffic signal maintenance; and hazardous spill responses.

   An exception to this guideline might be for agencies intending to contract variable quantities of emergency work to supplement their own capabilities during emergencies.

b) Given normal workloads, many contractors will be reluctant to purchase or rent specialized equipment they do not currently have, especially for short-term contracts. Equipment purchases may require investment recovery over a relatively short time, and equipment rental can create demands for new operator skills, training programs and learning curves. If bids are submitted, unit costs can be expected to be high. Examples include snow plows, tractors and mowers, pavement striping machines, dumpsters and the like. If initial activity selections will create new contractor equipment demands for those likely to propose, multiple-year contracts should be anticipated. If multiple-year contracts are unacceptable, and if the agency is unable to provide the specialized equipment needed on the same basis to all bidders, the activity should normally be rejected as a contract maintenance candidate.

c) Agencies need to evaluate long-term as well as short-term potential impacts of contracting, again especially if specialized equipment is involved. The objective is to identify, in advance, potentials for monopolistic or constrained bidding circumstances wherein one or a few bidders could control the bidding and thereby drive up prices. These circumstances could occur if agencies award one or a few contracts for activities such as mowing, and sell

or dispose of their own equipment, thereby eliminating governmental competition. Again, relatively long-term contracting, and dividing contracts into packages to retain competition, if there are sufficient amounts of work to do so, can help to avoid these potentials.

Most agencies operate in contract maintenance markets in which other agencies of government also operate -- states, cities and counties. Contracting workloads of other agencies and organizations may also help to retain a competitive market place.

d) Many maintenance agencies use management and financial systems that contain 100 or more activities. While each activity is important and must be done, not all are of equal managerial, financial or contracting significance. Research in many states has repeatedly shown that 70 percent or more of maintenance costs will be expended upon 30 to 40 percent of the activities, if a large number (100 or so) of activities are defined and used (the Pareto Principle). (*18*) One way to identify the significant few and the trivial many is the development of an array of costs budgeted by activity for the current year, as well as arrays of those costs actually incurred for the past one to three years. Such arrays would typically start with the activity upon which the most money was spent and progress downward to those upon which the least was spent. In addition to providing potentials for selecting or rejecting initial activities falling outside strategy bounds, these analyses will be useful in subsequent decision making.

An example of this type of an array is shown on the next page as Figure A-1.

e) Later guideline elements provide ways to identify contractor capabilities and potential interests for bidding maintenance activities not previously contracted. This step is a very preliminary review to determine if there are contractors with capabilities typically needed to perform the initial selection of candidate activities. The objective is not selection; it is simply a rough feasibility check that may save time and effort in later, more detailed analyses. An agency with a strategy to contract striping for one year to bridge a budget request for a new striping machine, as an example, is not likely to be effective unless at least one, and preferably more than one, contractor currently has a striping machine.

Most agencies prequalify construction contractors. A few have started prequalification for maintenance contractors. Typically, prequalification has some type of description as to the contractor's equipment and bonding capabilities, and permanent office locations. A quick check of capabilities at this level of the analysis can serve to confirm or identify the need for strategy and candidate activity selection changes.

f) The final step of this phase of the analysis will be the confirmation of the contract maintenance strategy and the development of a list of candidate contract maintenance activities.

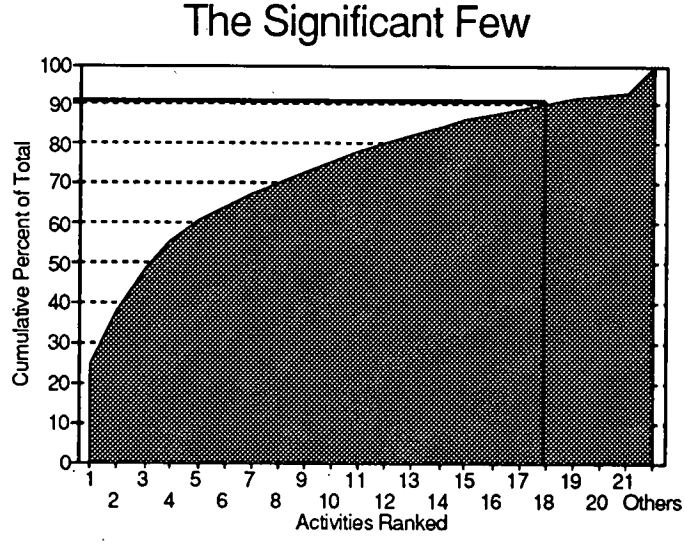
2. Cost Comparisons

Most contract maintenance strategies will have cost, effectiveness and efficiency roots. Strategy realization will usually require, at the minimum, a comparison of at least apparent agency and contractor costs. The general discussion that follows will provide agency guidance in making basic and reasonably unbiased comparisons.

Cost and quality comparisons are needed at two stages in contracting for maintenance services: (1) for individual projects and activities to determine the feasibility of contracting in the first place; and (2) to compare actual results after the work is completed to assess whether contracting should continue, be reduced or be expanded. Where significant differences in costs are identified, an attempt should be made to determine the causes for the differences. The accuracy of quality and cost

Figure A-1 -- Maintenance Activity Significance

Activity	Annual Cost	Percent of Total	Percent Cumulative	Activity Rank
Hot Mix Overlays (1" or greater)	7,285,373	24.6	25	1
Salting	3,963,655	13.4	38	2
Snow Plowing	3,158,759	10.7	49	3
Sanding	2,034,371	6.9	56	4
Guard Rail Maintenance	1,559,902	5.3	61	5
Pavement Markings	990,161	3.3	64	6
Other Winter Maintenance	935,656	3.2	67	7
Pavement Leveling	882,870	3.0	70	8
Structures Painting	814,160	2.8	73	9
Rest Areas Maintenance	757,915	2.6	76	10
Tree Trimming and Control	706,481	2.4	78	11
Mowing	666,322	2.3	80	12
Maintaining Gravel Shoulders	564,947	1.9	82	13
Ditching	560,220	1.9	84	14
Litter Control	509,486	1.7	86	15
Maintaining Traffic Signs	445,212	1.5	87	16
Maintaining Culverts	429,747	1.5	89	17
Thin Hot Mix Overlays	399,985	1.4	90	18
Patching	364,477	1.2	91	19
Pavement Markings	234,577	0.8	92	20
Joint and Crack Sealing	219,624	0.7	93	21
All Other Activities	2,076,312	7.0	100	Others
Totals	29,560,212	100		



comparisons should improve over time as the agency gains experience and collects more comparative information.

In making comparisons, two basic issues need to be addressed:

a) Do both the agency and the contractor perform work to the same specifications and quality requirements under reasonably comparable conditions? Where mowing of interstate highways is contracted and secondary roads are mowed by agency forces, the work is probably not comparable. Wider rights-of-way, fewer mowing inhibitors and the like provide opportunities for more productive equipment and operating conditions that promote higher levels of productivity and thereby reduce unit costs. All factors -- working conditions, equipment usage opportunities, traffic volumes, materials availability and haul distances, quality levels achieved, local unit costs, learning curves and the like -- should be considered and made as comparable as possible.

b) Are all applicable costs included for both parties in the comparison? Contractors have overhead costs; so do agencies of government. But contractors earn profits and agencies of government do not.

The following table is an example of the elements that should be included in cost build-ups for both agency and contractor operations.

Figure A-2 -- Activity Cost Comparison Worksheet

	Estimated Costs	
Cost Element	**Agency**	**Contract**
Salaries for performing work	$_____	N/A
Fringe benefits	$_____	N/A
Equipment rental	$_____	N/A
Materials	$_____	N/A
Facilities (shops, yards, etc.)	$_____	N/A
Supervision	$_____	N/A
Agency overhead burden	$_____	N/A
Contract cost	N/A	$_____
Material furnished to contractor	N/A	$_____
Preliminary engineering (P.E.)	N/A	$_____
Inspection & contract administration (C.A.)	N/A	$_____
Agency overhead burden on P.E. and C.A.	N/A	$_____
Total Costs	$_____	$_____

Note: Where maintenance supervisors administer contracts and inspect the work in conjunction with their normal duties, these costs should be omitted from both in-house and contract cost estimates.

In-house unit costs for activities can be extracted from the agency's maintenance management system and in many cases from accounting systems for those agencies without maintenance management systems. Even if an agency does not have a maintenance management system, costs by activity (or function) will normally be readily available. The missing component, in many cases, will be the number of units of work done -- acres of mowing, tons of patching, pass miles of blading, etc. Many accounting systems will, however, show the quantities of materials purchased and the hours of labor paid. Some will be for specific activities. Examples include tons of patching materials, gallons of striping paint, tons of salt and sand for snow and ice control, gallons of liquid asphalt appropriate for crack sealing, and hours of operator mowing. Some of these factors can be converted to unit costs simply by dividing total costs by the quantities of materials used (tons, gallons, etc.). Others such as mowing may require estimates of the number of acres management units typically mow and the number of times they are mowed each year. Resulting unit costs may not be precise, but they will provide rough measures that may be adequate for initial comparisons. Accuracy may be improved by including three years or so of the information into each activity computation. Of course, agencies deciding to contract maintenance that do not currently report units of work done by agency forces should revise their reporting procedures to include this information for subsequent years.

Bid price information is generally not available the first time an activity is contracted. To overcome this problem, contract costs may be estimated until actual data is available. Estimates can be based on information from other agencies or by build-ups from construction contract costs. Many construction contracts have unit costs that can be used for initial estimates. They may provide relatively direct relationships such as ranges and averages in unit costs for contractor patching prior to overlays or seals. Others will require build-ups from contractor force account bids -- dump truck costs per hour plus ton costs of bituminous pre-mix, plus operator costs, etc. Other cost comparison guidelines that should be considered are:

- Bids should not be sought solely for the purpose of collecting bid information. This practice ultimately will discourage contractors from bidding.
- Agency equipment costs should be included. When two charges are made for equipment -- a general fee for availability and a user fee based on actual usage -- both should be included. The rental rates should reflect all costs of acquiring and operating the equipment.
- The agency's maintenance overhead burden should include its pro rata share of the costs for accounting, legal, insurance, personnel, and maintenance and general administration (local and central managers who do not normally charge their time to specific projects or work activities both within the maintenance organization and at the upper levels of the total organization). Overhead costs should also include the operating costs of facilities (heat, light, water, insurance, etc.), as well as depreciation allowances for these facilities. Overhead costs may be difficult to identify; however, some information should be available. Many agencies routinely include overhead allowances in certain types of billings. They may include: federal or state-aid reimbursement requests; billings for work done for others such as contract maintenance for railroad crossings and city signals; and invoices to the public for facility repairs required as a result of accidents. These rates may not be realistic, but they may be the best available. Maintenance managers should seek the assistance of accounting and financial managers in the development and updating of agency overhead estimates.
- By continuing to perform a portion of each activity in-house, agency costs can be identified and used as a check on contractor bid prices. Again, the work performed by each must be reasonably comparable, if the cost comparisons are to be useful. If there is sufficient competition,

the in-house cost check is unnecessary. Most agencies do not perform construction work to check contractors' prices.

- And finally, when an activity is first contracted, bid prices may not be realistic or indicative of those that can be expected in the future. Inexperienced contractors may bid either too high or too low. And the agency's initial specifications and requirements may need to be improved. Consequently, realistic bid prices may not be received for two or three years. It may take that long for both parties to realize the level of contracting and bidding maturity that long-term contracting will require.

3. Work Location Selections

Three primary factors will guide the agency's selection of areas in which maintenance contracting will be implemented -- the agency's strategy, contractor capabilities, and managerial acceptance.

Strategy and contractor capability implications for work location selections were discussed in earlier sections. The third factor, managerial and employee acceptance, is at least an equally important consideration.

People, all of us, naturally resist change. Even bad jobs can be preferable to those with limited employment security. And the contracting of work historically done by agency personnel can be -- and often is -- a threatening change, even if the agency is committed to the retention of its current work force. Resistance to change can be managed, and its negative impacts can be minimized. Primary managerial tools include:

- Establishing and maintaining open and clear lines of communication throughout the maintenance organization. The information supplied should be straightforward, accurate and consistent. Even when these guidelines are adopted and implemented, it is likely that the "grapevine" will carry contradictory messages unless the agency has previously established high levels of credibility and open lines of communication, both upward and downward. Early in the formulation of the maintenance contracting program, the agency should design and adopt a communications program to "tell it like it is." Employees should be kept informed as to the agency's goals, objectives and implementation strategies. Such openness may create short-term problems, but should minimize those encountered in the long term. Whenever possible policies should be established and communicated to the work force that will minimize negative impacts. Examples could include work force reductions through attrition, early retirements, earnest agency assistance in finding other employment together with descriptions as to how this policy will be implemented, and, as earlier noted, requirements that contractors hire displaced agency personnel. Effective employee communications programs are not realized with one-time efforts. Overcoming the grapevine will require a continuous commitment to open communications as the program is formulated and implemented.

- Allowing participation in decision-making can also help to improve contracting programs while simultaneously assisting in reducing employee and managerial resistance to change. It is unlikely that all employees can or should participate. However, forming committees of key personnel, those in whom many employees have confidence, as well as representatives of all levels of management that will be impacted, should be key program formulation and implementation considerations. Open discussions should be encouraged and all factors leading to goals, objectives and strategies should be explored. This approach frequently generates new potential approaches and improvement ideas. Obviously, good ideas should be adopted, and credit should be given to those developing them. These committees should, however, understand the basic rules at the outset: Their views will be sought and respected, and they will be important considerations in final decision-making. Still, final decisions will be made by ap-

propriate agency authorities: managers responsible for providing the most effective and efficient transportation facilities with the resources available, the same people responsible for carrying out the mandates of higher authorities.

- Even with open lines of communication and high levels of decision participation, all people and managers are not likely to be equally receptive. A final contract work location consideration should be the selection of locations and areas where resistance will be minimized and opportunities for success maximized.

4. Impact Analyses

Before deciding to undertake contract maintenance programs, managers need clear definitions of current impacts and best possible estimates of potential future ramifications for their organizations and operations. There are three primary considerations: internal staffing impacts, impacts upon current and future agency capabilities to complete its highway maintenance mission, and long-term agency implications.

The magnitude of these impacts will vary with each agency's strategy. Those seeking to complete expanding workloads with current staff levels will, for example, have minimum impacts upon current staffing levels and should, with reasonably open lines of communication, meet with minimum employee resistance. The other extreme in this decision matrix will be those agencies with strategies designed to replace current government employees with contractor personnel. Obviously, these strategies have the most significant staffing impacts.

a) The first step is to identify the number of current staff members, if any, that will be adversely impacted by the implementation of the contract maintenance program. For agencies with maintenance management systems capable of producing computer-generated workload-related staffing estimates (man-days, crew-days, man-years, etc.) by activity, this step can be readily completed. Estimates of expected contract quantities by activity (cubic yards or tons of asphalt patching materials, acres of mowing, lane miles of striping, etc.) need only be subtracted from agency work activity quantities to develop new estimates of internal staff requirements. Activity combinations and quantities can be increased and decreased, in trial-and-error applications, until strategy objectives are reasonably satisfied. These trial-and-error applications will also produce new estimates of internal equipment and material requirements -- important considerations in most contract maintenance strategies.

   Agencies without maintenance management systems can use spreadsheets together with unit cost estimates prepared in previous steps to make similar analyses. These initial estimates will guide maintenance managers in making initial contract maintenance scope, activity and work quantity decisions that are consistent with adopted strategies. These estimates should be continuously refined as subsequent contracting steps are completed.

b) Current-year staffing ramifications are important considerations, as are analyses to identify impacts upon the agency's continued capability to fulfill its highway maintenance role in the face of unexpected developments. Examples include contractor defaults, especially in the early stages of the program; bid costs that significantly exceed those expected, thereby requiring reductions in either internal or external programs, or both; and the ramifications of potential agency actions that could be difficult to reverse (such as the premature disposal of key pieces of equipment and the great difficulties that will be encountered in attempting to reverse untimely reductions in force). Implementing contract maintenance will force timely decision-making. The need is to retain as much flexibility as possible while making the decisions necessary to reap the benefits of the agency's contract maintenance strategy.

c) The first two steps focus on current and budget-year impacts. This step should focus on potential long-term impacts. At the beginning of this guideline we noted that nearly any maintenance activity can be contracted in the appropriate atmosphere and under the proper conditions. Still the effective performance of most maintenance activities requires equipment operating skills; a knowledge of maintenance materials, their uses, applications and limitations; and an understanding of the most effective interventions (sealing or patching) used to correct a wide variety of failures (pavements, drainage, roadside) under variable field conditions (weather, traffic, terrain). The mastery of these knowledge, skills and abilities typically takes years. Certainly training programs can shorten the development time, but there is no current replacement for field applications, especially in equipment operation. Agency personnel expected to inspect contractor maintenance activities will be required to have many of the same combinations of knowledge, skills and abilities. Extensive contracting may leave insufficient internal workloads to foster skill and ability developments, thereby "locking" agencies into contract reliances that are not consistent with initial objectives or strategies. Other major long-term considerations have been discussed. They include potentials for monopolistic bidding conditions; contractor learning curves and potential impacts upon costs and benefits; loss of agency capabilities to return to internal maintenance if equipment is disposed of and personnel lost; and the need for multiple-year contracting before consistent and competitive prices emerge.

5. Initial Estimates

The next step is to prepare the first "engineer's estimate" of the maintenance work that is expected to be contracted. In preparing this schedule, estimators should use the agency's current construction contract estimating format. It usually shows work items (maintenance activity or function), estimated number of work units to be contracted, unit cost, item (activity) cost and the estimated total cost. It may be desirable to break down the estimates by geographical location or managerial unit if more than one contract is anticipated. In most cases these unit costs will be based on historical records. Indexing can be important, especially in periods of rapid cost escalations. Most agencies currently maintain and apply indexes for construction costs. The same practice should be adopted by agency contract maintenance managers.

6. Work Programs and Budgets

The final step in deciding to contract individual maintenance activities is the development and approval of a comprehensive maintenance work program and budget. Minimum elements should include:

- Work quantity, unit cost, activity cost and total costs estimates for work to be undertaken by both agency and contractor forces. These estimates should be prepared in normal agency budgeting formats. In many agencies that will include performance budgets for both contract and agency work. In all agencies the minimum requirement will be the preparation of an object-of-expenditure budget in the agency's traditional format.
- About the first thing every official with budget responsibilities will want to see is a comparison of the current budget request with those of the past, both in terms of dollars and staffing levels. Consolidated comparisons showing both internal and contract estimates should be prepared by activity. These comparisons will provide budgetary decision-makers with reasonability guidelines. Significant changes should be noted and justified in the same ways as they would be justified if all work was expected to be performed by agency personnel.
- Variations in unit costs between those historically experienced by agency forces and those anticipated for contract forces should be identified. Significant differences, if any, should be

noted, the basis for the estimate should be explained, and proposals should be justified, usually in terms of actions needed to implement the agency's approved contract maintenance strategy.

- Usually goals and objectives, as originally approved by top management, will remain essentially unchanged throughout the program and budget development analysis. However, detailed analyses completed in the preceding five steps may require justifiable deviations from originally approved contract maintenance strategies. Analyses should also be completed and justifications prepared to show how the approval and implementation of the proposed program will advance the realization of maintenance improvement goals and objectives, as well as the program's consistency with, or changes required to, initial strategy decisions. Significant strategy departures should be fully identified and management approval sought.
- Some risk-taking, especially in initial maintenance contracting, is probably unavoidable. The final element of program and budget developments should be the identification of any significant risks that can be foreseen. A fall-back position should be developed in anticipation of significant risks materializing. Examples could include insufficient contractor bidding interest, excessive bid prices, and contractor defaults.

Program Analyses

As earlier noted, agencies planning large amounts of contract maintenance, amounts that will essentially replace management units or major portions of these units, need to consider more systemic impacts. The primary need is to ensure that an effective management structure is in place: a structure that will safeguard the public's interest and provide contractor profit and level-of-service checks and balances. There are many potential conflicts between efficiency and the services that public agencies are expected to provide. A few examples will illustrate the point:

- Regular working hours, hours that do not require overtime or shift premium payments, minimize costs but may not be consistent with the public's need for services, especially during rush hours and storms.
- The most efficient way to repair a road is to close it, again during regular working hours. While that will minimize costs, it will not provide the level of service the public rightly expects.
- Litter pick-up prior to mowing is expensive. It is also needed to ensure that motorists are not unnecessarily exposed to flying debris.
- Productivity is maximized when the travel time between repair sites is minimized. In other words, it is more cost-effective to patch many pot holes in short sections of roads than to patch one or a few.
- Contractors will naturally strive to maximize profits. That may mean concentrating on those activities providing the highest rates of return, which may or may not be the activities contributing the most to highway maintenance levels of service.

Written procedures can and should be prepared that will minimize potential conflicts between profit-making and public services. However, it is unlikely that all circumstances can be anticipated without continuing active agency involvement. More important, agencies of government have public trusteeship responsibilities that cannot be contracted (abdicated). The most cost-effective solutions are not always in the public's best interest, even if all technical factors are considered.

The Federal Highway Administration currently requires states to have a state-agency engineer in responsible charge of all Federal-Aid contract work. The principle is sound. It should be adopted by all agencies contracting maintenance work, whether the work involves single activities or the total

workloads of geographical areas. Responsible charge does not necessarily create full-time assignments. It does require sufficient inspection and overview to ensure that the actions of the contractor are consistent with contractual requirements, while simultaneously fulfilling the agency's trusteeship responsibilities to the traveling public.

Agencies contracting significant amounts of maintenance will need to complete all of the analyses described for activities. In addition they will need to ensure that an adequate maintenance management structure is in place.

Pre-Award

Types of Contractors

If the decision is made to contract for services, the next step is to select the most appropriate contractor. Options include:

- contracting with counties, cities and other governmental agencies;
- taking advantage of prison labor;
- initiating services such as adopt-a-highway programs to take advantage of donated labor;
- utilizing offender programs for litter cleanup;
- contracting with sheltered workshops for the handicapped;
- permitting landowners to mow the rights of way for hay; and
- contracting with highway and specialty contractors.

Contracting with private sector highway and specialty contractors is used for more activities than other types of contractors.

Contracts

Defining the Work

The maintenance work to be performed should be well defined whether it is performed in-house or by contract. It is essential that work be well defined if it is to be contracted. The statement of work prepared in the decision process should be used and expanded as necessary to describe the work. Standard maintenance specifications, where they have been prepared, take the place of the statements of work. There should be no surprises in the contracts for either the contractor or the inspector. The intent should be clear.

The agency should provide the contractors with all relevant data available. Contractors are likely to bid higher if there are gray areas in the plans and specifications.

Contracts should be of such size that contractors find them attractive and profitable. The quantity of work in an area may be too small to interest contractors or for them to amortize equipment purchases. District-wide contracts may be more attractive for some items. Larger projects may exclude small contractors. Agencies need to size the projects to fit potential bidders.

Coordinate the work to be done to avoid conflicts between contractors. For example, litter should be picked up prior to mowing to avoid having the mowers grind up the litter. Combining these two items into one contract can improve coordination.

Tailor the specifications and work definitions to fit potential contractors. For example, Florida needed to fertilize the roadsides. Those in the business normally provide services to farmers. They

were not set up to provide traffic control for these operations. The state furnished the traffic control so the fertilizer contractors did not have to gear up and to ensure that it was handled properly. The responsibilities and liabilities of the agency and the contractor must be specifically defined in the contract documents.

Some very small projects require as much time to prepare the bids as it takes to perform the work. This type of work should be combined with other contracts, be let under simplified bidding procedures, or be performed by in-house forces.

Local agencies should consider using the state maintenance specifications when setting up maintenance contracts because more contractors are used to them. Their use should improve uniformity, bids, and quality, especially for materials.

Specifications

Specifications are used to define the work to be performed and communicate that definition to the contractor and the inspector. Communication can be enhanced if specifications for maintenance contracts are written so they can be understood by the contractors and inspectors who will actually perform the work. Many do not have technical educations.

Standard construction specifications are available in all state agencies and have been used for maintenance contracts by the addition of special provisions and supplemental specifications. This works well for project-type maintenance contracts, those that are similar to normal construction projects. However, the use of construction specifications on maintenance-type contracts is somewhat overwhelming for the contractors who usually bid mowing, litter pickup, rest-area maintenance and the like. Several states have developed, or are developing, standard maintenance specifications for use state-wide. As with construction specifications, special provisions are used to tailor these standard specifications for local conditions.

Where development of maintenance contracts is decentralized to the districts, the use of standard maintenance specifications promotes agency-wide uniformity. All special provisions must be approved in the central office to retain uniformity while providing for legitimate changes in response to local needs.

Work methods from agency maintenance management systems will provide a good starting place for developing specifications. The optimum methods or results should be used no matter who performs the work. For cost comparisons to be truly comparable, specifications and MMS work methods must also be comparable.

All unneeded special provisions and supplemental specifications should be omitted from the contract documents. It is too difficult to sort out those that do not apply. Where changes in specifications or special provisions are required, revised special provisions should be prepared and included in the contract documents. Issuing provisions that change a word or words in the specifications or special provisions is confusing and result in misunderstandings.

Traditionally, specifications have defined the methods, materials and equipment that contractors were expected to use. Currently, specification writers are working to define the results expected so contractors have more leeway to be innovative. These innovations will benefit the agency in the long run. Results-oriented specifications cannot be developed for all activities. Method specifications are still appropriate for many activities. However, insofar as it is practical, the expected results should be specified rather than work methods and equipment. Results-oriented specifications do not eliminate the need for inspection, but they may reduce the level of effort. Activities for which results-oriented specifications should be considered include:

- seal coating,
- planing/milling
- roadway sweeping,
- blading unpaved roads,
- blading unpaved shoulders,
- ditching,
- cleaning culverts,
- cleaning sewers,
- cleaning catch basins,
- replacing drainage structures,
- mowing,
- herbicide treatment,
- brush and tree cutting,
- landscape maintenance,
- litter pickup,
- fertilizer application,
- bridge cleaning
- movable span maintenance,
- sign repair,
- sign cleaning,
- striping,
- pavement message painting,
- guardrail maintenance,
- lighting maintenance,
- delineator maintenance,
- fence maintenance,
- installing raised pavement markers,
- installing driveway pipes,
- weigh station operations,
- trash collection,
- ferry operation,
- hauling sand,
- sign fabrication,
- aggregate production,
- asphalt mix production,
- furnishing P.C. concrete

Contractors should be advised in the contract documents of any special requirements for completing the work: items such as the proper disposal of lead-based paints and other hazardous wastes and the need for permits for herbicide application.

Periodic reviews of specifications and contracting procedures should be held with district and residency personnel and with contractor representatives to discuss problems encountered with specifications and develop revisions for future contracts. These sessions should encourage input for improvements, not just inform them of changes already completed.

Where maintenance contractors are organized, either as a separate group or as a section of a highway contractors' organization, discussion of specifications and contracting procedures with representatives of the organization can improve communication and help resolve problems with the specifications. Since many smaller maintenance contractors are not likely to be members of any contractors' organization, it may also be desirable to select contractor representatives from the different specialties for periodic meetings to discuss specifications and contracting procedures.

Value Engineering

Many agencies include provisions in their construction contract documents which permit contractors to submit value engineering proposals for consideration. Contractors may propose modifications to the plans, specifications or other contract requirements which will reduce the total cost of construction without reducing the design capacity or quality of the finished product. Typically, the contractor and the agency share the savings equally.

Most specifications for maintenance contracts do not include value engineering (VE) provisions that typically are in construction specifications. The time required for evaluation and approval of VE proposals makes their use on most maintenance contracts impractical. Contractors do not think the potential return on small projects is worth the risk of delaying completion of the project.

While value engineering clauses are not appropriate in most maintenance contracts, value engineering is an effective tool for in-house evaluations of maintenance activities.

Contract Time

Contract time is specified in calendar days, working days or completion dates. All three methods are applicable depending on the activity to be contracted. The definition of calendar and working days must be clearly stated in the specifications.

Because most states have a fiscal year beginning July 1 and much of the maintenance work is performed throughout the summer, these maintenance contracts must overlap into more than one fiscal year. Agencies must follow state and local laws, but in some instances, laws need to be changed to improve contracting practices.

Contract time for activities that require a significant investment in equipment should be for two to three years to allow contractors to amortize these costs. This practice should reduce bid prices, and encourage contractors to have good equipment and maintain a trained staff. Longer-term contracts also may encourage the use of value engineering by contractors and average out quantity estimates for maintenance-type items. Activities for which multi-year contracts should be considered include:

- roadway sweeping,
- blading unpaved roads,
- blading unpaved shoulders,
- ditching,
- cleaning culverts,
- cleaning sewers,
- cleaning catch basins,
- mowing,
- herbicide treatment,
- bridge cleaning,
- movable span maintenance,
- sign cleaning,
- striping,
- traffic signal maintenance,
- snow and ice control, and
- trash collection.

A number of agencies let one-year contracts for maintenance-type activities with optional annual renewals for two additional years. Either the agency or the contractor can refuse to renew for any reason. The agency will not renew contracts if the contractor's performance is unsatisfactory. Typically, the renewal provision stipulates that no change in price can be made. The contractor must be willing to undertake the work at the first-year prices. In anticipation of this, the contractor will likely bid a little high the first year if competition isn't too tough. If costs have risen excessively, the contractor can refuse to renew and the contract must be re-advertised.

A variation of this method provides for price changes based on a specified cost index. The index must be selected specifically for the bid item involved to accurately reflect contractor cost increases or decreases. A maximum change is usually specified to control costs.

Contracts with annual renewals encourage better performance, in part because contractors have an incentive to perform well so the contract will be renewed without re-bidding.

A better option is to let three-year contracts with separate bid prices for each year. This allows the contractor to estimate annual cost increases. The low bid is determined from the total cost for the three-year period. This type of contract typically includes a cancellation clause in case of non-appropriation of funds to continue.

Maintenance work, because the contracts are typically small, often cannot be given high priority by contractors. However, where it is possible to have a flexible starting time, contractors can be competitive by using it as fill-in work between larger projects.

To give contractors flexibility in scheduling maintenance contracts, agencies may specify the number of working days and completion dates for contracts and allow the contractor to select the starting date. Contractors are free to schedule the starting date to fit their other work as long as they

complete the work by the specified completion date. Once they start, they must complete the work within the specified working days. The latest start date is determined by deducting the working days from the completion date. Where earlier completion is needed, the starting date is specified.

Methods of handling traffic should be considered in scheduling contract time. For example, resurfacing a rural multi-lane highway in the summer months when traffic is the heaviest might be delayed until September so lane closures would not be so critical. Where traffic must be accommodated during rush hours, the hours that contractors must be off the road should be spelled out in the special provisions. Similarly, where it is necessary to perform the work at night to reduce the impact on traffic, the requirements should be defined in the special provisions.

Response Time

For some activities, timely response by the contractors is essential. Traffic services such as sign replacements and guardrail repairs are examples. Snow plowing is another. The length of the response time depends primarily on the risk to the public resulting from failure to respond. The risk is greater on heavily traveled highways than on low-volume roads, so the location should be considered in establishing response times for each activity.

The specifications should define the response times for those activities where prompt response is critical and the consequences of non-responsiveness are severe. Lack of responsiveness for safety items can be discouraged by the assessment of liquidated damages.

Types of Contracts

Two major types of contracts are used when contracting with the private sector for maintenance. The descriptions vary by agency. For the purposes of these guidelines, they will be referred to as *Project-type* and *Maintenance-type*. Project-type contracts are used for activities involving larger quantities or that are similar to construction projects, such as seal coats, overlays, and bridge repairs. Maintenance contracts cover activities such as mowing rights of way, landscape and rest area maintenance, annual contracts for guardrail repair, litter pickup, janitorial services, preventive maintenance of vehicles and minor pavement repairs. A third type of contract or agreement, usually less formal and often a purchase order, is used for renting equipment on an hourly basis, purchasing minor amounts of materials, and contracting for small emergency repairs.

A listing of the types of contracts generally appropriate for maintenance activities is presented in Table A-1, beginning on the next page. The quantity and location of the work can affect the type of contract. For example, machine patching at a specific site might be let as a project-type contract, while this activity might be let as a maintenance-type contract for small scattered locations or where the contractor is on call. If an agency performs the work itself, a purchase order may be appropriate to purchase the material or rent a laydown machine. Small quantities of most activities can be performed under purchase orders.

Purchasing materials in small quantities generally increases the unit cost and requires more tests and certifications than for larger quantities. The agency can acquire materials for maintenance contracts and furnish them to the contractor. The agency can take advantage of quantity purchase cost savings and eliminate the need for testing on individual contracts. This procedure also reduces the cash required by maintenance contractors, which may be an advantage for small contractors. The inspectors must document the materials issued to the contractors and its use in the work. Agencies may want to limit furnished materials to contracts which require full-time inspection.

Table A-1 -- Types of Contracts by Activity

Roadway Surface Activities	Project Type	Maintenance Type	Purchase Order
Hand Patching		X	
Machine Patching	X	X	
Crack Sealing	X		
PCCP Joint Repair	X	X	
Seal Coating	X		
Planing/Milling	X	X	
Slabjacking	X	X	
Roadway Sweeping		X	
Heater Scarifier/ Thin Overlay	X		
Thin Overlay	X		
Slurry Seal	X		
Slab Repair	X		
Blade Unpaved Roads		X	
Sand Sealing	X		
Concrete Patching	X	X	
Fabric Underliner	X		
Shoulder Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Blade Unpaved Shoulders		X	
Patch Unpaved Shoulders	X	X	
Replenish Unpaved Shoulders	X		
Drainage Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Ditching		X	
Clean Culverts		X	
Clean Sewers		X	
Repair Minor Drainage Structures	X	X	X
Replace Drainage Structures	X		
Clean Catch Basins		X	
Slip-Line Roadway Culverts	X		
Roadside Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Mowing		X	
Herbicide Treatment		X	
Brush & Tree Cutting		X	
Landscape Maintenance		X	
Erosion Control	X		
Major Slide Repair/Removal	X		
Litter Pickup		X	
Fertilizer Application		X	

Table A-1 -- Types of Contracts by Activity (Continued)

Traffic Activities	Project Type	Maintenance Type	Purchase Order
Sign Repair		X	
Sign Cleaning		X	
Striping	X	X	
Pavement Message Painting	X	X	
Guardrail Maintenance	X	X	
Traffic Signal Maintenance		X	
Lighting Maintenance		X	
Delineator Maintenance		X	
Fence Maintenance	X	X	
Attenuator Maintenance		X	
Raised Pavement Markers	X	X	
Sign & Guardrail Upgrades	X		
Bridge Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Bridge Cleaning		X	
Bridge Painting	X		
Minor Bridge Repairs	X		
Major Bridge Repairs	X		
Movable Span Maintenance	X	X	
Riprap Installation	X		
Tunnel Cleaning		X	
Deck Overlay	X		
Winter & Emergency Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Snow & Ice Control		X	X
Emergency Maintenance	X	X	
Road Patrol		X	
Weather Forecasting		X	
Snow Fence Repair/Construction	X	X	
Service Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Install Driveway Pipes	X		
Weigh Station Operations		X	
Rest Area Maintenance		X	
Trash Collection		X	
Bridge Safety Inspections	X	X	
Bridge Operations		X	
Emergency Call Services		X	
Ferry Operation		X	
Hauling Sand	X	X	X
Towing		X	

Table A-1 -- Types of Contracts by Activity (Continued)

Materials Activities	Project Type	Maintenance Type	Purchase Order
Sign Fabrication	X	X	
Aggregate Production	X	X	
Asphalt Mix Production	X	X	
Drainage Materials		X	X
Sanding Rock		X	
P.C. Concrete	X	X	
Equipment Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Equipment Service		X	
Equipment Repair		X	X
Dry Dock & Ferry Repair & Maintenance	X	X	
Improvements Activities	**Project Type**	**Maintenance Type**	**Purchase Order**
Resurfacing	X		
Roadway Improvements	X		
Shoulder Improvements	X		
Drainage Improvements	X		
Roadside Improvements	X		
Traffic Operation Improvements	X		
Structure Improvements	X		
Sign/Striping Improvements	X		

Another method of ensuring that repair parts are available for activities such as attenuator and guardrail repair is the inclusion of a bid item for acquiring and storing an inventory. Actual repairs are covered by a second bid item. Any stock remaining at the end of the contract becomes the property of the agency. Use of materials from the inventory must be documented to ensure that all material paid for is used on agency work and the remaining inventory is available for future work.

Contracting Methods

Nearly all contracts for maintenance can and should be awarded to the low bidder -- the method traditionally used for awarding construction contracts. Contracts are advertised, bidders submit sealed bids, and the lowest responsible bidder is awarded the contract.

A variation of this method is called two-step sealed bidding. In this method, contractors submit only their qualifications for the advertised work. On the basis of these qualifications, the agency selects a short list of contractors -- usually three to seven. Those on the short list are invited to submit competitive sealed bids for the work. The lowest bidder is awarded the contract as described above. This method is appropriate for critical activities that require special expertise or experience.

Where it is difficult or impossible to define the work exactly, competitive proposals may be warranted. Contractors are requested to submit proposals that define their approach to completing the work, a schedule, their qualifications, proposed staffing, and a cost estimate. Proposals are evaluated against predetermined criteria to select the most advantageous proposal. Requests for proposals may be used by an agency when it is first contracting for a maintenance item and does not have the experience to define the specifications. As experience is gained and specifications and contract documents are improved, the item can be shifted to the low-bid method.

Special expertise is required to perform some maintenance activities. Operation, maintenance and repair of movable bridges is one example. Contractor selection under these circumstances should include evaluation of qualifications as well as costs. Proposals should be requested for this type of work rather than awarding to the lowest bidder. Evaluation criteria should be determined and weighted in accordance with their importance to the success of the contract. Proposals are then rated by assigning points to each criterion. The contractor's proposal with the best overall score is selected for contract award.

Payments

Basis for Payment

Units of measure must be selected individually for each bid item. Select units that encourage productivity. Avoid hourly rates whenever possible except for equipment rental. The types of units used for each activity are summarized in Appendix C, Pages C-41 through C-46.

Units from maintenance management systems may not be the best units for contracting. In some instances, the amount of measurements and documentation is onerous to get accurate pay quantities. Where bid item units are not the same as for the agency's maintenance management system (MMS), accomplishments must be converted if MMS is designed to track contract work as well as in-house work. This conversion will make cost comparisons easier. Another alternative is changing the MMS units to match the bid items.

Insofar as possible, the units of measure for each activity should be standard across the state to facilitate comparison of costs and quantities and to encourage contractors to bid agency-wide.

Graduated pay rates provide for reduced payment for material that does not meet specifications but which is not bad enough to require removal, or when services are below standards but not unacceptable. Under these provisions, materials or services that meet specifications are paid for at the bid price. The amount paid for materials or services which do not meet the specifications is a percentage of the bid price based on the amount of deviation from the desired quality. The specifications define how much deviation is permitted, with adjustments in payment and at what point the material must be removed and replaced or services terminated.

Periodic Progress Payments

Many maintenance contractors are small businesses. Cash flow can often be a problem. Agencies should pay promptly and at least monthly. Some agencies pay biweekly either as normal practice or upon request. Items that are paid by the cycle, such as mowing or litter pickup, are exceptions to monthly or biweekly payments. It is logical to pay for this type of item at the completion of each cycle, which usually takes less than a month to complete.

Where payment of interest for late payments is in the regulations, interest should be paid automatically. Contractors should not have to request payment for items included in the contracts. To accomplish this, the responsibilities for processing periodic estimates and the starting date for interest calculations must be well defined.

The use of electronic transfer of funds for progress payments speeds up payment to the contractors and reduces paperwork.

Inspectors and contractors should confer frequently on quantities completed for payment. Hourly items such as truck rental should be agreed on daily.

Material and Supply Price Adjustments

Occasionally, the quantities of some materials and supplies are temporarily curtailed and price uncertainties make estimating costs difficult for contractors. Asphalt, fuel and steel are recent examples. The risk to the contractors is greater on projects with contract time in excess of one season. To share the contractors' risks under these circumstances and avoid excessive bids, agencies sometimes include price adjustment clauses in the contracts. A base price is established at the time the contract is awarded, and an appropriate cost index for the item in question is specified. Price adjustments, either up or down, are based on the monthly value of the cost index at the time the material is purchased.

Most project-type maintenance contracts are completed in one season, so price adjustments for materials shortages are needed infrequently. Computing the adjustments for periodic and final payments is time consuming, so price adjustments should be avoided unless there is a critical shortage. When price adjustments are needed, the agency should use the same procedures for maintenance contracts as for construction contracts.

Sureties

Agencies use bid, performance, and payment bonds, retainage and insurance as means to mitigate the risks associated with contracting. Warranties are used less frequently.

Bid Bonds

The purpose of a bid bond or proposal guaranty is to cover the agency's costs, such as the cost of re-advertising the project, in the event that the low bidder does not accept the contract. A cashier's check, a certified check or an irrevocable letter of credit are acceptable substitutes for a bidder's bond.

Performance Bonds

A performance bond provides a guarantee that the contractor will complete the work in accordance with the terms of the contract. Usually state laws require performance bonds for contracts above a specified minimum dollar value. Typically, this value is about $25,000, although it is as high as $100,000 in some states. Bonds have traditionally been set at 100 percent of the contract amount.

The decision to require a performance bond and the amount of the bond should be commensurate with the risk to the agency.

The contract time for most project-type contracts is relatively short, and maintenance-type contracts are often paid by the completed cycle, so the risk of having paid contractors a significant portion of the contract amount without a similar amount of work being completed is quite low. Eliminating the requirement for performance bonds on some small contracts for maintenance services has the potential of encouraging more contractors to bid, with increased competition likely to reduce costs.

Bonding companies rate contractors to determine a bonding capacity. Items such as company assets, organization, company experience, personal indemnifications by company officers, personal relationships between the contractor and the bonding agent, level of work on hand, and the characteristics of the proposed work are considered in developing the ratings.

Premiums for bonds range from 1 percent to 3.5 percent of the bond amount, depending on the bonding company's assessment of the risk. To reduce the cost of bonds, some agencies specify a bond of less than 100 percent of the contract amount on some contracts. For example, the performance bond for mowing contracts may be set at the estimated cost of mowing one cycle

although the contract may require a total of six cycles. It was felt that this adequately protected the agency because a new contractor could be found after one cycle.

Irrevocable letters of credit, cashiers' checks and cash performance bonds are permitted by some agencies. Because of the cost of bonds and the difficulty some contractors face in obtaining them, more agencies are accepting these alternates to traditional bonds. While these methods have the disadvantage of tying up contractors' assets, they give contractors more options in providing the desired protection to the agency.

Agencies need to be realistic in estimating quantities for maintenance contracts. Bonds are based on contract quantities. If quantities underrun, contractors cannot get a refund from the bonding companies although increases in contract amounts require additional premiums. Some provision of paying for fixed overhead items when there are significant underruns should be considered.

Performance bonds are usually not required for equipment rental contracts.

Payment Bonds

Payment bonds are used to protect the agency from the contractor's creditors. Fewer agencies require payment bonds than performance bonds. Payment bonds are used to protect claimants supplying labor and materials from non-payment by the contractor. One of the purposes of retainage is provide funds for meeting unpaid bills. The use of payment bonds eliminates the need for the agency to withhold funds to cover these claims.

Retainage

Retainage provides:

- leverage to ensure that the contractor completes the contract;
- a reserve to recover inadvertent overpayments;
- a reserve to recover potential liquidated damages; and
- a reserve for unsatisfied claims against the contractor.

The amount of retainage ranges from none to ten percent of the contractor's earnings.

Where payment bonds are required, the agencies do not need retainage to provide for claims against the contractor.

Retainage is usually not withheld on purchasing agreements.

Where retainage is held, provisions for putting the funds in interest-earning escrow accounts which would benefit the contractors should be considered.

Insurance Requirements

Contractors are usually required to have insurance coverage to protect the agency from tort liability for the contractor's actions or inactions. Because of the current tendency of claimants to sue, adequate insurance coverage is recommended; however, the amount of coverage should be related to the potential risk to avoid excessive costs. It must be recognized that the agency still has some responsibility despite insurance requirements.

Insurance requirements for project-type contracts should be the same as for similar construction projects. The amount of insurance for maintenance-type contracts should be based on an evaluation of the risks -- the chances of people slipping on wet floors in rest areas, for example. Higher-level maintenance reduces the risks. Normal vehicle insurance should be adequate for equipment rentals. Of course, state and local laws must be observed in establishing insurance limits.

All agencies require contractors to provide workman's compensation insurance coverage for their employees.

Warranties

Contractors may be required to provide warranties for materials and workmanship for a specified period of time, usually one to three years. Local agencies that have no engineering staff sometimes use warranties to ensure that contractors provide quality products. The savings in inspection costs may be offset by higher bid prices.

Warranties are not used to any great extent in maintenance contracts. The primary use of warranties is for manufactured items such as catch basins, traffic controllers, raised pavement markers, and sign materials -- items that are normally warranted by the industry. Service warranties include such items as guaranteeing growth of landscape items, that a specified percentage of raised pavement markers adhere, and that bridge paint show no signs of deterioration -- all for a specified period of time. Typically, contractors are required to care for landscape items for the warranty period. Warranty requirements and the method of measuring fulfillment of the requirements must be defined in the specifications to avoid later disputes.

Maintenance of highways is an agency responsibility and is not eligible for federal participation. Federal regulations limit payment for items with warranties because they are considered maintenance items. Items commonly warranted by the industry are exceptions to the limitation on participation. However, the definition of maintenance and construction as related to the federal regulations has been revised to include projects funded through the 3R federal-aid program. Agencies where the matching funds for 3R projects are from maintenance funds must be aware of this limitation on the use of warranties.

Bidding and Award

Prequalification of Contractors

Contractor prequalifications are used to determine the capacity and capability of potential bidders to perform contract work prior to actual bidding. Prequalification forms usually request information on the contractor's financial capacity, staff qualifications, available equipment, experience of the firm, and types of work performed. Typically, contractors will be rated as to the total dollar limit of uncompleted contract work they can have under way at any one time and the type of work they will be allowed to bid. The purpose of prequalification is to prevent contractors from taking more work than they can complete within the time limits or work for which they are not qualified.

Past performance with respect to timely completions and quality of work should be considered in determining the bidding capacity of contractors and the types of work they will be allowed to bid. A major problem in accomplishing this is in the development of meaningful criteria and obtaining objective evaluations that meet legal requirements. See the discussion under Contractor Performance on Page A-43.

Typically, contractors must re-submit pre-qualifications annually or every two years. An optional interim submission is permitted where contractors want to update their qualifications.

Prequalification application forms should also be designed to collect other information about the firm or its officers and key employees, such as:

- failure to complete any work in the past, say, five years;
- suspension for bid rigging;
- having been debarred by any agency;

- bankruptcies;
- having a financial interest in any other company which contracts with the agency; and
- having been the subject of criminal actions, even if pending.

Having this information will alert the agency to situations where firms have been reorganized under new names to disguise past indiscretions.

Some agencies require maintenance contractors to prequalify prior to bidding; others allow any contractor who obtains a bond to bid. Still others require prequalification for projects above a preset amount. The preset amount varies considerably from agency to agency. Each agency must set this amount considering local conditions and the type of work.

Prequalification requirements can be less stringent for maintenance contractors than for construction contractors, at least in part because typical projects are smaller. A one-page prequalification application form for maintenance-type projects should provide ample information -- such as:

- the firm's net worth;
- identification of two similar projects completed within the last two years;
- whether the projects were completed on time;
- whether the firm owes money on any project completed within the last year; and
- whether the firm has been convicted of any criminal act involving contracts.

The advantages of prequalification will depend somewhat on the prequalification criteria.

- Bonding companies may be more willing to provide performance bonds to small contractors if the agency has a prequalification procedure. Prequalification usually focuses on the contractor's financial capability, with some assessment of the firm's technical capability.
- Prequalification procedures usually result in setting a maximum contracting capability for each contractor. Contractors will be less likely to take more work than they can handle because of this limitation.

One disadvantage is that requiring prequalification may reduce competition. Small contractors may feel that the prequalification process is too burdensome and not bid agency work.

It is recommended that agencies adopt a policy of requiring prequalification for all projects above a preset limit and for selected specialty contracts of any size where technical or financial capability is critical. Bridge painting might fall in the latter category. Pre-qualification should not be required for maintenance-type contracts below the pre-set limit or for equipment rental agreements.

Pre-Bid Conferences

Many agencies conduct pre-bid conferences to inform prospective bidders of the requirements for maintenance contracts. A few agencies hold pre-bid conferences for all contracts, but most hold them when there is a need to explain the work to be performed, such as:

- emergency work;
- work not previously contracted;
- specialty work;
- unique or unusual work;
- complex projects; or
- major changes in special provisions.

Procurement procedures should include provisions for mandatory attendance at pre-bid conferences for selected projects. Attendance should be mandatory only when bidders would likely not understand the work requirements well enough to prepare responsive bids without attending the pre-bid conference. Mandatory attendance should be considered for projects which are very complex, where new methods or materials are specified, or when there is doubt that contractors experienced in the work are available. The advertisements must specify if attendance at the pre-bid conference is mandatory -- that only those contractors represented at the pre-bid conference can bid.

It is essential that the person conducting the pre-bid conference be thoroughly familiar with the contract provisions and the work site.

Videotapes have been used successfully at pre-bid conferences to describe the work to be performed in proposed contracts.

In some instances, pre-bid conferences have been used to explore the feasibility of contracting activities not previously contracted. Through these meetings, the agencies were able to determine contractor interest, obtain suggestions for work methods and specification requirements, and identify potential problems.

Advertising

Potential bidders must be made aware of upcoming projects. These methods of advertising maintenance contracts are typically used:

- newspaper advertisements;
- direct mailings;
- telephone solicitations;
- trade association publications;
- trade magazine advertisements; and
- advertisements in state or agency bulletins.

Newspaper advertisements frequently only fulfill the legal requirement for advertising and may not be read by potential bidders. Other methods are needed to inform contractors of upcoming work.

Most maintenance-type contracts are too small or too specialized to provide opportunities for subcontracting. Consequently, few agencies include goals for the use of disadvantaged business enterprise (DBE) firms as subcontractors in these contracts. DBE goals may be assigned for project-type maintenance contracts, depending on the characteristics of each project. However, agencies should encourage DBE firms to bid as prime contractors on maintenance contracts by advertising contracts in minority newspapers and with minority associations. Because many maintenance contracts are fairly small, they offer all small contracting firms, including minority and women business enterprises, opportunities to get started in highway contracting.

Where subcontracting is feasible, approval of subcontractors by the agency should be required.

The following innovative techniques for advising contractors of potential contracts should be considered to supplement normal advertising.

- The establishment of an 800 number where contractors can call toll-free to inquire about upcoming projects.
- The installation of an electronic bulletin board which lists information about advertised projects. Contractors with computers equipped with modems can access the bulletin board to get specific project information on the scope of work, bid items and quantities. They can then

order bid documents and plans for the projects that are of interest. Contractors save the cost of ordering unneeded plans, and the agency can reduce its total printing costs significantly.

- The establishment and maintenance of a list of contractors in each area and district by specialty. A contractor need only call in to get on the list.
- Send representatives to job fairs to explain maintenance contracting opportunities to potential contractors.
- Conduct workshops and training sessions for small businesses, including DBE firms, covering such subjects as the contracting procedures, how to propose, how to get bonded, and insurance requirements.

Letting all projects of one type, such as mowing or overlays, for the year in one or two lettings may reduce competition. Contractors may not have time to attend the pre-bid conferences, inspect all of the sites and prepare the bids during the advertising period. Staggering the lettings can increase competition.

Timing of lettings can affect the bid prices. Some states have found that prices at lettings early in the year are usually lower than those at later lettings. It is surmised that contractors without a backlog of work want to ensure that they have work for the coming season. As they obtain work, they are less competitive.

Bid Submissions

Because of the widespread use of computers by contractors, their use should be encouraged in preparing bids. This can be accomplished by:

- designing bid forms to be compatible with common spreadsheet software and furnish diskettes to contractors so all bids will be in the desired format; or
- accepting bids on diskettes with a printed hard copy.

Regular hard-copy forms must be retained for use by small contractors without access to computers, of course.

With the popularity of facsimile machines, agencies should develop a policy on bid submissions by fax. Some of the problems with fax submissions are:

- provisions must be made to maintain security of the submissions when sealed bids are requested;
- the agency's fax machine could run out of paper at a critical time when it was receiving a bid;
- only copies of signatures are provided; and
- it is possible for an unscrupulous contractor to tie up the agency's machine just before bids are due by sending a long document to prevent competitors from submitting their bids.

Fax courier services are available in many cities. Contractors can send their bids to these firms, which then package them and take them to the agency. This method resolves all of the problems except the signature.

Contract Award

Contracts may be advertised and awarded in the districts or in the central office. Usually small routine projects are awarded in the districts and larger, more complex projects in the central office.

Agencies should prepare engineer's estimates for all contracts for use in budgeting and evaluating bids. Low bids that vary substantially from the estimate should be carefully reviewed before

awarding or rejecting the bid. When low bids are significantly higher than the estimate, say more than 10 percent, award of the contract should require some justification -- an error in the engineer's estimate, urgent need for the work to be completed, or the like. Bids significantly lower than the estimate, especially if much lower than other bids, may indicate an error in the judgment or understanding of the work by the low bidder. Acceptance of the bid may cause the contractor to default or require an excessive amount of inspection to achieve desired levels of quality.

Agencies must retain the right to reject all bids for cause. The most common reasons for rejecting all bids are (1) where the low bid is substantially higher than the engineer's estimate and (2) when there are an insufficient number of bids. The need to reject all bids should be unusual if estimates are realistic. Because contractors have no way of knowing which, if any, contracts they will win in a letting, they must submit bids on a number of projects -- sometimes on more work than they can handle. Agencies have addressed this problem in different ways:

- Mowing bids are opened at specified intervals over a two-day period in each district. The bids for two contracts are opened every one and one-half hours. Bidders can submit bids just prior to each opening. When a bidder reaches the firm's capacity, no further bids are submitted.
- Contractors are permitted to put a dollar limit on the amount of work they will accept in a letting to avoid their becoming overextended. All bids are opened. If contractors are low on more work than their dollar limit, the agency determines which contracts to award to them and which will go to the second bidder. The agency takes the best bid for the agency -- that is, they compare the next higher bid on each project and take the combination of bids which will result in the lowest overall cost to the agency.
- Contractors are permitted to submit regular bids on the projects that they prefer, to reach their bidding capacity, and label all other bids as conditional bids. If they reach their capacity by being low on regular bids, the conditional bids are not considered even if they are the low bid.
- Some types of work, such as surface treatment, are let in two to four schedules per district. Contractors must bid each section, but they are permitted to submit an alternate bid for a predetermined group of sections. A sample advertisement showing the alternates is presented in Figure A-3. This sample proposal requests bids for asphalt surface treatment for five road sections. Contractors may bid for any or all of the sections. In addition, contractors may submit alternate (or combined) bids for the first two sections or the last three sections. The state analyzes bids to accept the options which are the "best buy" for the state. The intent is to encourage competition between large and small contractors.

Several agencies have set-aside programs to purchase services and products from handicapped workers. Such services include janitorial services, litter pickup and rest area/comfort station maintenance. Prices are negotiated at competitive rates.

Bid Analysis

Most states use BAMS (Bid Analysis and Management System, an AASHTOWARE product of the American Association of State Highway and Transportation Officials) to check bids on construction projects for bid-rigging. BAMS is also used to check larger maintenance contracts in many states. This software provides a historical data base specifically designed to provide decision support in the areas of bid monitoring and evaluation, vendor (contractor) analysis, item price estimation, and the planning and budgeting process.

Contractors may submit bids that are considered unbalanced -- high bids for items they expect to overrun and low bids where an underrun is expected. To discourage unbalancing of bids, agencies should make the most accurate quantity estimate possible.

Figure A-3 -- Alternate Bid Advertisement -- Virginia

JOB DESIGNATION 272-90A PROJECT ASPHALT SURFACE TREATMENT

STAUNTON DISTRICT

PROPOSAL TO THE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SUBMITTED 10:00 AM,EST,WEDNESDAY, DECEMBER 12, 1990

I/WE DECLARE THAT NO OTHER PERSON, FIRM OR CORPORATION IS INTERESTED IN THIS PROPOSAL; THAT I/WE HAVE CAREFULLY EXAMINED THE PLANS, CURRENT ROAD AND BRIDGE SPECIFICATIONS, FORM OF CONTRACT AND ALL OTHER DOCUMENTS PERTAINING THERETO AND THOROUGHLY UNDERSTAND THE CONTENTS THEREOF; THAT I/WE UNDERSTAND THAT THE PLANS AND CURRENT ROAD AND BRIDGE SPECIFICATIONS, AS DEFINED IN THE CURRENT ROAD AND BRIDGE SPECIFICATIONS, ARE A PART OF THIS PROPOSAL; THAT ALL OF THE QUANTITIES SHOWN HEREWITH ARE A PART OF THIS PROPOSAL; THAT ALL THE QUANTITIES SHOWN HEREWITH ARE APPROXIMATE ONLY; THAT I/WE HAVE EXAMINED THE LOCATION OF THE PROPOSED WORK AND SOURCE OF SUPPLY OF MATERIALS; AND THAT I/WE AGREE TO BIND MYSELF/OURSELVES UPON AWARD OF THE STATE TRANSPORTATION BOARD UNDER THIS PROPOSAL TO A CONTRACT WITH NECESSARY SURETY BOND, TO START WORK ON THE DATE SPECIFIED IN THE NOTICE TO PROCEED, AND TO COMPLETE ALL WORK IN ACCORDANCE WITH THE PLANS AND CURRENT ROAD AND BRIDGE SPECIFICATIONS WITHIN THE TIME LIMIT SET FORTH IN THE CONTRACT WHICH IS:

I/WE ELECT TO UTILIZE THE ESCROW ACCOUNT PROCEDURE DESCRIBED IN THE PROVISIONS OF THIS PROPOSAL IF DETERMINED TO BE THE SUCCESSFUL LOW BIDDER(S) YES (WRITE "YES" OR "NO").

SHEET	CONTRACT ITEM	BID TOTAL
1	C-81-91	$_____
2	C-82-91	$_____
3	ALT.BID #1(C-81-91 & C-82-91)	$_____
4	C-83-91	$_____
5	C-84-91	$_____
6	C-85-91	$_____
7	ALT.BID #2(C-83-91, C-84-91 & C-85-91)	$_____

ATTACHED IS CHECK OR BOND CONFORMING TO THE REQUIREMENTS OF THE CURRENT ROAD AND BRIDGE SPECIFICATIONS, IT BEING UNDERSTOOD THAT SUCH CHECK OR BOND IS TO BE FORFEITED AS LIQUIDATED DAMAGES IF, UPON ACCEPTANCE OF THIS PROPOSAL, I/WE FAIL TO EXECUTE THE CONTRACT AND FURNISH BOND AS PROVIDED IN THE CURRENT ROAD AND BRIDGE SPECIFICATIONS.

_____	BY:	_____	_____
(NAMES OF INDIVIDUAL(S), FIRM(S) OR CORPORATION AND ADDRESS)		SIGNATURE	(TITLE)
_____	BY:	_____	_____
(NAMES OF INDIVIDUAL(S), FIRM(S) OR CORPORATION AND ADDRESS)		SIGNATURE	(TITLE)
_____	BY:	_____	_____
(NAMES OF INDIVIDUAL(S), FIRM(S) OR CORPORATION AND ADDRESS)		SIGNATURE	(TITLE)
_____	BY:	_____	_____
(NAMES OF INDIVIDUALS(S), FIRM(S) CORPORATION AND ADDRESS)		SIGNATURE	(TITLE)

Most agencies have clauses that permit the rejection of the low bid where there are excessive unbalanced bids.

Contract Administration

Pre-Work Conferences

Pre-work conferences are held to discuss the specifications and terms of the contract, unusual conditions, the contractor's plan and schedule of operation, the type and adequacy of equipment, maintenance of traffic, safety requirements, utility conflicts (if any), and any other items that will result in better understanding between the agency and the contractor.

Pre-work conferences should always be held for contracts with complex work plans or schedules, where traffic control is likely to pose a problem, for the initial contracts of activities not previously contracted, and for first-time efforts of new contractors. It is desirable to hold pre-work conferences for all projects. Getting projects off to a good start can prevent misunderstandings and problems later in the contract.

A check list of items to be discussed at the pre-work conference should be used to ensure that nothing is overlooked. Items that should be on the checklist include:

- the location and limits of the contract;
- the scope of work;
- contract time and the definition of working or calendar days -- whichever is appropriate;
- critical work schedule dates;
- the contractor's plan for meeting the production levels needed to complete the work within the contract time, including equipment to be assigned;
- the contractor's planned methods of operation;
- traffic control and maintenance of traffic;
- the need for any local, state or environmental clearances or permits, and the need to obtain them prior to commencing work;
- utilities;
- job safety;
- payment forms and procedures;
- arrangements for any agency-furnished materials;
- materials suppliers and certifications; and
- any subcontracts proposed.

Videotapes and other training material can be effective in clarifying the work to be performed, particularly where new materials or work methods are required by the specifications. Great care must be taken in preparing this material if it is to be effective. A videotape that has safety violations in the background sends the wrong message. All procedures must be correct.

Contracts where specific work locations cannot be predetermined require procedures for selecting the sites when the work is needed and authorizing the contractor to proceed. Annual contracts for pothole patching or guardrail repair are two examples. Agencies normally issue purchase orders or

use other methods of notifying the contractor of needed work. Contractors are expected to respond within the time limit specified in the contract. The procedures for selecting work sites and notifying the contractor should be discussed at the pre-work conference.

Quality Control

Inspection

The purpose of inspection is to ensure that the contractor complies with contract provisions in performing the work.

The level of inspection should be tempered with the amount of risk. The risk the agency assumes for poor workmanship or materials, and for safety of employees or the public, must be balanced against the cost of inspection.

Full-time inspection is needed for items that cannot be checked after completion and where traffic control is of special concern. Items in this category include such activities as asphalt overlays, culvert replacements, concrete pavement repairs, and bridge repairs.

Part-time or random spot inspection can be effective for lower-risk items -- mowing, rest area maintenance, litter pickup, and the like. Inspectors must have an assigned vehicle or other provisions for transportation. They can inspect several operations if they are mobile; only one if they are not.

Project-type maintenance contracts are usually administered by construction project engineers and technicians. while maintenance-type contracts are administered by maintenance supervisors and inspectors. Essentially all maintenance contract administration is assigned to the districts and residencies.

There is a need to monitor both in-house and contract maintenance to ensure work quality and productivity. Traffic control -- signing and flagging -- is especially critical.

Only the assigned inspector should deal with the contractor. Having to deal with two or three different inspectors or levels of management cause confusion with the contractors in administering contracts. The inspector must deal only with the contractor's supervisor. Directing individual contractor employees puts the inspector in the role of foreman, which should not be permitted.

An appeal process is needed to resolve any disagreements between contractors and inspectors. Typically, the process requires appealing through the agency chain of command.

Documentation

All on-site inspections should be documented. However, the documentation can be as simple as an entry in a diary for small contracts. Properly prepared reports provide a permanent record of:

- the details of work performed;
- contractor and subcontractor crew sizes and hours worked;
- weather and working conditions;
- materials delivered;
- equipment on the job;
- pay quantities completed and accepted;
- special instructions given; and
- unusual occurrences.

Good reports will ensure proof of and support for the decisions and actions taken. Care must be taken to record information accurately on a daily basis. Documentation of inspections is accomplished through the use of inspectors' daily reports (IDRs), diaries, and special forms.

Standard IDRs normally used by construction inspectors are generally also appropriate for project-type maintenance contracts. Contract diaries are usually bound books, which ensures that records cannot be added or deleted. A sample job diary from Texas' Contract Management Training Course is shown in Figure A-4. Samples of completed job diaries are presented in Figures A-5 and A-6.

Many agencies have developed a number of special forms for use when inspecting specific operations. These forms have the advantage of addressing the specific inspection requirements for the activity being inspected and encouraging uniformity of inspection and reporting. The disadvantage is the need for so many different forms. The sample inspection report for rest areas in Figure A-7 is used by Florida inspectors.

Training for Inspectors

Inspectors for maintenance contracts need to be well trained both in contract administration and for the assigned type of work. This area has been neglected by most agencies.

Formal training programs should be developed and conducted to train inspectors in contract administration and inspection as well as for the specific maintenance work they will be inspecting. If formal training cannot be provided, the agency should at least develop written material and self-study courses for inspectors. Experienced construction inspectors are capable contract administrators but may need training in specific maintenance work activities or special requirements in maintenance contracts.

A training program for administration of maintenance contracts should include items such as:

- What is a contract?
- The purpose of each part of the contract documents.
- How to conduct pre-work conferences.
- Documentation requirements and importance.
- Traffic control requirements.
- The authority of the inspector.
- Relationships with the contractor.
- Specifications.
- How to deal with the public.
- Inspection requirements.
- The difference between methods and results type specifications.
- The importance of being fair, reasonable and consistent.
- Acceptance of work.
- Payment for work.

In addition to training in contract administration, inspectors need to be trained in the technical aspects of the work they will be inspecting, how to identify needed maintenance, and the need for coordination with in-house maintenance.

Figure A-4 -- Sample Inspector's Diary (Texas)

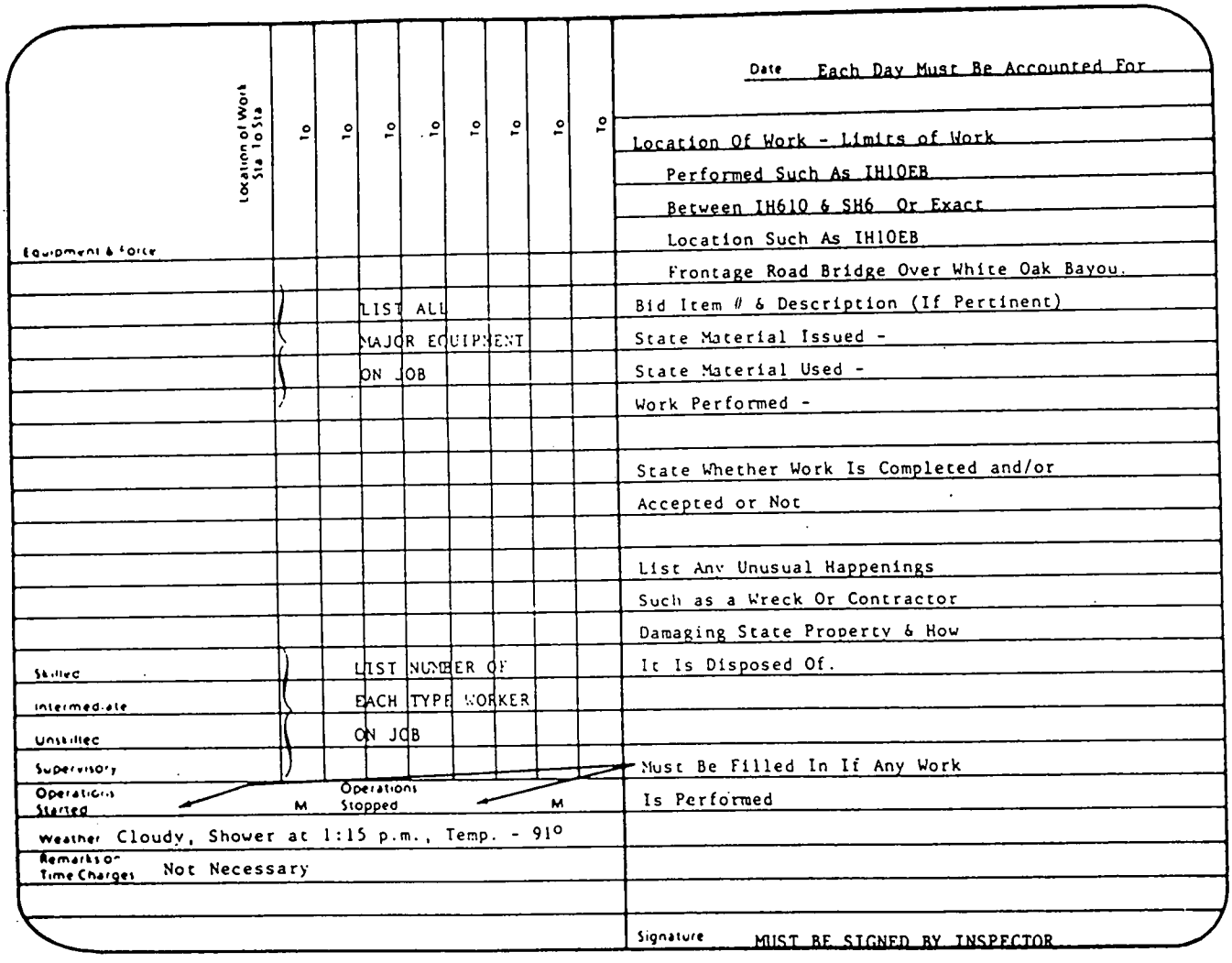
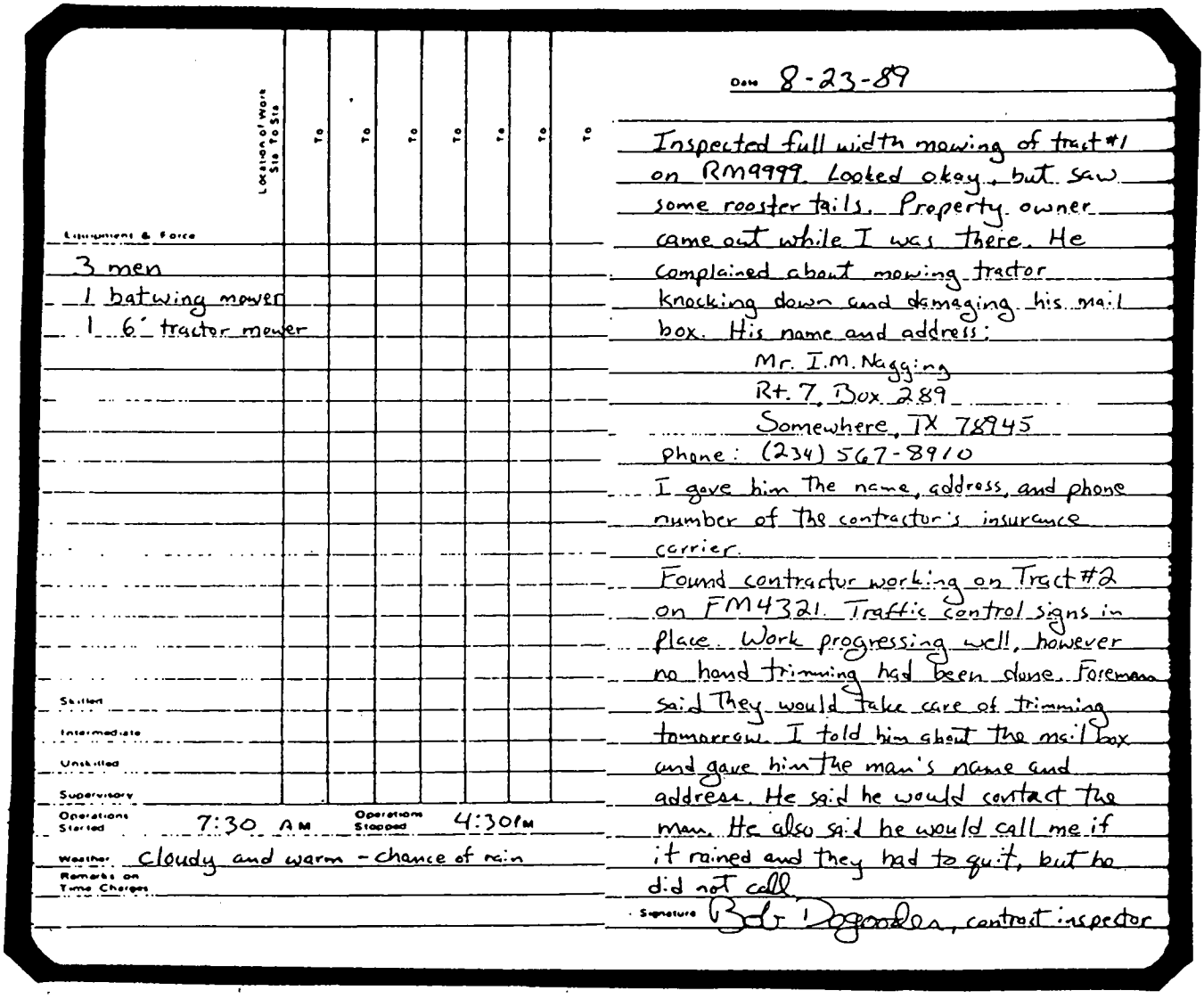


Figure A-5 -- Sample Mowing Job Diary (Texas)



Location of Work Site To Site

To | To | To | To | To | To | To

Equipment & Force

3 men
1 batwing mower
1 6' tractor mower

Skilled
Intermediate
Unskilled
Supervisory

Operations Started 7:30 AM Operations Stopped 4:30 PM

Weather: cloudy and warm - chance of rain

Remarks on Time Charges:

Date 8-23-89

Inspected full width mowing of tract #1 on RM9999. Looked okay, but saw some rooster tails. Property owner came out while I was there. He complained about mowing tractor knocking down and damaging his mail box. His name and address:

Mr. I.M. Nagging
Rt. 7, Box 289
Somewhere, TX 78945
phone: (234) 567-8910

I gave him the name, address, and phone number of the contractor's insurance carrier.

Found contractor working on Tract #2 on FM4321. Traffic control signs in place. Work progressing well, however no hand trimming had been done. Foreman said they would take care of trimming tomorrow. I told him about the mail box and gave him the man's name and address. He said he would contact the man. He also said he would call me if it rained and they had to quit, but he did not call.

Signature Bob Dogooder, contract inspector

Figure A-6 -- Sample Mowing Job Diary (Texas)

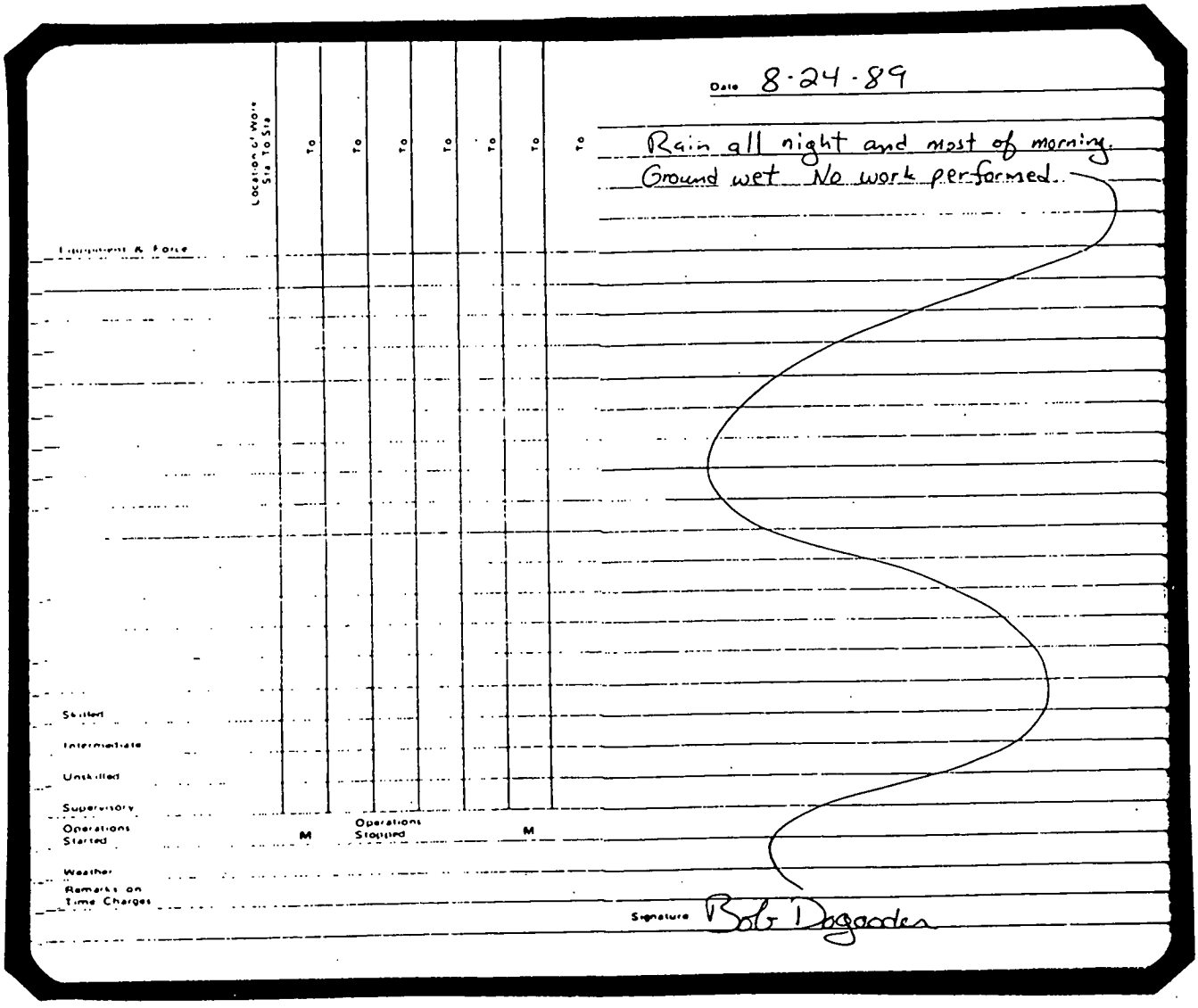


Figure A-7 -- Sample Rest Area Inspection Form (Florida)

FLORIDA DEPARTMENT OF TRANSPORTATION
INSPECTION SHEET FOR INTERSTATE REST AREAS

AREA INSPECTED _____

DATE INSPECTED _____ TIME INSPECTED _____

ALL AREAS LISTED BELOW SHALL BE INSPECTED FOR CLEANLINESS, FUNCTION, AND APPEARANCE. CHECK APPROPRIATE CORRECTIVE ACTION BOX AND EXPLAIN UNDER REMARKS, IF NECESSARY.

	MEN'S					WOMEN'S				
	O. K.	Clean	Repair	Replace	Paint	O. K.	Clean	Repair	Replace	Paint
RESTROOMS										
A. Soap Dispenser										
B. Toilet Paper Rollers										
C. Floors										
D. Walls										
E. Toilet Partitions										
F. Doors										
G. Toilets										
H. Urinals										
I. Washbowls										
J. Faucets										
K. Lighting										
L. Trash Containers										
M. Mirrors										
N. Hand Dryers										
O. Odor Control										
P. Exhaust Fans										
Q. Napkin Disposals										
FOYER AREA (OUTSIDE THE REST ROOMS)										
A. Floors										
B. Doors										
C. Water Fountain										
D. Walls										
E. Ceilings										
F. Bulletin Boards										
G. Walkways										
H. Lighting										
STORAGE ROOM										
A. Tools and Equipment										
B. Other Supplies										
C. Air Conditioning Filters										
D. AC/Heat Temp. Setting										
E. Plumbing										
F. Lighting										
GROUNDS AND PARKING LOT										
A. Planter Areas, Shrubs, etc.										
B. Grounds										
C. Parking and Driveways										
D. Garbage Cans										
E. Grass Height, etc.										
F. Walkways										
G. Evidence of Plant Watering										
H. Shelters										
I. Signs										
J. Curb and Gutter										
K. Outside Faucets										
L. Picnic Tables and Benches										
M. Grills										
SEWAGE TREATMENT PLANT/LIFT STATION										
A. Logs										
B. Function										
C. Cleanliness										
D. Equipment										

OTHER COMMENTS

_____

_____

_____

ATTENDANT

A. Name _____
1. Uniform _____ Belt ____ Cap ____ Shirt ____ Shoes ____ Trousers ____
2. General Appearance _____

B. Name _____
1. Uniform _____ Belt ____ Cap ____ Shirt ____ Shoes ____ Trousers ____
2. General Appearance _____

C. Name _____
1. Uniform _____ Belt ____ Cap ____ Shirt ____ Shoes ____ Trousers ____
2. General Appearance _____

ATTENDANT ON DUTY _____

DEPARTMENT INSPECTOR _____

CONTRACTOR INSPECTOR _____

Where it is practical, contractors should be allowed to participate in the training courses, at their expense. Proper training of inspectors and contractor personnel reduces the risks involved with contracting.

Quality Assurance

Quality assurance for maintenance contracts involves spot checking of the quality of work actually achieved in relation to that specified. District maintenance personnel can conduct quality assurance inspections on contracts in conjunction with similar inspections of work performed by agency crews.

Some quality assurance procedures to consider are:

- Conducting periodic inspections, such as twice each year, of selected work items throughout the agency whether maintained by agency forces or by contract by a central-office maintenance employee. The objective of the inspections is to rate the current condition of the facility. By having one person conduct all of the ratings, uniformity of inspections is assured. Sample forms for such inspections of rest areas are shown in Figure A-8.
- Inspection of all bridge painting contracts about a year after completion by central-office personnel to check the workmanship and paint thickness. Poor performance is identified, especially if there appears to be a trend for certain contractors. The purpose of the review inspections is to evaluate procedures, materials and specifications.
- Alternate rest area inspections between inspectors to ensure that ratings are fair and that inspectors do not become complacent.
- Provide cards at rest areas to encourage motorists to comment on the conditions found.
- Conduct inspections-in-depth on selected maintenance projects similarly to those conducted for construction projects. Criteria for selection of maintenance projects for inspections must be established. The criteria should include procedures for randomly selecting projects for review.

  The inspections-in-depth consist of comparing the actual performance in the field with the contract requirements. Inspections are conducted while the project is under way. The purpose is to identify trends in performance rather than specific project deficiencies through statistical sampling.
- Use video camcorders to document conditions at various stages throughout the project.

Incentives/Disincentives

Incentives provide a positive feedback to the contractors for achieving work quality that exceeds the specifications or completing work ahead of schedule. Disincentives are used to prod contractors to achieve desired results.

Examples of disincentives are included in Florida's specifications for rest area maintenance and bridge tending, which provide for reductions in compensation payments for non-compliance with specifications as shown in the excerpt from the specifications presented in Figures A-9 and A-10.

Progress Management

Notice to Proceed

Contractors are typically given ten days after notice to proceed to commence work. One exception is for contracts with flexible starting dates, where the contractor selects the starting date within contract limits.

Figure A-8 -- Sample Rest Area Inspection Form (Texas)

REV. 12-3-89
IDENTIFICATION:

HIGHWAY: IH-35 (S.B.) COUNTY: Hayes DISTRICT: 14

LOCATION: Kyle MILEPOST: _____

DAY OF WEEK: Tues. DATE: 5-1-90 TIME: 2:55 P.M.

ATTENDANT INFORMATION:

COULD YOU IDENTIFY ATTENDANT? Yes SDHPT___ SET-ASIDE___ CONTRACT ✓
WHAT ARE THE MAINTENANCE HOURS PER DAY? SUMMER- 12 HOURS WINTER- 8 HOURS
-7:00 AM TO 7:00 PM -7:30 AM TO 4:30 PM
HOW WAS THE ATTENDANT'S APPEARANCE? O.K. Sept. only 9:00 AM TO 5:00 PM.
WHAT WAS THE ATTENDANT'S ACTIVITY? At N.B. Rest Area - Returned To S.B. Rest Area Shortly After my Arrival.
RATING SYSTEM:

EXCELLENT: 5 POINTS (CONDITION IS VERY WELL OPERATED/MAINTAINED)
GOOD : 4 POINTS (CONDITION IS WELL OPERATED/MAINTAINED AND REQUIRES ONLY MINOR ATTENTION)
FAIR : 3 POINTS (CONDITION IS MINIMALLY OPERATED/MAINTAINED AND REQUIRES IMPROVEMENT)
POOR : 2 POINTS (CONDITION IS UNACCEPTABLE AND REQUIRES ATTENTION AS SOON AS PRACTICAL)
VERY POOR: 1 POINT (CONDITION IS UNACCEPTABLE AND REQUIRES IMMEDIATE ATTENTION)
COMMENTS:

OPERATION EVALUATION:		RATING POINTS	MULTIPLIER	TOTAL
1. WATER FOUNTAINS	1 OF 2 ARE OPERATING.	3	1	3
2. JUG FILLERS	2 OF 2 ARE OPERATING.	5	1	5
3. SINKS (MEN'S)	2 OF 2 ARE OPERATING.	5	2	10
(WOMEN'S)	2 OF 2 ARE OPERATING.	5	2	10
4. HAND DRYERS (MEN'S)	1 OF 2 ARE OPERATING.	3	2	6
(WOMEN'S)	2 OF 2 ARE OPERATING.	5	2	10
5. TOILETS (MEN'S)	CONV(C)/MICRO(M): M 2 OF 2 ARE OPERATING.	5	2	10
(WOMEN'S)	CONV(C)/MICRO(M): M 4 OF 4 ARE OPERATING.	5	2	10
6. TOILET PAPER DISP. (MEN'S)	2 OF 2 ARE OPERATING.	5	1	5
(WOMEN'S)	4 OF 4 ARE OPERATING.	5	1	5
7. URINALS	2 OF 2 ARE OPERATING.	5	2	10
8. SANITARY NAPKIN CONTAINERS	4 OF 4 ARE OPERATING.	5	1	5
9. INFORMATION DISPLAY		4	1	4
			TOTAL OPERATION RATING:	93

Figure A-8 -- Sample Rest Area Inspection Form (Texas) (Continued)

page 2 of 2

HIGHWAY: IH-35 (SB) COUNTY: Hayes DISTRICT: 14

LOCATION: Kyle DATE: 5-1-90

MAINTENANCE EVALUATION:	RATING POINTS	MULTIPLIER	TOTAL
GROUNDS AREA:			
1. LANDSCAPING	5	1	5
COMMENTS:			
2. LITTER/LITTER CONTAINERS	4	2	8
COMMENTS: Some Litter Containers Need Painting -			
3. WATER FOUNTAINS/JUG FILLERS	3	1	3
COMMENTS: one (1) Water Fountain Not operating due to Lack of Parts To Repair - Finish Worn off drain Area (Enamel)			
4. PICNIC TABLES/ARBORS & APPURT.	4	1	4
COMMENTS: Inside Tops of Arbors Need Cobwebs & bird Nest Cleaned & Repainting.			
5. DRIVEWAY/PARKING ~~& ROADWAY STATION~~	5	1	5
COMMENTS:			
6. GRAFFITI	4	2	8
COMMENTS: Tables Need Graffitti Sanded off And repainted.			
RESTROOMS:			
7. FLOORS (MEN'S)	5	1	5
COMMENTS:			
FLOORS (WOMEN'S)	4	1	4
COMMENTS: Some debris on floor And in stalls			
8. WALLS/PARTITIONS (MEN'S)	5	1	5
COMMENTS:			
WALLS/PARTITIONS & DOORS (WOMEN'S)	4	1	4
COMMENTS: Need Painting			
9. FIXTURES (MEN'S)	5	2	10
COMMENTS:			
FIXTURES (WOMEN'S)	5	2	10
COMMENTS:			
10. GRAFFITI (MEN'S)	4	2	8
COMMENTS: Some Graffiti on Wall			
GRAFFITI (WOMEN'S)	3	2	6
COMMENTS: Graffiti on Walls and inside stalls			

INSPECTED BY: A. Thomas TOTAL MAINTENANCE RATING: 85

Accompanied by Asst. Foreman.

Figure A-9 -- Example Disincentive Clause -- Rest Areas (Florida)

"When the Contractor fails to provide any part of the complete service in accordance with the terms of the contract, reductions shall be made to the monthly compensation on the monthly invoice submitted for payment. The reduction shall be calculated separately for each rest area side according to the following schedule: in single rest area facilities one side only, contracts, the reduction schedule will be in accordance with the reduction rate identified below for "two sides."

Daily Compensation Reduction Schedule

Restrooms	One Side	Two Sides
(Including storage room and foyer)	25%	50%
Wastewater Plant		
(Including water system)	10%	20%
Grounds		
(Including parking lots)	10%	20%
Miscellaneous		
(Out of uniform, failure to maintain logs, reports, unauthorized use of facilities by attendant, etc.)	5%	10%
TOTALS	50%	100%

Special Compensation Reduction Schedule

	One Side	Two Sides
Attendant not present for duty *	50%	100%
(Inadequate staffing as outlined in this contract)		
Sewage/water treatment plant down **	50%	100%

* In the event the attendant is found sleeping, intoxicated, drugged or in any other way incapacitated, he shall be considered as not present for duty and the appropriate compensation reduction applied.

** Should the rest area or rest areas be closed due to noncompliance of regulatory agency rules or as a result of Contractor negligence in the execution of this contract and the provisions thereof, appropriate reduction as stated above shall apply.

Daily compensation is computed by dividing the contract amount by three hundred sixty five (365) days."

Figure A-10 -- Example Disincentive Clause -- Bridge Tending (Florida)

"NON-CONFORMANCE

When the Department determines that the Contractor has failed to conform with the terms of the contract, a non- conformance assessment shall be made by the Department against the Contractor.

Such assessments shall be made according to the following:

1. ABANDONMENT OF BRIDGE

In the event a bridge is abandoned by contractor default, left unattended by a bridge tender or if the Engineer or his representative dismisses a bridge tender due to his incapacity to function as result of an apparent aberrant state of mind, or drug or alcohol use, an assessment shall be made according to this mathematical formula:

$$T = \$3,000 + [(N/2)(N-1) + N] \times \$100.00$$

Where T = Total Assessment

N = Number of continuous whole hours bridge is left unattended. (Example: an abandonment of 4.5 hours will result in an assessment of $4,000.00)

For purposes of this section if a bridge is left unattended, the Engineer shall assume that the bridge tender abandoned the bridge at the time of the last entry in the log book unless other compelling evidence can be presented to show otherwise.

2. OTHER CASES OF NON-CONFORMANCE

All other cases of non-conformance shall result in an assessment of $100.00 per incident per day, until conformance is achieved. Specific tasks to which the Contractor must conform include but are not limited to the following:

(1) Operating bridge according to schedule.

(2) Post Acknowledgment Form.

(3) Provide Engineer ....."

Charging Time

Contract time may be specified in working days, calendar days, months or years. Working days or calendar days are used most for project-type contracts and where interim completions are specified for either project- or maintenance-type projects.

The working days charged must be recorded daily on the IDR or in the diary and a weekly report prepared for documentation. A copy of the weekly summary of working days charged should be sent to the contractor so any questions on time charges can be resolved while the conditions are fresh in everyone's memory. Normally, the definition of working days in the standard construction specifications is used for project-type and, when needed, for maintenance-type contracts.

Many states do not charge time in the winter months, typically from November 15 to April 1. Specifications provide cutoff dates in the fall for most asphalt-related items, such as resurfacing, seal coating, and the like, because of temperature requirements for quality work.

Liquidated Damages

Liquidated damages are assessed against contractors who fail to complete work within the specified time, either for completion of the total project or some portion of it. Most agencies assess liquidated damages for failure to complete project-type maintenance contracts on time. Liquidated damages are usually only specified for interim completions in contracts for annual services such as mowing, litter pickup and rest area maintenance. They are not needed for completion of the total project. Equipment rental agreements do not include liquidated damage clauses.

In some instances, liquidated damages are assessed for failure to complete work by interim completion dates or for failure to open sections of roads to the public by specified times of day or dates. One example of liquidated damages for interim completions is taken from Tennessee special provisions, where liquidated damages are assessed as follows:

- failure to complete each mowing cycle within the specified time period -- $250 per cycle not completed;
- failure to complete the litter pickup cycle within the specified time period -- 10 percent of the contract unit price per linear mile;
- failure to commence work on an attenuator repair within 24 hours of notification -- $100 per day; and
- failure to completely renovate an attenuator at a site within ten calendar days -- $200 per day.

Where liquidated damage provisions are included in contract documents, most agencies use the liquidated damage schedules from the standard construction specifications, which are based on the cost of the contract. Unless there are unusual conditions, the use of the liquidated damage schedules from the standard construction specifications is appropriate for project-type maintenance contracts. Liquidated damages must be based on actual anticipated damages resulting from failure to complete the work on time, not as a penalty, to be defensible in a court of law. Normally, liquidated damages should not be applied to purchasing agreements for equipment rental or furnishing materials, or for annual maintenance-type contracts unless there is a need for interim completions.

Time Extensions

Time extensions should be permitted under the same conditions as for construction projects.

Change Orders/Supplemental Agreements

Change orders and supplemental agreements are legal documents used to amend contracts. The basis of payment and any time adjustments resulting from the change must be spelled out on the change order. The development of good quality plans and contract documents minimize the need for changes. Change orders are needed:

- to authorize changes in the plans or specifications;
- when extra work for which there is no unit price must be performed to complete the contract;
- to authorize extensions of time; or
- when there is a major change, either an increase or a decrease, in the quantities of work.

Extra work may be paid for at agreed prices or, if agreement cannot be reached on an equitable price, as force account work. The basis of payment for force account work is the actual cost of labor, plus an allowance for bond, insurance and payroll taxes, materials at actual cost, equipment at authorized rental rates, and an allowance for overhead and profit.

Change orders usually are not needed for nominal overruns or underruns in pay quantities for contract bid items (those with unit prices).

Contractor Default

Specifications must include provisions for revoking contracts when contractors do not perform in accordance with the terms of the contract, although few contractors actually default. A typical specification reads as follows:

> If the contractor fails to begin the work within the times specified; or fails to perform the work with sufficient workmen and equipment; or has insufficient materials to insure the completion of the work within the contract time; or shall perform the work unsuitably; or shall neglect or refuse to remove materials or perform anew such work as may have been rejected as being defective or unsuitable; or shall discontinue the prosecution of the work without authority; or shall become insolvent or be declared bankrupt; or shall commit any act of bankruptcy or insolvency; or shall make an unauthorized assignment for the benefit of any creditor; or from any other cause whatsoever shall not carry on the work in an acceptable manner, the Engineer shall give notice in writing to the Contractor and his surety of such delay, neglect or default, specifying the same. If the Contractor within a period of seven (7) calendar days after such notice shall not proceed in accordance therewith, then the State shall, upon written certificate from the Engineer of the fact of such delay, neglect or default and the Contractor's failure to comply with such notice, have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of the Contractor and enter into an agreement for the completion of the contract according to the terms and provisions thereof or use such other methods as in the Engineer's opinion may be required for the completion of the contract in acceptable manner. All costs and charges incurred by the State, together with the costs of completing the work under contract, shall be deducted from any money due, or which may become due, the Contractor. In case such cost shall exceed the amount which would have been payable under the contract, then the Contractor and the Surety shall be liable and shall pay to the State the amount of the excess. (*11*)

The application of the termination clause requires good documentation of the contractor's deficiencies.

Contract Cancellation

Generally, maintenance contracts have clauses that permit cancellation for cause -- dissatisfaction with contractor performance, a change in priorities, or a shortage of funds. Usually, the agency provides for reimbursement for materials purchased but not yet incorporated into the work.

Cancellation of contracts can have a devastating effect on small contractors, especially if they have no other work. The consequences of canceling should be carefully considered because the practice will, if it happens frequently, make work for the agency less attractive to contractors and reduce competition.

Contractor Debarments

Agencies can refuse to allow contractors to bid on projects if there is good cause. Such reasons as fraud, conviction of felonies and repeated failure to perform are cause for debarment. Although debarment should occur infrequently, provisions for debarment should be included in the contracts. The agency should use existing debarment provisions in contracts for maintenance, if they are available. The application of the debarment provisions should consider the seriousness of the contractor's acts or omissions and any mitigating circumstances.

As with defaults, good documentation of the contractor's shortcomings is essential. Debarments are usually processed through the prequalification committee, where such a committee exists. Debarments must be cleared with the agency's legal representative.

Debarred contractors are restricted from bidding. Jurisdictions cannot enter into a contract with a debarred contractor.

Contract Renewals

Where contract renewals are permitted, the provisions should be included in the contract terms and conditions to avoid misunderstandings and claims.

The most frequent use of renewal provisions are for annual contracts such as those for mowing, rest area maintenance, weather forecasting and bridge tending. Renewal of contracts for these services is discussed under Contract Time on Page A-15.

Contract Completion

Final Acceptance

The work under maintenance-type contracts is accepted as work is completed -- when a round of mowing is finished or an attenuator is repaired. Project-type contracts are generally accepted when all work is complete, the same as for construction projects. Procedures must be developed to define authority for acceptance. Usually the district engineer will be given this authority. Criteria for acceptance should be defined in the contract documents and will normally include contractor certifications that all payments for materials, labor and the like have been made, a check that all materials certifications and test reports are on file, and that the project site is in an acceptable condition.

Contractor Performance

Contractor performance evaluations are used to rate contractors as they complete contracts. They are typically sent to the prequalification committee for its use in evaluating contractors for qualification and capacity.

The items included in the contractor rating forms should be those which can be rated objectively: such items as quality of work, timely completion, and maintenance of traffic. Ratings of items such as general management and cooperation with agency personnel are more subjective and subject to personal bias. Performance evaluations offer an opportunity to provide constructive criticism or compliments to contractors. Contractors should be furnished copies of their ratings.

If performance ratings are used for defaulting or debarring contractors, criteria must be established. Resident and district personnel should recommend defaults or debarments, but final approval should be in the central office, where they have an agency-wide perspective.

If contractor performance evaluations are used, written explanations should be required for all ratings -- not just the high and low ratings -- to discourage raters from giving all average ratings. Contractors should receive copies of the ratings or be advised of any need to improve. Normally, performance evaluations are submitted only at the completion of contracts. However, interim ratings should be submitted at any time during the course of the contract that the contractor's performance warrants such action.

If prequalification is required, copies of the contractor performance ratings should be sent to the prequalification committee for evaluation of the contractor's status.

Performance ratings must be shielded from the Freedom of Information Act to prevent misuse of the ratings by competitors.

Recognition of Performance

Agencies may want to consider giving awards for outstanding performance by maintenance contractors to recognize a job well done. Awards such as "Snow Remover of the Year," "Truck Driver of the Month," or "Smoothest Patches of the Year" might be considered. The awards need not be monetary. While not all contractors see these awards as worthwhile, many will strive to attain them. For the awards to be effective, the criteria for the awards and the method of selection must be designed to eliminate favoritism and give all contractors an opportunity to win.

Final Payments

The contract administrator should determine the pay quantities and review them with the contractor. The district should spot check them for approval. Any central-office audit should be accomplished by spot checking.

As with construction contracts, the inspector should not wait until the final inspection to call problems to the contractor's attention. They should be resolved as they are identified. Finaling the contract will then be easier for all concerned.

Specifications often provide for unit price changes if final quantities for a major work item are increased or decreased more than a preset limit, usually 20 to 25 percent. The reason for such price adjustments is that fixed contractor costs included in the unit prices may not be fully compensated if quantities underrun significantly. Conversely, if quantities overrun, the unit bid prices may reflect an excessive amount for fixed costs. Normally, contracts for maintenance would include the same adjustment provisions as those specified for construction.

Kentucky uses formulas to adjust unit prices for overruns or underruns that exceed 25 percent of the contract quantities. An excessive underrun is 75 percent of the original contract quantity of the item minus the final quantity of the item. An excessive overrun is the final quantity of the item minus 125 percent of the original contract quantity. New unit prices are computed using these formulas:

Excessive Underrun Formula

NP = OP + (EU x 0.25 x OP) divided by the final quantity of the contract item

Excessive Overrun Formula

NP = OP - (EO x 0.25 x OP) divided by the final quantity of the contract item

Where:

NP = New Unit Price
OP = Original Unit Price Bid by Contractor
EU = Excessive Underrun
EO = Excessive Overrun

Another example specification covering price adjustments for changed quantities is taken from the Texas Routine Maintenance Specifications. Texas defines a major item as an individual bid item included in the proposal that has a total cost equal to or greater than 5 percent of the original contract or $100,000, whichever is less. When final quantities for a major item exceed 120 percent of plan quantity, either party to the contract may request an adjustment in price on that portion of the work above the 120 percent. Where final quantities of a major item are less than 80 percent of plan quantities, the adjusted unit price to apply to the final quantity of work performed is determined from Table A-2. For example, if the plan quantity was 200 units, the final quantity 64 units and the

original bid price $1.00 per unit, the underrun would be 68 percent (200-64=136; 136/200x100=68%). From the table, the new unit price would be $1.00 times 1.21 (121%) or $1.21.

Table A-2 -- Unit Price Adjustment Factors

% Decrease	Factor	% Decrease	Factor	% Decrease	Factor
20-24	1.01	48-50	1.09	65	1.18
25-28	1.02	51-53	1.10	66	1.19
29-32	1.03	54-56	1.11	67	1.20
33-35	1.04	57-59	1.12	68	1.21
36-38	1.05	60	1.13	69	1.22
39-41	1.06	61	1.14	70	1.23
42-44	1.07	62	1.15	71	1.24
45-47	1.08	63	1.16	72-99	1.25
		64	1.17		

The maximum adjusted unit price is 125 percent of the original unit price. Where final quantities of a major bid item are less than 80 percent of plan, the maximum total payment for that item is the original unit bid price times 80 percent of the original quantity. If a major item is not used (underrun by 100 percent), the contractor may be reimbursed for a pro-rata portion of out-of-pocket expenses for insurance and bonds.

One problem identified as delaying completion of the final payment process was the receipt of certifications. The need for these certifications should be identified at the pre-work conference, possibly through the use of check lists. The check list should be discussed with the contractor at the pre-work conference. The check list can also serve to monitor progress in obtaining needed certifications.

Appendix B

The British Columbia Maintenance Contracting Experience

Background and Scope

The Ministry of Transportation and Highways in the Province of British Columbia is responsible for maintenance of approximately 28,000 miles of provincial highways. Prior to 1988 about four-fifths of the maintenance services for these highways was performed by Ministry forces. Contractors were hired locally to perform the remaining work.

The Ministry now contracts for all maintenance services within its responsibility except ferries, ferry operation and centerline striping. The Ministry's experience with contract maintenance is summarized in this appendix.

Beginning in 1988, a decision was made by the Ministry to contract for essentially all of its road and bridge maintenance work. To better manage the contracts and to improve accountability, the Ministry reorganized. (*10*) Authority for many programs was transferred from headquarters to the regions or districts. One goal of the reorganization is to make the Ministry more responsive to local needs.

The six regional directors now report directly to the Highways Operations Administrator. Regional and district boundaries were revised to match contract area boundaries. The 37 districts were reduced to 28 in the process. The districts were further divided into 103 areas.

The Contracting Process

A number of key decisions had to be made prior to contracting. Such policies as these were adopted:

- contracts would be lump sum with provisions for monthly payments;
- the contract period would be three years with no renewal provision;
- government personnel would undertake quality assurance with inspections limited to those necessary for assurance of performance, and contractors would do the quality control;
- primary, essential maintenance equipment would be leased to the successful contractors;
- the successful contractor was expected to offer employment to displaced Ministry maintenance personnel; and
- buildings and lands would be leased.

Proposals were solicited for the 28 contract areas. Proposals were evaluated and the prices were negotiated with the firms with the highest rankings for each area. The government favored arrangements that encouraged its maintenance employees who would be affected by the change to establish contracting firms. The successful contractors included 8 firms owned by former Ministry employees, with 10 contracts and 12 private firms for the remaining 18 contracts. No one contractor was awarded more than three contract. The starting dates for the individual contracts ranged from September 1, 1988 through April 1, 1989.

Each 3-year lump-sum contract is for the performance of all maintenance activities. Being lump sum, it is "quantity independent." The contract truly includes the management of maintenance, not just reacting to requests for services. There is no direct allowance for inflation. (For example, no adjustments have been given for higher fuel prices.) The lump sum covers all of the routine maintenance including snow removal for the 3-year period. Current contracts limit the dollar amount that the contractor is liable for each emergency and some include limits on the number of occurrences for which there is any dollar liability. (Future contracts will only have an upper limit on dollar value, with no number allowance.) Emergency work above the contract limit must be authorized by work order and is paid at rates originally negotiated prior to contract start-up specifically for such instances. Unit prices for annual maintenance activities were included in the proposals and the negotiations. Provincial law had to be changed to permit the agency to accept the "best value" contract instead of the low bid.

The size of the current contracts ranges from $7.4 million to $41.0 million (Canadian dollars). The total contract amount is $752 million (Canadian) for the 3-year contract period -- over $250 million a year. This is a dramatic move into contracting. Cost comparisons between contracting and in-house performance are not readily available. Comparisons are difficult to fully quantify because of the need to separate associated asset sales revenues, quantify any increases in maintenance services, and consider many indirect benefits to the government such as license fees, taxes and the general establishment of a new industry.

The Ministry has retained ownership of major equipment and yards, leasing these to winning contractors. The Ministry believes its ownership is necessary to protect these items when contracts end. It also allows the Ministry quick access in the event of a default.

The contracts are three-year non-renewable contracts. The new competition, for the second round of contracts beginning in 1991, will have terms ranging between two-and-one-half and three years, in order to stagger the contract ending dates and spread the proposal solicitation, evaluation and negotiation process over a longer time. There will be an optional two-year renewal period. The Ministry believes this added time will encourage competition, encourage investment in new equipment, and encourage contractors to do more preventive maintenance.

Of the 2,449 road and bridge maintenance employees affected by the privatization, 2,187, almost 90 percent, chose to work for the successful contractors. One hundred of the other 262 employees choosing to stay with the Ministry were placed in other positions, retired or resigned. Active placement efforts continue for the remaining 162 employees. (*11*)

While a move as broad as this seems extremely unlikely in most states or provinces, the British Columbia practices and experiences are of considerable interest, and some aspects used in the Province may be applicable to other highway maintenance agencies.

Evaluation to Date

The Province is completing its first cycle of three-year contracts in 1991. By and large the Ministry feels reasonably satisfied. Public criticism, such as that appearing in the media, has been light. The number of positive comments about maintenance are slightly higher now than in past years when the service was performed by public servants. (*19*). In addition, a Province-wide poll conducted in the spring of 1989 (only a short time after the beginning of the contracts) found that 75% of the public described road and bridge maintenance to be as good, if not better, than before. As of November 1990, the agency was satisfied with the performance of most contractors. Only two contractors were performing poorly where corrective actions were needed. Early in 1991, one contractor defaulted as a result of poor performance and was replaced.

The agency found that the main weakness in the administration of most contracts was the lack of good qualified middle management and lack of a maintenance management plan. Contractors found that maintenance work is entirely different from traditional road construction work, including its very high public relations exposure. In addition, the agency is somewhat concerned that the government has been accused of supporting the larger new contractors to the detriment of smaller, established contractors. After two seasons of winter activities, there is reported to be some evidence of inadequate timing of responses due to reduced on-shift labor. There is also evidence of greater risk taking, such as holding back on pre-salting for black ice in the hope that it wouldn't be needed. Where the gamble did not pay, there is evidence that the lessons have been learned, at least by some contractors.

In a few instances, contractors have tried to claim extra work and increase the value of their contracts. The Ministry has resisted this and had not yet agreed to such extra payments.

The Ministry believes that the largest factor in success is the attitude of the contractor. "He has to *want* to provide a good public service and not feel that he is compelled to do it. To date, it appears that we have been able to attract a majority of that kind of contractor."

Most contractors appear to be achieving financial stability.

Quality Control

A major concern, probably *the* major concern, for the public in such large-scale contracting is whether there is adequate quality control over the work performed. With lump-sum contracts, the Ministry decided that it could not, and should not, undertake all-encompassing inspection of the work. Thus, the contractors have the responsibility for basic quality control and day-to-day inspections. However, the Ministry has established an extensive formal process for periodic inspections under its "Quality Assurance Program." The program consists of three major components: (1) maintenance activity specifications, (2) inspections by area personnel, and (3) central auditing of the process.

Activity Specifications

Defining the work and expected results were essential. One of the first undertakings in contracting for maintenance was the development of a set of highway maintenance standards and specifications. The Ministry prepared specifications for approximately 60 road and bridge maintenance activities. Each specifies the desired result, acceptable maintenance methods, and materials requirements where appropriate. It is the contractor's responsibility to select the appropriate method and equipment to best perform the needed maintenance. Specifications for most activities list the maximum response times, such as for snow and ice control and curb maintenance. (For example, the latter includes the maximum response times for performing the maintenance -- from the time the problem is first detected by, or reported to, the contractor.) The response times for each activity were set to provide practical, achievable maintenance to keep each class of roadway in a safe condition. A copy of the maintenance standard for Highway Pavement Patching is attached as an example. See Pages B-6 through B-12. (*20*)

The Ministry's policy provides that the maintenance services for each activity be consistent Province-wide for each class of roadway. Roadways are classified by traffic volume. The specifications provide for geographical differences where necessary. For example, the roadside mowing standard has different maximum height specifications depending on the class of highway, the geographical area, and whether the area is urban or not.

Inspections by Area Personnel

The second major feature of the overall quality assurance process is the agency's three-phase quality assurance program, which spells out the procedures. The contractors are responsible for quality control and the Ministry for quality assurance. Most of the quality assurance program is carried out by the 141 area managers who work directly for the district managers. About 60 percent of the area managers' time is devoted to the quality assurance program, including some indirectly related contract administrative functions. They have no assigned staff. The district managers also spot check work performed by the contractors.

The Province divides its inspections into three types: 1) work-in-process inspections, 2) end-product inspections, and 3) "present state" inspections.

In-process inspections are required for work where it is not possible to verify that the correct work methods or materials were used by observation of the end results. One example is the replacement of a cross-culvert under a roadway. Any time a roadway is cut, full-time inspection is required. Most bridge repairs are inspected full time.

End-product inspections are used for activities where the inspection of the end product provides satisfactory evidence that the work is acceptable.

Present state inspections are somewhat unique to this type of general maintenance contract. Under these contracts, the contractors identify the deficiencies relative to the standards, the work to be undertaken, and the schedule for performing the work. Therefore, the inspection process needs to identify work not undertaken, in addition to the quality of work undertaken. Each area manager randomly selects 15 two-kilometer segments of highway to inspect each month through the use of a computer program. The area manager also selects one-twelfth of the total inventory of bridges within the contract area to be inspected each month. (Each structure has to be examined at least once per year and a cross section of bridge types have to be examined each month.) The purpose of the present state inspections includes the evaluation of the contractor's maintenance and overall preservation of the road and bridge infrastructure. A flow chart showing the process for present state inspections is presented on Page B-14.

The forms used for these inspections, along with selected examples of the definitions for completing the forms, are attached on Pages B-15 through B-26.

Present state inspections also apply to activities, such as rest area maintenance and mowing, where it is not necessary to inspect the work in progress or immediately upon completion. Rather, this type of activity can be inspected at any time to ensure that the results are within the activity quality specifications -- such as that grass is mowed to the specified height. Each month a general assessment of the contractor's management of the contract is done by the district manager with the input of the area managers. The evaluations include assessing the contractor's compliance with reporting and response times and for public relations (including handling of public complaints).

The Province wants complaints from citizens to go directly to the contractor for the contractor's correction. The contractor is required to record complaints and their disposition. Complaints going directly to the contractor helps ensure quicker reaction to the problem, with no middleman. In future contracts, the agency will include the need for even better access to the contractor by the public, such as 24-hour toll-free contact phone, and more comprehensive public relations and promotion of the services they are providing. The agency hopes that this direct exposure to citizen complaints will sensitize the contractor to the need to be fully responsive to such complaints. Currently, and undoubtedly in the future, the Province will continue to accept complaints from citizens, particularly those that have not been corrected after the citizen has previously complained to the contractor.

Each month an overall evaluation is prepared for each contract. It is based on combining all the completed inspection forms that month using a weighting process and formula. For example, in completing the Highway Maintenance Inspection Form ITP1, 10 points are given for a rating of "good," 8 for "fair," and 0 for "not to standard." The agency has been experimenting with monthly "report cards" for each contractor.

The Ministry has developed an overall inspection test plan that indicates the type of inspection, frequency, and form to be used. (See Page B-28 for an excerpt from the inspection and test plan.)

Regional meetings are held twice each month to discuss maintenance and contract administration problems with area and district managers. District meetings are held monthly. An annual seminar is conducted with contractors and Ministry representatives to identify and resolve contracting problems.

Central Auditing

Central staff, at regular intervals, review the inspection efforts in each district. The intent is to ensure that the quality assurance program is being uniformly and properly applied in all contract areas and to get feedback from the districts and areas about needs for revision and improvement in the contracting and inspection process. British Columbia has one full-time auditor who visits the districts. In part, the purpose of the audit is to ensure that both the district manager and the area managers fully understand the program and their role in it. Its goal is also ensuring that area managers are interpreting the standards consistently throughout the Province.

The audit is primarily an examination of the inspection forms and related documentation to assure that all of the many inspection forms have been completed properly and that appropriate actions such as defect notices are handled and followed up properly. The auditor also interviews the district and area personnel and prepares summaries of their suggestions and comments.

The auditor does not normally check actual road conditions. The Province has not undertaken any regular effort to assess the rideability of the roads as an overall performance monitoring task.

B.C. MINISTRY OF TRANSPORTATION AND HIGHWAYS

Maintenance Standard

HIGHWAY PAVEMENT PATCHING

A. MAINTENANCE SERVICE

Highway pavement patching will be performed by the Contractor as required on highways to:

a) maintain pavement surfaces in a smooth, stable and safe condition for the travelling public;

b) seal pavement from moisture penetration;

c) prepare and strengthen a paved highway surface for a thin overlay of asphalt concrete pavement or pavement surface treatment; and

d) extend pavement life;

in accordance with this Maintenance Standard.

B. SPECIFICATIONS

1. Materials

The following materials will be supplied and used by the Contractor. These and other materials will be in accordance with the Standard Specifications for Highway Construction:

a) asphalt concrete mix (ACM) in accordance with Section 223 of the Standard Specifications for Highway Construction;

b) recycled asphalt mix (RAM) comprised of less than 40% by weight of reclaimed asphalt pavement (RAP) as acceptable to the Province;

c) special mixes in accordance with the manufacturers' specification and they include:

(i) Unique Patch Mix,

(ii) Everlasting Patch Mix,

(iii) Instant Road Repair, and

(iv) Portland cement concrete and epoxy repair products for concrete pavements; and

d) Cold-mix asphalt (plant or grader mix with asphalt materials) in accordance with Section 225 of the Standard Specifications for Highway Construction; and

all other asphalt materials in accordance with Section 311 of the Standard Specifications for Highway Construction; and

e) Cover aggregate for spray patch in accordance with all the requirements for its intended use and in accordance with Section 224.11 of the Standard Specifications for Highway Construction.

2. Performance Standards

Paved surfaces will be restored by the Contractor to a smooth, free-draining, impermeable, well-compacted, stable and safe condition using the following specified patching materials:

PATCHING MATERIALS

SUMMER HIGHWAY CLASSIFICATION

	Pavement Type	1 & 2	3	4	5	6 & 7
a)	Asphalt concrete pavement	ACM RAM SMIX SPatch	ACM RAM SMIX SPatch	ACM RAM SMIX SPatch	ACM RAM SMIX SPatch	ACM RAM SMIX Coldmix SPatch
b)	Cold-mix pavement	ACM RAM SMIX SPatch	SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch
c)	Portland cement concrete pavement	SMIX	SMIX	SMIX	SMIX	SMIX
d)	Surface treated gravel surface	ACM RAM SMIX SPatch	SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch	Coldmix SMIX ACM RAM SPatch

Legend

ACM Asphalt Concrete Mix
RAM Recycled Asphalt Mix
SMIX Special Mix
Coldmix Cold-Mix Asphalt
SPatch Spray Patch

3. Methods

Any of the following methods are acceptable to correct the pavement deficiencies indicated:

a) Temporary Patch

Used as a temporary correction of pavement deficiencies such as pot-holes, edge failures, depressions and settlements.

Used when prevailing road and weather conditions prohibit the correcting of the pavement deficiency by the placing of a permanent patch or when specified patching materials are not available.

Constructed generally as follows:

(i) define the perimeter of the pavement deficiency and clean the area of all loose and foreign materials,

(ii) prepare the area by applying a tack coat to the perimeter of the area to be patched, and

(iii) place the patching material in the prepared area and hand tamp or machine compact until all particles are well keyed into place.

Temporary patches that perform to the standards of a permanent patch may not need to be removed and replaced by a permanent patch if approved by the Province.

b) Replacement Patch (Permanent)

Used to correct pavement deficiencies such as pot-holes, shoving, edge failures, depressions and settlements, and alligatored areas with surface distortion.

Constructed generally as follows:

(i) define the perimeter of the pavement deficiency and make a vertical cut through the existing pavement 30 cm beyond the perimeter. Remove all pavement down to the top of the underlying undamaged structural layer. If the underlying layer is granular base, remove contaminated and foreign material and recompact any loose material.

Vertical cuts through multiple lifts of pavement shall be staggered horizontally by a minimum of 15 cm;

(ii) prepare the area by applying tack coat to all asphalt concrete pavement surfaces and a prime coat to all granular base surfaces, all in accordance with Section 223.19 of the Standard Specifications for Highway Construction;

(iii) place the specified patching material in the prepared area and layout with a shovel, grader, or by dumping into a spreading machine;

(iv) compact in layers not to exceed a compacted thickness of 60 mm for asphalt concrete mix or recycled asphalt mix, 25 mm for cold mix, and the maximum thickness as specified by the applicable special mix manufacturers for special mixes; and

compaction of each layer shall continue until all particles are well keyed into place using industry standard asphalt mix vibratory compacting equipment; and

(v) the finished patch shall be consistent with the line, grade, and crossfall of the adjacent pavement.

c) Overlay Patch (Permanent)

Used to correct pavement deficiencies such as depressions and settlements, alligatored areas with surface distortion, flushing, bleeding, ravelling and rutting.

Constructed generally as follows:

(i) define the perimeter of the pavement deficiency and clean the area of all loose and foreign materials;

(ii) prepare the area by applying a tack coat to all asphalt concrete pavement surfaces within the perimeter in accordance with Section 223.19 of the Standard Specifications for Highway Construction;

(iii) place and compact a levelling course of patch material as required within the perimeter to ensure the final patch thickness does not exceed maximum allowable compacted thicknesses indicated below;

(iv) place the specified patching material in the prepared area and layout with a shovel, grader, or by dumping through a spreading machine in layers not to exceed a compacted thickness of 60 mm for asphalt concrete mix or recycled asphalt, 25 mm for cold mix, and maximum thickness as specified by the applicable manufacturer for special mixes;

(v) edges of the patch that tie in elevation to existing pavements will be feathered to an angle of no less than 30 degrees from the centerline;

(vi) compaction of each layer will continue until all particles are well keyed into place using industry standard asphalt mix vibratory compacting equipment;

(vii) the finished patch will be consistent with the line, grade, and crossfall of the adjacent pavement; and

(viii) shoulders shall be built up and compacted to match the pavement elevation and shall be consistent with the line, grade, and crossfall of the adjacent shoulders.

d) In-Place Recycled Patch (Permanent)

Used to correct all pavement deficiencies.

Constructed generally as follows:

(i) define the perimeter of the pavement deficiency and clean the area of all loose and foreign material;

(ii) prepare the area by applying a radiant heat until the existing pavement is hot enough to be remolded using a scarifying tool; and

a pavement rejuvenating agent may be added to the area at an application rate as recommended by the manufacturer;

(iii) if required, add asphalt concrete mix or recycled asphalt mix to the area;

(iv) remold the pavement by scarifying, remixing and redistributing it to the desired line, grade and crossfall; and

(v) recompact the recycled pavement immediately after remolding until all particles are well keyed into place using industry standard asphalt mix vibratory compacting equipment.

e) Spray Patch (Permanent)

Used to correct pavement deficiencies such as alligatored areas without surface distortion, flushing, bleeding, ravelling and rutting.

Constructed generally as follows:

(i) define the perimeter of the pavement deficiency and clean the area of all loose and foreign material to 30 cm beyond the perimeter;

(ii) apply high-float emulsified asphalt uniformly over the area to be patched at a a rate of approximately 0.35 litres per square metre on pavements and at 2.0 litres per square metre on gravel surfaces;

(iii) apply cover aggregate uniformly at a rate of approximately 25 kilograms per square metre;

(iv) compact the area to be patched with a pneumatic tired roller immediately after the application of the cover aggregate and continue until all particles are well keyed into place; and

(v) the finished patch shall be swept clean of surplus loose aggregate immediately and before opening to traffic.

Spray patch is construct only when the ambient air temperature is 10 degrees C. and is expected to rise during the construction.

f) Major Patching

Used primarily to maintain structural strength of the pavement and to restore the surface riding quality rather than correct individual pavement deficiencies.

Constructed with asphalt concrete mix in accordance with the methods described in this Maintenance Standard for replacement patching or overlay patch and in accordance with all the requirements of Section 223 of the Standard Specifications for Highway Construction.

Major patching using the overlay patch method will be constructed generally as follows:

(i) construct to a width that matches the existing pavement and includes the construction of the adjacent granular shoulder to the elevation of the new pavement edge and to the line, grade and crossfall of the adjacent shoulders;

(ii) construct to a minimum compacted thickness of not less than 50 mm and at an average application rate of not less than 120 kilograms per square metre.

Major patching using the replacement patch method will be constructed to a depth equal to the depth of the distressed pavement but never less than a minimum of 60 mm.

4. Miscellaneous

a) In all cases consideration will be given to the cause of the pavement failure. Insufficient or contaminated base materials may be causing the surface failure and this will be addressed before final patching repair (see the Maintenance Standard for Road Base Maintenance). Also, drainage improvements may be required where pavements are failing (see the Maintenance Standard for Ditch and Watercourses Maintenance);

b) for pavement edge repairs the edge will be well defined and shoulder material replaced and compacted to give adequate lateral support to the patch;

c) sufficient stockpiles of cold mix or special mix material will be maintained by the Contractor at all times to meet patching requirements;

d) permanent patching will only be done during favourable weather conditions (+10 degrees C.) and with dry road conditions;

e) rutting repairs will be performed for all localized ruts affecting less than 200 metres of continous highway length including severe ruts exceeding 19 mm depths within a generally rutted portion of highway, and at intersections. Repair of extensive continuous rutting exceeding 200 metres of highway is nor required by this Maintenance Standard unless provided for in the Annual Maintenance Plan;

f) the Contractor warrants to the Province that for a period of 365 days following the completion of a major patch all work will be free from any defect resulting from work done or materials supplied and the Contractor will rectify any such defect within 21 days from the time first detected by or reported to the Contractor or as directed by the Province;

g) if the estimated costs to repair the highway at a single site where there are pavement deficiencies with an area greater than 250 square metres or a series of pavement deficiencies whose area is greater than 10% of the paved surface per 1,000 metres of length exceeds $5,000 as determined by the Contractor in accordance with the provisions of Part II of the Fee Schedule, the following will apply:

(i) the Contractor will immediately notify the Province,

(ii) the Contractor will continue to perform work as set out in Section B.2 until notified by the Province to cease,

(iii) the Contractor will be entitled to a payment in accordance with the terms of Part II of the Fee Schedule for work performed in excess of $5,000 unless that work is included in the Annual Maintenance Plan, and

(iv) the Province may elect to cause another contractor to complete the work; and

h) paved bicycle and/or pedestrian paths will be patched as part of the highway.

C. SCHEDULING

1. Response Time

The following table represents the maximum response time within which the Contractor will perform the described maintenance by repairing the pavement deficiency indicated from the time first detected by or reported to the Contractor:

		SUMMER HIGHWAY CLASSIFICATION				
	Pavement Deficiency	1 & 2	3	4	5	6 & 7
a)	Pot-hole on travelled lane or inside shoulder of curving highway sections	24 hours	48 hours	72 hours	7 days	14 days
b)	Shoving	48 hours	72 hours	7 days	14 days	30 days
c)	Edge failure					
	i) inside lane (including single lane in each direction)	24 hours	28 hours	72 hours	7 days	14 days
	ii) outside lane	72 hours	7 days	10 days	21 days	45 days
d)	Pot-hole on outside shoulders of curving highway sections, and on straight sections of highway	72 hours	7 days	10 days	21 days	45 days
e)	Depression or settlements	7 days	21 days	30 days	90 days	6 months
f)	Alligatored areas without surface distortion	21 days	30 days	90 days	180 days	1 year
g)	Alligatored areas with distortion	7 days	21 days	30 days	90 days	6 months
h)	Flushing or Bleeding	7 days	21 days	30 days	90 days	6 months
i)	Ravelling	21 days	30 days	90 days	180 days	1 year
j)	Rutting (over 19 mm deep)	7 days	21 days	30 days	90 days	6 months

2. Schedule/Annual Maintenance Services

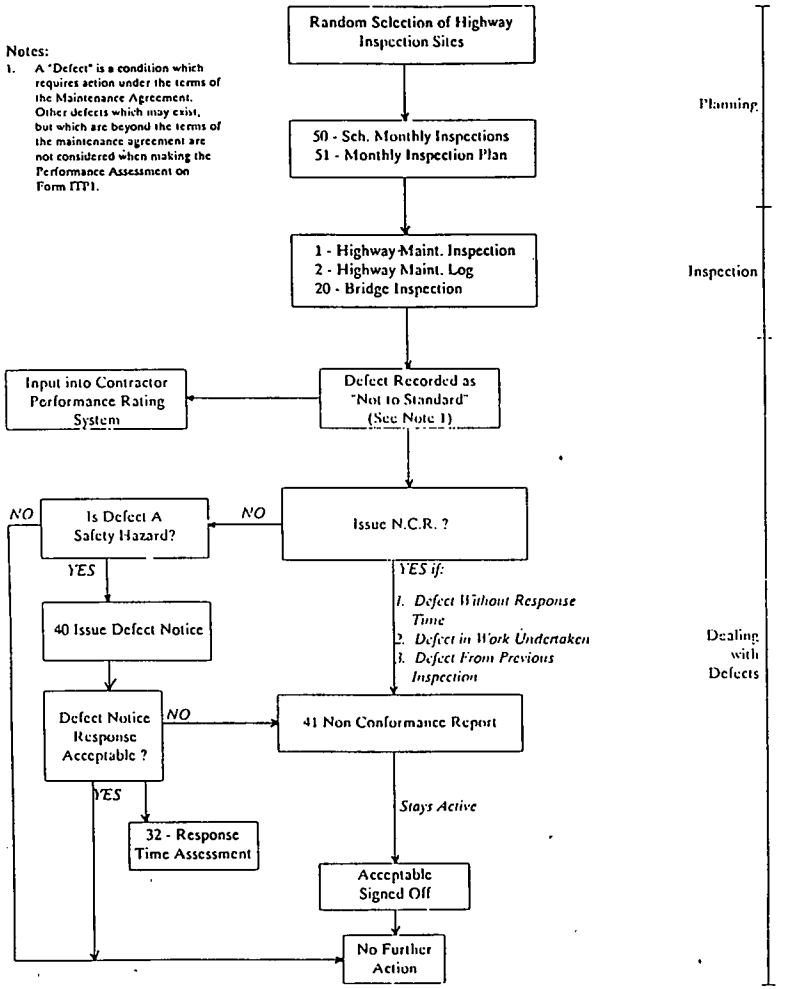
Highway pavement patching will be performed by the contractor as follows:

a) Highway pavement patching will be performed by the Contractor in accordance with the response times set out in Section C.1;

b) XXX square metres of Annual Maintenance Services consisting of major patching comprising single areas in excess of 25 square metres using the overlay patch method, will be performed by the Contractor in accordance with the methods set out in Section B.3 at locations set out in the Annual Maintenance Plan; and

c) XXX square metres of Annual Maintenance Services consisting of major patching comprising single areas in excess of 25 square metres using the replacement patch method will be performed by the Contractor in accordance with the methods set out in Section B.3 at locations set out in the Annual Maintenance Plan.

Figure B-1 -- Flow Chart -- Present State Inspection of Highways and Bridges



PRESENT STATE INSPECTION
OF HIGHWAYS AND BRIDGE
FLOW CHART

Figure B-2 -- Highway Maintenance Inspection Form ITP1

QUALITY ASSURANCE PROGRAM

ITP1

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

HIGHWAY MAINTENANCE INSPECTION

Summer/Winter Highway Class ☐☐ Surface type ☐

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Location:

PRESENT STATE INSPECTION

		N/A	Number of Deficiencies (0–10)	N.C.R. NO.	Defect Notice (Y/N)
SURFACE	Surface				
	Shoulders				
	Curbs and Barriers				
	Pavement Cleaning				
	Dust Control				
	Structures				

		N/A	Number of Deficiencies (0–10)	N.C.R. NO.	Defect Notice (Y/N)
DRAINAGE	Roadside Ditches				
	Culverts/Flumes/Curbs				
	Catch Basins/Manholes				
	Streambeds/Banks				

		N/A	Number of Deficiencies (0–10)	N.C.R. NO.	Defect Notice (Y/N)
ROADSIDE	Signs/Delineators				
	Roadside Mowing				
	Roadside Brushing				
	Roadside Litter/Barrels				
	Fences				
	Roadside Snow/Ice Control				

Comments: _____

Area Manager's Signature

_____

H – 901 (90/05) HB 1301

Figure B-3 -- Highway Maintenance Inspection Log

QUALITY ASSURANCE PROGRAM

ITP2

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

HIGHWAY MAINTENANCE INSPECTION LOG

Summer/Winter Highway Class ☐☐ Surface Type ☐

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Location:

Distance	Surface Type 1	Surface Type 2	Drainage Type 1	Drainage Type 2	Roadside Type 1	Roadside Type 2
0.0						
0.1						
0.2						
0.3						
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4						
1.5						
1.6						
1.7						
1.8						
1.9						
2.0						

Comments _____

Area Manager's Signature

_____

H – 902 (89/09)
HB-1157

Figure B-4 -- Highway Surface Inspection Form

QUALITY ASSURANCE PROGRAM

ITP3

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

HIGHWAY SURFACE INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Location:

Activity No. (applies to 100,130,170 and 100M through 160N)

IN-PROCESS INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Traffic Control					
Site or Base Preparation					
Visual Inspection of Material					
Work Procedure					
Specified Quantity Utilized					
Work Site Clean up					

Material sample taken (Y/N)

Amount (quantity) inspected

Air Temperature (C°) _____ Weather _____

Comments _____

Activity No. (applies to 100,130,140 and 160 and 100M through 160N)

END PRODUCT INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Smoothness (Rideability)					
Crown/Drains properly					
Impermeable/Compaction					
Loose Surface Material					
Dust Free					
Appropriate Location					
Work Site Clean up					

Quantity as stated in work reports (Y/N)

Amount (quantity) inspected

Comments _____

Area Manager's Signature

_____

H — 903 (90/01)
HB 1261

MINISTRY OF TRANSPORTATION
AND HIGHWAYS
HIGHWAY AND BRIDGE MAINTENANCE
QUALITY ASSURANCE PROGRAM

GUIDE TO COMPLETION OF HIGHWAY SURFACE INSPECTION FORM ITP1

In-Process Inspection

i) Traffic Control - As specified in contract?

ii) Site or Base Preparation - Required for such items as major surface treatment - no loose material on surface prior to spraying oil.

iii) Visual Inspection of Material - Lumps in hot mix asphalt? etc.

iv) Work Procedure - As specified in contract?

v) Specified Quantity Utilized - Surface treatment and stabilization have specified application rates.

vi) Work Site Clean-up - Has contractor cleaned up his work area upon completion? Have signs been removed? Highway or work area should be as clean as or cleaner than existed prior to work activity.

vii) Material sample taken - Note here if sample has been taken for independent testing. eg. oil sample, gravel sample, etc.

viii) Amount (quantity) inspected - Note here the quantity of work inspected. eg. 10 m^3 of patching, 200 m^2 of surface treatment.

End Product Inspection

i) Smoothness (Rideability) - As specified in contract? Must be safe at posted speed.

ii) Crown/Drains properly - As specified? Gravel surface is to be properly crowned. Asphalt patches shaped to permit surface run-off.

iii) Impermeable/ Compaction - Patched surface to be impermeable. Visually inspect compaction. If problems arise, core sampling and analysis may be required.

iv) Loose Surface Material - As specified in contract? Required for surface treatment, stabilization.

v) Dust Free - As specified in contract? For dust control and stabilization.

vi) Appropriate Location - Dust control has specific locations (bus stops, residences, school zones) in contract. Check that material has been placed as required.

vii) Work Site Clean-up - As above for In-Process Inspection

viii) Quantity as stated in work reports - Check if Contractor's work report quantity checks with the quantity measured during inspection. If not possible to relate work reports to actual site condition leave blank and note comments.

ix) Amount (quantity) inspected - Note the total work quantity inspected.

Figure B-5 -- Rest Area Inspection Form

QUALITY ASSURANCE PROGRAM

ITP4

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

REST AREA INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Site Number | Name:

Activity 380 only

PRESENT STATE INSPECTION

	N/A	To Standard Good	Fair	Not to Standard	N.C.R. No.
Mowing as specified					
Litter clean up					
Sufficient barrels on site					
Garbage disposal frequency adequate					
Toilet facilities clean					
Toilet accessories in place					
Septic tanks operating					
Buildings clean & hygenic					
Heating system working					
Fixtures in good repair					
Lights functioning					
Tables clean & sealed					
Winter vent covers in place					
Walkways clean of ice/vegetation					
Snow clear from doors & floors					
Site tidy and hygenic					

Comments _____

Area Manager's Signature _____

H — 904 (89/10)
HB-1187

Figure B-6 -- Drainage Inspection Form

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

DRAINAGE INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Location:

Activity No. (applies to 250M 260M, 260N, 260P)

IN-PROCESS INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Traffic Control					
Site or Base Preparation					
Visual Inspection of Material					
Work Procedure					
Specified Quantity Utilized					
Backslope Condition					
Work Site Clean up					

Amount (quantity) inspected

Air Temperature (C°) _____ Weather _____

Comments _____

Activity 250M only

END PRODUCT INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Ditch Cross-section					
Ditch gradient					
Shoulder Clean up					
Debris Removed					
Culvert Ends Clean					
Rock Ditches Clean					
Work Site Clean up					

Quantity as stated in work reports (Y/N) | Amount (quantity) inspected

Comments _____

Area Manager's Signature

_____

H – 905 (88/12)

Figure B-7 -- Roadside Inspection Form

QUALITY ASSURANCE PROGRAM
ITP6

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

ROADSIDE INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Location:

Activity 360M only (BRUSHING)

END PRODUCT INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Distance From Shoulder					
Specified Height					
Unimpeded Drainage					
Specified Location					
Sight Distances Cleared					
Work Site Clean up					

Quantity as stated in work reports (Y/N) | Amount (quantity) inspected

Comments _____

Activity No. (applies to 440M, & 440N) (Signs & Delineators)

END PRODUCT INSPECTION

	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Specified Location					
Visual Inspection of Material					
Specified Type & Size					
Workmanship					
Clean & Legible					
Work Site Clean up					

Quantity as stated in work reports (Y/N) | Amount (quantity) inspected

Comments _____

Area Manager's Signature

_____

H – 906 (88/12)

Figure B-8 -- Winter Highway Inspection Form

QUALITY ASSURANCE PROGRAM

ITP7

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

WINTER HIGHWAY INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Location:(s) (Hwy. No.):

Activity No. (applies to 300, 310) | SURFACE — IN PROCESS — END PRODUCT

	N/A	To Standard Good	Fair	Not to Standard	N.C.R. No.
Preventative Actions Taken (Act. 310)					
Response to Conditions (Act. 300 & 310)					
Safety & Work Procedures (Act. 300 & 310)					
Specified Materials Utilized (Act. 310)					
Snow Removal as Specified (Act. 300)					
Surface Traction as Required (Act. 310)					

Air temperature (C°) | Surface temperature

Comments

Activity No. (applies to 300, 320) | ROADSIDE — IN PROCESS — END PRODUCT

	N/A	To Standard Good	Fair	Not to Standard	N.C.R. No.
Shoulders Clear (Act. 300)					
Rest Area Clear (Act. 300)					
Footpaths Clear (Act. 300 & 320)					
Sight Distances Plowed (Act. 320)					
Response Times Met (Act. 300 & 320)					
Snowdrift Control (Act. 320)					
Glaciation Control (Act. 320)					

Comments

Area Manager's Signature

H-907 (90/01)
HB-1139

B-9 -- Landscape Area Inspection Form

QUALITY ASSURANCE PROGRAM

ITP8

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

LANDSCAPE AREA INSPECTION

Inspection Date (YR MO DY) | Region/ Dist./Area | Highway Number | Site Number | Name:

Activity 390 only — PRESENT STATE INSPECTION

	N/A	To Standard Good	Fair	Not to Standard	N.C.R. No.
Mowing as specified					
Grass Clippings Removed					
Lawn Edges Trimmed					
Lawn Aerated as specified					
Weeds less than 10% of Lawn Area					
Lawn Fertilized as Specified					
Liming as required					
Lawn Replaced as required					
Plantation Beds & Tree Bases Edged					
Plantations Fertilized as required					
Pruning as Required					
Pesticide and Herbicide as Required					
Dead Vegetation & Weeds Removed					
Bark Mulch Replenished as Required					
Damaged Plants Repaired/Replaced					
Litter Cleaned Up					
Debris Removed					
Watering as Required					
Irrigation System in Order					
Backflow Preventors Tested					
Sprinklers Adjusted as Required					
Irrigation System Winterized					
Cleaning Frequency Adequate					

Comments

Area Manager's Signature

H - 908 (88/12)
HB-1185

MINISTRY OF TRANSPORTATION

AND HIGHWAYS

HIGHWAY AND BRIDGE MAINTENANCE

QUALITY ASSURANCE PROGRAM

GUIDE TO COMPLETION OF LANDSCAPE AREA INSPECTION FORM ITP8

ITP 8 is used for Present State Inspections of landscape areas.

The following guidelines are provided for the completion of the form. When in doubt as to what the Contractor's obligations are reference shall be made to the performance standards included in the contract.

i)	Mowing	-	Minimum height of grass to be 40 mm; maximum height 80 mm. There should be no wheel depressions.
ii)	Grass Clippings	-	All clippings are to be removed.
iii)	Lawn Edges	-	Edges are to be trimmed at least twice a year.
iv)	Lawn aerated	-	Lawn aeration should be undertaken each spring to a depth of 100 mm.
v)	Weeds	-	weed presence must not exceed 10% of total area.
vi)	Fertilizing	-	Lawn areas must be fertilized in April, July and October.
vii)	Liming	-	pH should be checked in the spring and adjustment made where necessary by application of lime.
viii)	Lawn Repair	-	There should be no damaged or worn areas.
ix)	Plantation Area	-	Weeds in plantation areas and tree beds must not exceed 50% of the area. Bed perimeters shall be neatly edged.
x)	Plantations Fertilized	-	Beds must be fertilized in April and October.
xi)	Pruning	-	Plants shall be pruned in accordance with the procedures included with the Standards.
xii)	Pesticide/Herbicide	-	Pesticide/herbicide should be applied to lawns and plantation areas to control insect pests and disease as necessary.
xiii)	Dead Vegetation and Weeds	-	All dead vegetation and weeds should be removed.
xiv)	Bark Mulch	-	A minimum depth of 100 cm of bark mulch should exist.
xv)	Damaged Plants	-	There should be no dead or damaged plant material.
xvi)	Litter and Debris	-	All refuse should be removed at the end of the maintenance operation. Sidewalk, highway and gutters should be clear of soil debris and bark mulch.
xvii)	Watering	-	Lawns and plantation areas should be watered each week to 100 mm penetration.
xviii)	Irrigation Systems	-	Irrigation systems should be in good working order.
xix)	Backflow Preventors	-	Backflow preventors shall be operational.
xx)	Sprinklers	-	Sprinklers should be adjusted to provide the design spray patterns.
xxi)	Irrigation System Winterized	-	After October the irrigation systems should be dry.

During Present State Inspections it may not be possible to confirm compliance with certain of the items listed above e.g. fertilizing. If the Area Manager cannot confirm compliance he/she should tick the N/A column.

Figure B-10 -- Bridge Maintenance Inspection Form

Province of British Columbia

Ministry of Transportation and Highways
HIGHWAY AND BRIDGE MAINTENANCE

QUALITY ASSURANCE PROGRAM
ITP20

BRIDGE MAINTENANCE INSPECTION

Inspection Date (Year Month Day) | Region/ Dist./Area | Highway Number | Bridge Number | Name: _____

PRESENT STATE INSPECTION

WORK ACTIVITY	N/A	To Standard Good	To Standard Fair	Not to Standard	N.C.R. No.
Wearing Surface					
Cleaning					
Drains and Flumes					
Joints					
Bearings					
Dolphins and Fenders					
Bailey/Acrow Bridge					
Painting					
Steel Deck					
Concrete Surface Treatment					
Concrete Structure					
Timber Re-decking					
Timber Truss Bridge					
Timber Superstructure					
Piling					
Log Stringer Bridge					
Ballast, Wing, Crib and Retaining Walls					
Timber Surface Treatment					
Steel Multiplates					
Railings					
Signs					
Streambed and Channel					

Date of Contractor Inspection (Year Month Day)

	Yes	No
Frequency of Contractor's Inspection satisfactory?		
For items "Not to Standard" above, did H265 identify it?		

Follow-up action required? If yes, describe _____

Area Manager's Signature _____

H-911 (89/09)
HB-1169

Figure B-11 -- Inspection and Test Plan

MINISTRY OF TRANSPORTATION & HIGHWAYS

HIGHWAY AND BRIDGE MAINTENANCE

INSPECTION AND TEST PLAN

		HIGHWAY SYSTEM INSPECTION TYPE, FREQUENCY & NO.		ACTIVITY INSPECTION TYPE, FREQUENCY & NO.				
#	ACTIVITY	PRESENT STATE	FORM #	PRESENT STATE	IN PROCESS	TESTS	FORM #	REMARKS
ROUTINE MAINTENANCE								
100	Patching	M-15	ITP1		W/M-1	T2/3	ITP3	Weekly during
130	Surface Grading	M-15	ITP1		W/M-1		ITP3	intensive periods
140	Dust Control	M-15	ITP1		W/M-1		ITP3	of activity only,
150	Spot Gravelling	M-15	ITP1					monthly otherwise
160	Shoulder Grading	M-15	ITP1		M-1		ITP3	
170	Road Base	M-15	ITP1				ITP3	
180	Cleaning	M-15	ITP1					
190	Debris Removal	M-15	ITP1					
200	Structures	M-15	ITP1					
210	Line Markings	M-15	ITP1					
220	Curb/Barriers	M-15	ITP1					
250	Ditching	M-15	ITP1					
260	Drainage Appliance	M-15	ITP1					
270	Bed/Bank	M-15	ITP1					
350	Mowing	M-15	ITP1					
360	Brushing	M-15	ITP1					
370	Litter Collection	M-15	ITP1					
380	Rest Area			W/M-A			ITP4	Weekly during summer
390	Landscaping			M-A			ITP8	season only
400	Fencing	M-15	ITP1					
440	Sign/Delineator	M-15	ITP1					
450	Traffic Control	---Site-----Specific----			M-1		ITP9	Included with
460	Traffic Patrol	---Site-----Specific----			M-1		ITP9	other activities for
470	Movable Bridge/Ops	---Site-----Specific----			M-1		ITP9	traffic control of
480	Monitoring	---Site-----Specific----			M-1		ITP9	work sites
500	Bridge Wear Surface	M	IPT20					
510	Bridge Cleaning	M	IPT20					
520	Bridge Drain/Pipe	M	IPT20					

Appendix C

Questionnaire Summary

Questionnaires were sent to all fifty states plus Puerto Rico and the District of Columbia, the ten Canadian provinces and selected cities and counties. The responses from those questionnaires are summarized in this appendix.

1. Additions to the description of maintenance

The following definition for maintenance was included in the questionnaire:

Highway maintenance is typically defined as including work such as repair of travelway surfaces, shoulders, roadsides, drainage facilities, bridges, tunnels, signs, markings, lighting fixtures, and truck weighing and inspection facilities; traffic services such as lighting and signal operation, and snow and ice removal; and operation of roadside rest areas, movable span bridges, and the like.

Agencies were requested to add any other major types of highway work classified as maintenance in their agencies. Eight states, two provinces and three other transportation agencies responded to this question. The responses included these additions:

- Concrete replacement
- Gravel road surface replacement
- Roadway inspection
- Sidewalk, curb and gutter
- Maintenance of trails (bike paths)
- Landscape design
- Leaf collection
- Tree maintenance
- Weather monitoring
- Roadway weather information
- Snow and ice condition reporting
- Snow fence repair
- Avalanche control
- Hydraulic-cement-concrete pavement patching
- Freeway traffic management
- Pavement widening for signal location
- Temporary signal location
- Towing vehicles from right-of-way
- Ferry operation
- Dry dock repair and ferry boat maintenance
- Tunnel ventilation control
- Environmental cleanup and monitoring
- Maintenance facility management
- Building repair
- Department house operation and repair
- Truck washing
- Material stockpiling
- Site specific reconstruction

No agency gave the same addition as another agency.

2. Do you contract for any highway maintenance services? If no, why not?

Forty-one states, seven provinces and nine other transportation agencies responded to the question for a total of fifty-seven responses. All contracted for some highway maintenance services except Puerto Rico, West Virginia, and Hillsborough County.

Puerto Rico responded to the second part of the question by listing the following reasons for not contracting:

- No maintenance contractors are available;
- Laborers are paid minimum wages; and
- Maintenance equipment is available at minimum prices.

West Virginia plans to contract for maintenance services in the future. Hillsborough County did not respond to the second part of the question.

3. What factors are considered in deciding to contract for maintenance?

Fifty-three agencies responded to this question: thirty-eight states, seven provinces and eight other agencies. There were 378 individual responses:

Limitation of in-house staff	51	Legal restrictions on contracting	16
Need for specialized equipment	50	Employee contract restrictions	11
Need for specialized personnel	44	Relations with contracting community	1
Cover peak work loads	42	Statutory requirement	1
Obtain services at lower cost	38	Supplement in-house staff	1
Executive policy	37	Provide higher service levels	1
Emergency work	35	Improved flexibility	1
Improve responsiveness	31	Political direction	1
Legal restrictions on force account	16	Any work that can be planned and controlled	1

4. Describe your process for deciding whether to contract for maintenance.

Thirty-eight states, seven provinces and eight other agencies responded to the question. Of these, nine states and one other agency provided no descriptions or responded only that they had no process or no formal process. The response summaries below are for the agencies providing any descriptive comments.

- ***Arizona.*** Decision is based on Engineering District's desire to contract a maintenance activity. Factors used in deciding whether to contract are: staffing, skills required, and quantity of work.
- ***California.*** Limits on contracting are imposed by the Civil Service Act and State Contracting Law. Technical considerations also limit contracting; the considerations involve response and liability. The Government Code permits contracting when: "The contract is for a new state function and the Legislature has specifically mandated or authorized the performance of the work by independent contractors."
- ***Delaware.*** District needs are weighed against available personnel, and decisions are based on funds available. Contracts for measurable work are prepared, advertised and awarded.
- ***Hawaii.*** None. Determined by maintenance engineer.
- ***Idaho.*** No formal process. Contract maintenance selection is based on cost effectiveness.
- ***Illinois.*** Districts assess maintenance needs and on-board resources to determine where and how to spend their contract allocation.
- ***Iowa.*** Generally, contract work is used when the work required exceeds the capabilities of in-house staffing or when the equipment needed is not owned by the Department.
- ***Kansas.*** Districts prioritize and initiate projects, which are reviewed and approved by headquarters.
- ***Maine.*** Decided on a project-by-project basis.

- ***Maryland.*** No written policy. Decision made by District Maintenance Engineer based on the specialty of the work, equipment needed, and availability of manpower.
- ***Massachusetts.*** Determine the quantity of work to be performed. Analyze what can be done by force account. Prepare proposals for contract maintenance using the funds available for the purpose.
- ***Mississippi.*** Maintenance is contracted when: staff can not provide required level of service; there are proven cost savings by contracting; the required equipment is too specialized or costly; or specialized personnel are needed for short periods.
- ***Nevada.*** Contracting is used if there are insufficient Department personnel, equipment or skills.
- ***New Hampshire.*** Thin hot-mix overlays are always contracted as determined over thirty years ago to be better suited to contracting because of economic and logistic reasons. Other work is contracted based on the judgment of District Engineers considering priorities, work load and funding availability.
- ***New Jersey.*** Based on available personnel and/or funds. Recommended by Bureau of Maintenance Support.
- ***North Carolina.*** Board of Transportation policy requires contracting of mowing, rest area operations, and some drawbridge operations. The specifics for decisions come after input from field divisions (districts). Other contracts may be handled by the divisions.
- ***North Dakota.*** The criteria are: ease of quantity measurement, inspection, etc.; avoidance of large equipment expenditures; pressure from contractors; and costs comparable to in-house costs.
- ***Ohio.*** Based on need and funding. Funding levels determine how many types of work are done. Districts determine their own needs and produce plans based on the allocation for their district.
- ***Oklahoma.*** Criteria are: (1) shortage of available equipment and manpower; (2) economics; and (3) statutory requirements.
- ***Oregon.*** Based on in-house study of contractor versus in-house costs, dated 1987-88.
- ***South Carolina.*** Contracts are recommended by District Engineering Administrator primarily based on work load and manpower allocation. State Maintenance Engineer considers the recommendations with reference to funds and statewide network needs.
- ***South Dakota.*** Field determines what work they cannot perform because of lack of personnel, expertise or necessary equipment.
- ***Tennessee.*** To preserve the investments made in state highways and bridges; to provide adequate levels of safety and reasonable convenience to the highway user; to ensure proper utilization of all available resources; to improve responsiveness to maintenance demands; to obtain specialized equipment and personnel; and to cover peak loads.
- ***Texas.*** Criteria are availability of contractors in sufficient quantities to promote competition and contract versus in-house cost (work at a savings of 10% or more from in-house must be contracted).
- ***Utah.*** The criteria are: costs, time constraints and nature of the work. District Maintenance Engineer and Engineer for Maintenance are involved in the decision-making process.

- ***Virginia.*** Make versus buy analysis.
- ***Washington.*** The goal is to maximize the value received from funds. Primarily, the Department attempts to contract items that it cannot do as efficiently or inexpensively as a contractor. This may be because of specialized equipment or methods of operation. Emergency situations often require contract work because of the immediate need for labor, equipment and material.
- ***Wisconsin.*** All work is contracted to counties by law.
- ***Wyoming.*** Certain categories are budgeted and contracted as special maintenance projects, such as pavement overlays, structure repair, snow fence, right-of-way fence, ports of entry, and emergency repairs.
- ***Alberta.*** An operations conference is held annually and is attended by the head office and district staff who have maintenance responsibilities. Suggestions for maintenance contracts are formulated at the conference and sent to the Department's senior executive for approval.
- ***British Columbia.*** All maintenance is contracted by government policy based on reduced direct costs and corollary benefits.
- ***Newfoundland.*** Maintenance is contracted if personnel and equipment are not available in a particular area.
- ***Nova Scotia.*** maintenance generally is contracted when workload is in excess of what can be handled by Department crews; some specialty services are contracted.
- ***Ontario.*** Local cost/benefit is required. District Engineers consider cost and practicality in making decisions for their areas. Head office exercises control by dictating the split between salary and operating budgets.
- ***Quebec.*** No formal process. Any work that can be planned and controlled can be contracted. Executive policy.
- ***Saskatchewan.*** Major initiative within the past five years was political/executive direction. Activities which were selected were those most similar to construction crew activities, such as seal coating, gravel crushing and asphalt-mix stockpiling. Additional items such as mowing have been added based on sample contracts and a cost comparison to in-house work. If contracting is less expensive than in-house work, that particular activity is extended.
- ***Massachusetts Metropolitan District Commission.*** Magnitude of project and staff limitation.
- ***Forest Service.*** Each National Forest makes its own decision; no service-wide decision-making process.
- ***Kent County, MI.*** Supervisory decision as to cost effectiveness and if needed to balance workload.
- ***Maricopa County, AZ.*** Within legal guidelines and Department policy, the decision-making is flexible and depends on factors existing at the time.
- ***San Diego County, CA.*** Maintenance contracting is dependent on the availability of force-account staffing and equipment. For longer projects, such as tree trimming, the cost and time to complete are considered.
- ***Prince George's County, MD.*** No specific process; based primarily on supervisory and administrative recommendations.

- ***Kansas City, MO.*** Maintenance is contracted when the City does not have the manpower and equipment to do the work.

5. Is contract maintenance budgeted separately from regular maintenance? If no, please indicate how your agency programs funds for each of its contract maintenance categories. If yes, can funds be transferred between categories?

Fifty-four agencies responded to the first question in this set. Twenty-eight answered that contract maintenance was budgeted separately from regular maintenance; twenty-six responded that it was not. Of the twenty-eight, twenty-four were states, two were provinces and two were other transportation agencies. Fifteen states, five provinces and six other transportation agencies responded that contract maintenance was not budgeted separately from regular maintenance.

The responses to the second question in this set should have corresponded to the "no" responses of the set's first question. However, two of the other transportation agency "no's" did not respond to the second question, and two states that answered "yes" to the first question (Iowa and Virginia) qualified their answers by completing the second question. The twenty-six responses to the second question are summarized below.

- ***Arizona.*** Funding for maintenance contracts is distributed to the Engineering Districts but not separately identified as contract funding. Pavement rehabilitation is budgeted separately from regular maintenance.
- ***California.*** Based on history, policy and legislative approvals.
- ***Delaware.*** Budgetary requests and experience influence the amounts programmed.
- ***Iowa.*** Maintenance funding is used for mowing and rest-area turf maintenance.
- ***Maine.*** Funds are from regular section appropriations.
- ***Maryland.*** Maintenance contracts are paid out of the annual district maintenance budget.
- ***Michigan.*** Part of regular maintenance.
- ***Mississippi.*** Funds for contract maintenance are included in the routine maintenance budget.
- ***New Hampshire.*** Contracts are procured through competitive bidding.
- ***New Jersey.*** Material needs and contract services are lumped together.
- ***North Carolina.*** Contractor payments are charged against the routine maintenance account.
- ***South Carolina.*** Funding categories are: ordinary (routine) maintenance, extraordinary (emergency) maintenance, and maintenance resurfacing.
- ***Texas.*** Use of routine maintenance funds for contracting is discretionary by the districts.
- ***Virginia.*** As part of regular budgeting process, field personnel estimate the amount of work to be performed by contract. However, this designation is within a budget line item, so fund transfers are required.
- ***Washington.*** The budget is based on history and modified by changes to the system and a projection of current needs. The funds are categorized by specific maintenance function. Funds programmed for a function can be spent on either contract work or State forces.
- ***Wisconsin.*** Agency does not program funds for maintenance categories.

- ***Alberta.*** Each district is provided with funds for maintenance and administers the budget as required.
- ***British Columbia.*** No in-house maintenance.
- ***Newfoundland.*** Contracting decisions are made by each of four regions. Funds are for summer and winter maintenance.
- ***Quebec.*** Some specific budget items are attached to maintenance work.
- ***Saskatchewan.*** Funding is based on the level of service provided. Contracting is simply a method of providing the service. The funds for any activity are based on the estimated costs for both contracted and in-house work. Adjustments are made as actual or tendered costs become known.
- ***Forest Service.*** Local units submit budget requests that are consolidated at the regional and national levels. Fund allocations are distributed to local units, where the local managers determine the mix of contract and force account maintenance.
- ***Hennepin County, MN.*** Maintenance contracts are in a separate account in the operating budget.
- ***Maricopa County, AZ.*** The decision to contract is made after the budget is prepared.
- ***San Diego County, CA.*** Funds are in the routine maintenance budget; work is performed under purchase orders. Each area contracts for work that it cannot perform.

The responses to the third question in the set should have corresponded with the affirmative responses to the first question in the set. However, twenty-eight states (instead of the expected twenty-four), three provinces (instead of two) and two (out of two) other transportation agencies responded to the question. Arizona, California, Delaware and New Hampshire answered the third question "yes" after responding "no" to the first question. Quebec answered "no" to both the first and third questions in the set.

Including only agencies that budget contract and regular maintenance funds separately (responded "yes" to the first question), fourteen states, one province and one other agency indicated that funds could be transferred between budgets. Ten states, one province and one other agency indicated that funds could not be transferred.

6. Does the scope of maintenance contracts cover (a) overall maintenance of a designated highway section? (b) all work in a specialty in a district or area? (c) specialty work at a specific location? (d) other? Please give examples of when each type is used.

Fifty-three agencies responded to the question, including thirty-nine states, seven provinces and seven other agencies. There were eighty-nine positive responses, distributed as follows:

Overall maintenance of a designated highway section	5
All work in a specialty in a district or area	30
Specialty work at a specific location	49
All maintenance in all areas	2
Emergency work	2
No scope category	1

Delaware, Nevada, Newfoundland, Saskatchewan, and Hennepin County answered in the category "overall maintenance on a designated highway section." British Columbia and Wisconsin answered "all maintenance in all areas."

We used the three main categories for examples of when each type of contracting is used. The examples given for the first category, "overall maintenance of a designated highway section," were:

- ***Delaware***. Roadside mowing is usually by maintenance area.
- ***Nevada***. Chip seals.
- ***Wisconsin***. All work.
- ***British Columbia***. In all twenty-eight areas of the Province.
- ***Newfoundland***. In remote areas where the Department does not have equipment capability.
- ***Saskatchewan***. Maintenance of remote earth/gravel roads used for resource extraction (forestry, for example).
- ***Hennepin County***. Contract with the City of Minneapolis for all routine maintenance of county highways within the City limits.

Delaware's and Nevada's examples probably should be placed in the category "all work in a specialty in a district or area."

The examples given for the second category, "all work in a specialty in a district or area," were:

- ***Arizona***. When contracting is the most economical or when ability and means are not available to the Department. Example activities are sweeping, mowing and Vactor cleaning of drainage structures.
- ***Arkansas***. Crack sealing is contracted when the percent of accomplishment falls below normal. Guardrail maintenance is contracted in the Little Rock area when sufficient damage occurs.
- ***Delaware***. Herbicide treatment is usually performed by the districts but can be statewide for specific problems.
- ***Florida***. Activities given but scope classifications are not specified.
- ***Idaho***. Brush removal, brooming and litter pickup.
- ***Illinois***. Guardrail maintenance for expressways in Chicago.
- ***Maryland***. Specific work contracts are advertised for each district from a central location.
- ***Mississippi***. Street sweeping.
- ***Nevada***. Weed spraying.
- ***North Carolina***. Mowing generally is for all work in a county.
- ***North Dakota***. Striping is for all roads in a particular district or statewide for freeways.
- ***Ohio***. Guardrail repair as needed, by work order.
- ***Oklahoma***. Rest area maintenance in a division.
- ***Oregon***. Mowing and/or spraying.
- ***Pennsylvania***. Mowing, spraying, tree work and guide fence repair are by county.
- ***South Carolina***. Resurfacing in a county. Sign fabrication and erection on the Interstate.
- ***South Dakota***. Guide rail and sign refurbishing.
- ***Tennessee***. Attenuator and guardrail contracts are based on detailed geographical areas.

- ***Texas***. Guardrail repair and pavement marking.
- ***Virginia***. Guardrail repair and resurfacing.
- ***Washington***. Roadway sweeping, luminaire lamp replacement, machine asphalt patching, litter pickup and tree removal.
- ***Wisconsin***. All work.
- ***Alberta***. Mowing and gravel road maintenance.
- ***Newfoundland***. Asphalt crack sealing and bridge cleaning.
- ***Nova Scotia***. Sand sealing and crack sealing.
- ***Saskatchewan***. Seal coating for the entire province and mowing in most areas.
- ***Hennepin County, MN***. Contract with township for blading of one gravel road.
- ***Kent County, MI***. Street sweeping, catch basin cleaning, snow plowing and mowing roadsides.
- ***Prince George's County, MD***. County-wide sweeping on set routes at specific intervals; county-wide tree trimming and removal for specific subdivisions; and mowing on specific routes.

Examples for the third category, "specialty work at a specific location," were:

- ***Arizona***. When it is the most economical and practical, such as for rest areas and picnic areas.
- ***Arkansas***. Litter control.
- ***California***. Base repair, crack sealing, rehabilitation of Class 3 (low-volume) roads, PCC maintenance, extended plant establishment (watering, trimming and fertilizing of newly acquired areas), roadside rest area maintenance, graffiti removal, tree trimming, major repair and replacement of bridge structural members, bridge structural steel cleaning and painting, major repair to bridge decks and replacement of joint seals, maintenance of pumps, maintenance of ferry facilities, traffic signal and counter loop detection maintenance, servicing and repair of traffic message signs and closed-circuit television systems, group re-lamping, non-standard guardrail replacement, installing inlaid thermoplastic stripe, sign replacement, and raised pavement marker maintenance.
- ***Connecticut***. Landscape crew, bridge repair crew and drainage crew.
- ***Delaware***. Control of brush in gore areas, control of noxious weeds, selective removal of broadleaf weeds in turf, and selective removal of undesirable vegetation in medians, in islands and under guardrails. Snow removal, crack sealing and concrete patching are road-specific but could be by area, district or statewide.
- ***Florida***. Activities given but scope classifications are not specified.
- ***Georgia***. Resurfacing of a specific section of road and barrier wall sweeping on the Interstate.
- ***Hawaii***. Landscape maintenance at an interchange or along a short section of road (about four miles long).
- ***Idaho***. Seal coats, bridge painting, specialized bridge repairs, aggregate production, and culvert repair and replacement.
- ***Illinois***. Patching, intermittent resurfacing, bridge painting and bridge repair.

- ***Iowa.*** When the work is craft-oriented and functional in nature (for example, crack filling and patching).
- ***Kansas.*** Surface overlays, crack repairs, highway lighting, and spraying for noxious weeds.
- ***Louisiana.*** Mowing.
- ***Maine.*** Snow and ice control for defined highway segments, specialty work such as guardrail installation. Also, edgelines on low-volume rural roads one year and pavement marking on the Interstate another year.
- ***Maryland.*** Contract mowing on specific routes.
- ***Massachusetts.*** To supplement force-account work.
- ***Michigan.*** Joint repair on a specific highway at specific locations.
- ***Mississippi.*** Rest area or welcome center.
- ***Missouri.*** Herbicide spraying for noxious weeds and slide repairs with extra heavy equipment.
- ***Nevada.*** Culvert cleaning.
- ***New Hampshire.*** Hot-mix overlays.
- ***New Jersey.*** Mowing, traffic striping, landscape pesticide application, tree trimming, sweeping, etc.
- ***North Carolina.*** Most contract work except for mowing.
- ***North Dakota.*** Chip sealing is by designated section of highway. Bituminous patching is by location. Rest area maintenance is by site.
- ***Ohio.*** Resurfacing, bridge repair and painting, guardrail and fence replacement, drainage structures, slips, berm widening, etc.
- ***Oklahoma.*** Cold milling.
- ***Oregon.*** All work that is site-specific.
- ***Pennsylvania.*** Bridge repair, surface maintenance, and roadside rest area maintenance.
- ***South Carolina.*** Bridge repair and rest area and welcome center maintenance.
- ***South Dakota.*** Bridge beam repair and bridge painting.
- ***Tennessee.*** Slide repair projects are designed to meet specific requirements at specific locations.
- ***Texas.*** Mowing and rest area maintenance.
- ***Utah.*** Activities such as chip seals, crack sealing, plant-mix seals, slurry seals, etc. in each district.
- ***Vermont.*** Building or repair of a specific item such as a maintenance shed.
- ***Virginia.*** Bridge repairs, Portland cement concrete pavement repairs, rest area maintenance and custodial work.
- ***Washington.*** Tunnel cleaning, generator maintenance, and the use of specialized equipment with an operator.
- ***Wisconsin.*** All work.

- ***Wyoming.*** Any work that exceeds the Department's capabilities.
- ***Alberta.*** Campground maintenance, rest area maintenance and crack sealing.
- ***Newfoundland.*** Repairs to cables at a lift bridge, and sand blasting.
- ***Nova Scotia.*** Bridge painting, concrete bridge repairs, and building repairs.
- ***Ontario.*** Winter control and guiderail repair.
- ***Saskatchewan.*** Thin overlays and intensive/extensive local pavement repair.
- ***Hennepin County, MN.*** Contract for milling of urban roadways prior to resurfacing.
- ***Kent County, MI.*** Overlays, hauling gravel to a site, pipe cleaning, and seal coating.
- ***Maricopa County, AZ.*** Slurry seals, milling, special structures, crack sealing, and chip sealing.
- ***Prince George's County, MD.*** Lawn care services, storm drain channel cleaning, and servicing of pumping equipment and controls.
- ***Kansas City, MO.*** Pavement marking because of not enough labor or equipment to cover the entire city. Towing because of insufficient manpower and equipment to tow all vehicles. Specialized work on traffic signals and street light repair or replacement. Asphalt overlay, cold milling and crack sealing because the city does not have the equipment or manpower.

7. How are bids solicited for contract maintenance? When is each type used?

Fifty-two agencies responded to the question: thirty-seven states, seven provinces and eight other agencies. The respondents answered with a total of 139 separate responses:

Newspaper advertisements	47	State bulletins	4
Direct mailings	37	Department bulletins	2
Telephone solicitations	28	Other means	10
Trade magazines	11		

Fifteen states, three provinces and four other agencies answered that they used newspaper advertisements for all or virtually all contracts. Other responses were:

- ***Delaware.*** Contracts greater than $10,000 are advertised in newspapers for two consecutive weeks.
- ***Illinois.*** All bids greater than $10,000.
- ***Maryland.*** All contracts greater than $25,000 are by law published in the "Maryland Register" thirty days prior to bid opening.
- ***Massachusetts.*** Normal contract work.
- ***Michigan.*** For common work such as rest area building cleaning.
- ***Missouri.*** Contracts at various locations and building construction.
- ***Nevada.*** Contracts greater than $50,000.
- ***New Hampshire.*** All major work.
- ***New Jersey.*** When the cost is greater than $8,000 and only in conjunction with direct mailings.

- ***North Dakota.*** Major highway-type work, sealing, striping, etc. advertised with construction projects.
- ***Ohio.*** Unclear. Possibly for all work.
- ***South Carolina.*** Contracts greater than $100,000.
- ***Utah.*** Contracts greater than $20,000 (by law).
- ***Virginia.*** When the standard procedure is used.
- ***Washington.*** Contracts greater than $30,000.
- ***Wyoming.*** All projects (as opposed to specialty work).
- ***Nova Scotia.*** Bridge painting, sand sealing, and construction greater than $100,000.
- ***Ontario.*** Small contracts or for lists for emergencies.
- ***Quebec.*** When a public tender is required.
- ***Hennepin County, MN.*** Always for larger projects.
- ***San Diego County, CA.*** Projects greater than $10,000.

Ten states, no provinces and no other transportation agencies used direct mailings without qualification for all contract work. Other responses were:

- ***Arizona.*** Contractors may request to be put on the State Bid List for specific types of work. Mailings are then automatic.
- ***Delaware.*** Contracts greater than $5,000. (Letter bids are sent to at least five prospective bidders when the contract is between $5,000 and $10,000. Direct mailings are always used for contracts of $10,000 or more.)
- ***Georgia.*** On all resurfacing projects and sweeping contracts.
- ***Maine.*** To request quotations from known sources.
- ***Maryland.*** For previous snow-removal contractors.
- ***Missouri.*** Rest area maintenance and building construction.
- ***Nevada.*** Contracts less than $50,000.
- ***New Jersey.*** When the cost is between $2,500 and $8,000. When the cost is greater than $8,000, direct mailing is done in conjunction with newspaper advertisements.
- ***Ohio.*** To prequalified bidders for minor repair work.
- ***Oklahoma.*** To all prequalified bidders.
- ***Pennsylvania.*** Contracts greater than $1,500.
- ***South Carolina.*** Small bridge repair contracts between $10,000 and $100,000.
- ***South Dakota.*** All work other than for emergency situations.
- ***Tennessee.*** The Department has a notice to contractors of some highway bids. This notice is mailed to all contractors.
- ***Virginia.*** When the standard procedure is used.
- ***Washington.*** Contracts less than $30,000.

- ***Nova Scotia.*** Concrete bridge repairs, crack sealing, and work for which few firms have expertise.
- ***Ontario.*** Contracts requiring pre-qualification.
- ***Forest Service.*** All contracts except those for which there are telephone solicitations.
- ***Hennepin County, MN.*** To notify previous bidders/contractors.
- ***Kent County, MI.*** When a bid list is used.
- ***Maricopa County, AZ.*** If a list of interested firms is available.
- ***San Diego County, CA.*** Projects less than $10,000.
- ***Kansas City, MO.*** Work greater than $2,500.

The use of telephone solicitations is summarized below.

- ***Delaware.*** Contracts less than $5,000.
- ***Georgia.*** Emergency repairs.
- ***Iowa.*** Only for emergency repairs.
- ***Maryland.*** Emergency short-term contracts, contracts for specialty equipment rental, and small informal contracts.
- ***Massachusetts.*** Emergency work.
- ***Michigan.*** When a limited number of vendors is known for specific type of work.
- ***Missouri.*** Force account contracts.
- ***Nevada.*** Contracts less than $50,000.
- ***New Hampshire.*** Very small and localized work that would be impractical to advertise statewide.
- ***New Jersey.*** When the cost is less than $2,500.
- ***North Dakota.*** Small emergency repairs.
- ***Oklahoma.*** Emergency bid procedure.
- ***Pennsylvania.*** Contracts less than $1,500.
- ***South Carolina.*** Contracts less than $10,000.
- ***South Dakota.*** Emergency situations.
- ***Texas.*** Emergency situations.
- ***Virginia.*** Emergency contracts needing immediate response.
- ***Washington.*** Contracts less than $2,500 and emergency or disaster maintenance contracts.
- ***Wyoming.*** Specialized work.
- ***Nova Scotia.*** Small repair jobs handled by districts such as building repairs, some storm sewer repairs, and gravel crushing.
- ***Ontario.*** Rental equipment, small hauls and emergencies.
- ***Forest Service.*** Small contracts of limited scope and emergency repairs.

- ***Hennepin County, MN.*** Used with specialized work or to expedite a contract.
- ***San Diego County, CA.*** Emergency or urgent work less than $10,000.
- ***Kansas City, MO.*** Work less than $2,500.

The use of trade magazines is summarized below.

- ***Massachusetts.*** Normal contract work.
- ***New Hampshire.*** All major work.
- ***Oregon.*** Each time.
- ***Pennsylvania.*** Contracts greater than $1,500.
- ***Vermont.*** When a contract is desired.
- ***Ontario.*** Larger jobs -- resurfacing, for example.
- ***Quebec.*** Used in an administrative region for small contracts.
- ***Massachusetts Metropolitan District Commission.*** All work.
- ***Kent County, MI.*** Specialty work when contractors are outside of the immediate area.
- ***San Diego County, CA.*** Projects greater than $10,000.

Other responses were:

- ***California.*** State bulletin is always used. Highway department bulletin is always used. Both are subscription services.
- ***Illinois.*** State bulletin is used (which also is published in the State newspaper).
- ***Oklahoma.*** Specialized contracts for buildings are handled by the State Board of Affairs' Construction and Property Division.
- ***Pennsylvania.*** State bulletin is used for contracts greater than $1,500.
- ***Texas.*** Job fairs are used when available.
- ***Wisconsin.*** Highway department bulletin is used for all work.
- ***British Columbia.*** A general public request for proposals is used for all work.
- ***Massachusetts Metropolitan District Commission.*** State bulletin is used for all work.
- ***Forest Service.*** The Commerce Business Daily is used for most contracts.

8. Is maintenance contracting centralized, decentralized or both? If both, where are bids requested (central, districts or areas) for each type of work contracted? What are the criteria to determine where bids are solicited?

Fifty-four agencies responded to the first question in this set, including thirty-nine states, seven provinces and eight other transportation agencies. Centralized maintenance contracting was reported by twenty-two states, two provinces and five other transportation agencies. Decentralized maintenance contracting was reported by five states, one province and two other transportation agencies. Twelve states, four provinces and one other transportation agency reported both centralized and decentralized maintenance contracting.

Twenty-seven states, six provinces and six other transportation agencies reported activities for which bids were requested centrally. The activities and number of responses were:

Bridge painting	28	Landscape maintenance	12
Major bridge repairs	27	Repair minor drainage structures	12
Resurfacing	27	Replace drainage structures	12
Asphalt mix production	25	Roadside improvements	12
Aggregate production	24	Traffic signal maintenance	12
Mowing	23	Sign repair	11
Litter pickup	22	Structure improvements	11
Planing/milling	22	Clean culverts	10
Seal coating	22	Hand patching	10
Rest area maintenance	20	Ditching	9
Crack sealing	19	Erosion control	9
Herbicide treatment	19	Pavement message painting	8
Snow and ice control	19	Bridge safety inspections	7
Equipment repair	18	Clean sewers	7
Striping	18	Movable span maintenance	7
Drainage improvements	17	Blading unpaved shoulders	6
Guardrail maintenance	17	Bridge cleaning	6
PCCP joint repair	17	Bridge operations	5
Roadway sweeping	17	Emergency call service	5
Brush and tree cutting	16	Installing driveway pipes	5
Major slide repair/removal	15	Slabjacking	5
Minor bridge repairs	15	Slurry sealing	5
Roadway improvements	15	Patching unpaved shoulders	4
Lighting maintenance	14	Road patrol	4
Sign fabrication	14	Delineator maintenance	3
Trash collection	14	Sign cleaning	3
Emergency maintenance	13	Blading unpaved roads	2
Equipment service	13	Heater scarification and thin overlay	2
Fence maintenance	13	Sign and/or striping improvements	2
Machine patching	13	Weigh station operations	2
Shoulder improvements	13	All maintenance for an area	1
Traffic operations improvements	13	All work greater than $5,000	1
Attenuator repair	12	Building repairs	1
Catch basin cleaning	1	Fertilizer placement	1
Concrete bridge repairs	1	Hot mix overlays - public tender	1
Concrete patching	1	Maintenance paving	1
Deck overlays	1	Major work	1
Drainage materials	1	Planned contracts	1
Fabric underliner	1	Raised pavement markers	1
Ferry operation	1	Regular maintenance	1

Ten states, four provinces and two other transportation agency reported activities for which bids were requested in districts. The activities and number of responses were:

Emergency maintenance	7	Clean sewers	3
Herbicide treatment	7	Delineator maintenance	3
Mowing	7	Ditching	3
Rest area maintenance	7	Drainage improvements	3
Striping	7	Erosion control	3
Brush and tree cutting	6	Installing driveway pipes	3
Crack sealing	6	Minor bridge repairs	3
Lighting maintenance	6	Patching unpaved shoulders	3

Litter pickup	6	Slabjacking	3
Machine patching	6	Structure improvements	3
Major slide repair/removal	6	Traffic signal maintenance	3
Aggregate production	5	Attenuator repair	2
Bridge painting	5	Emergency call service	2
Fence maintenance	5	Movable span maintenance	2
Guardrail maintenance	5	Pavement message painting	2
Hand patching	5	Roadside improvements	2
Landscape maintenance	5	Roadway improvements	2
Major bridge repairs	5	Shoulder improvements	2
Planing/milling	5	Sign cleaning	2
Repair minor drainage structures	5	Sign fabrication	2
Seal coating	5	All work less than $5,000	1
Sign repair	5	Bridge cleaning	1
Snow and ice control	5	Bridge safety inspections	1
Trash collection	5	Building repairs	1
Asphalt mix production	4	Ferry operation	1
Clean culverts	4	Hauling sand	1
Equipment repair	4	Hot mix overlays - negotiated	1
Equipment service	4	Local/minor work	1
PCCP joint repair	4	Sign rehabilitation	1
Replace drainage structures	4	Slurry sealing	1
Resurfacing	4	Small road material stockpiles	1
Road patrol	4	Small work	1
Roadway sweeping	4	Small, short-term contracts	1
Traffic operations improvements	4	Special work	1
Blading unpaved shoulders	3	Tunnel cleaning	1
Bridge operations	3	Weigh station operations	1

One state, no provinces and one other transportation agency reported activities for which bids were requested in areas. The activities and number of responses were:

Digout, rebase	1	Sidewalk repair	1
Drilling, blasting	1	Signal maintenance	1
Sealing	1	Sweeping	1
Mowing	1	Special work	1

The responses to the last question in this set, "What are the criteria for where bids are solicited," were:

- ***Arizona.*** Location of work (state border areas) and type of work. If work can be serviced locally, it may be advertised locally.
- ***Arkansas.*** Bids are results of work proposals by districts sent to and approved by central office. The procurement section advertises projects and awards contracts.
- ***California.*** Bids are always solicited except when an emergency is declared. All projects greater than $39,000 are central bids.
- ***Connecticut.*** Criteria are set by the Department of Administrative Services. DOT Purchasing keeps a list of vendors from an application procedure. Bid requests are sent to all vendors submitting a bid on a similar project the last time bids were requested. Also use SBE/DBE directories.
- ***Delaware.*** Set by field conditions as to the extent and type of vegetation; available manpower in each maintenance area/district.

- ***Florida.*** Set by Florida statutes.
- ***Hawaii.*** Set by state DOT contract procedures.
- ***Idaho.*** Determined by the size of contract to be awarded and type of work to be accomplished.
- ***Iowa.*** Bids are solicited in the same manner as for construction activities.
- ***Maine.*** Snow removal contract bids are solicited in the general vicinity of the work. Guard rail contract bids generally are solicited from statewide specialty contractors. Paving bids are solicited statewide at least. Striping is solicited from specialty contractors.
- ***Michigan.*** Which group wants the work done and has budgeted funds.
- ***Mississippi.*** Determined by districts based on need and location of work.
- ***Missouri.*** Size and scope of project and availability of contractors.
- ***Nevada.*** District if less than $50,000; central if more than $50,000.
- ***New Hampshire.*** Small contracts are bid in local areas where the contract work is planned. Larger contracts are bid centrally.
- ***New Jersey.*** By State statues, either through Treasury Department or DOT Procurement.
- ***North Carolina.*** Contractors must be pre-qualified. On certain contracts, contractors must attend a pre-bid conference to qualify.
- ***North Dakota.*** Few big contracts are centralized; many small contracts are decentralized.
- ***Oregon.*** Dollar amount.
- ***Pennsylvania.*** If labor costs fifty percent or more of the project, the district obtains the bids (service purchase contracts).
- ***Tennessee.*** Non-emergency contracts are advertised, reviewed and awarded through the Construction Division's normal highway lettings. Emergency contracts are administered through headquarters' Maintenance Division office.
- ***Texas.*** Districts for contracts less than $100,000; centralized for contracts greater than $100,000. The $100,000 limit is set by law.
- ***Virginia.*** Planned or different levels of emergency.
- ***Wyoming.*** Contracts greater than $20,000 are advertised and bid. Contracts less than $20,000 can be solicited locally or by central office.
- ***Alberta.*** Bids are solicited locally and have no restrictions as to the residency of the bidder.
- ***British Columbia.*** Nationwide for long-term contracts.
- ***Nova Scotia.*** Generally depends on whether (1) district funds are used; (2) several districts are involved; (3) required expertise is available in the districts
- ***Ontario.*** Major work is bid centrally using standard tendering procedures. Equipment rental with operators and emergencies can be handled in a district with standard forms.
- ***Quebec.*** The only criterion is the amount of the estimate.
- ***Hennepin County, MN.*** Research and experience.

- ***Kansas City, MO.*** Telephone bids for work less than $2,500; through purchasing department for work greater than $2,500.

9. Do you conduct pre-bid conferences to explain project requirements? If yes, for what types of work? If no, how do you inform prospective contractors?

Thirty-nine states, seven provinces and eight other transportation agencies responded to the first question in this set. Twenty-six states, three provinces and seven other transportation agencies indicated that they conducted pre-bid conferences.

Twenty-six states, three provinces and seven other transportation agencies responded to the second question in this set. The types of work for which they hold pre-bid conferences and the number of responses were:

All types of work	7	Building renovation and repair	1
Rest area maintenance	6	Drawbridge operations	1
Unique, unusual or complex work	6	Emergency repairs	1
Work not previously contracted	5	If large amount of work is for DBEs	1
Specialty work	4	If work requires engineering	1
As needed to explain the work	2	Landscape maintenance	1
Major work	2	Major revisions	1
Most contracts	2	Pre-bids at request of contractor	1
Mowing	2	Snow and ice control	1
Specialty or non-routine projects	2	Sweeping	1
All maintenance in an area	1	Tree trimming and removal	1
If major changes are made to special provisions	1	Larger specialized maintenance (non-mandatory showings)	1
Bridge painting	1		

The number of respondents to the third question in this set should have corresponded to the number of negative answers to the first question in the set. However, sixteen states (instead of thirteen expected), five provinces (instead of four) and five other transportation agencies (instead of one) responded to the question. This may indicate that some agencies hold pre-bid conferences for some work and not for all. The ways in which contractors are informed in lieu of pre-bid conferences and the number of responses were:

Information in bid package	17	Contractor associations	1
Staff available for questions	4	Joint industry-government committees	1
Newspaper advertisement	2	Phone calls	1
Specifications available before bid date	2	Bid award notices	1
Descriptions in newspaper or telephone quotes	1	Specifications and drawings requested by contractor	1

10. Do you require private contractors to be prequalified prior to bidding on maintenance contracts? If yes, what are the prequalification requirements? How is competence determined?

Twenty-five states, three provinces and four other transportation agencies responded that they required contractors to be prequalified prior to bidding on maintenance contracts. Fourteen states, four provinces and four other transportation agencies responded that they did not require prequalification.

Twenty-six states, four provinces and four other transportation agencies responded to the second question in this set. Although it responded to this question with "Performance bonds on all contracts," California indicated that it did not require prequalification when answering the first question in this set. The reported prequalification requirements and the number of responses were:

Finance	27	Contractor must be responsible	1
Equipment available	25	Contractor's license	1
Competence	23	Contractors prequalified by state	1
Staff available	22	Current projects	1
Experience	3	EEO requirements	1
Past performance	3	Finance for resurfacing contracts only	1
Attend pre-bid conference	1	Pre-qualification but after bid is submitte	1
Bond	1	Pre-qualification for construct projects	1
Competency for contracts greater than $500,000	1	Finance for contracts greater than $500,000	1
Capacity to contract additional work	1		

The respondents to the third question in this set should have corresponded to the respondents indicating that no prequalification was required (answering "no" to the first question in the set). However, twenty-two states (instead of fourteen expected), five provinces (instead of four) and six other transportation agencies (instead of four) responded to the third question. The factors determining competence and the number of responses were:

Past performance of contractor	20
Availability of needed equipment	5
Experience	4
References	3
Bonding	2
Experience of key personnel	2
Staff availability	2
Annual certification	1
As deemed necessary (new contractors)	1
Bonding capability (projects greater than $10,000)	1
By standards set within contract	1
Calibration and mixing observed (herbicide treatment)	1
Compliance with special provisions	1
Contractor performance report	1
Current projects under way	1
Detailed review of submitted proposal	1
Evaluated on project-by-project basis	1
Financial capacity	1
Financial stability	1
Labor and equipment availability	1
Licensed by state	1
Manpower and equipment observed prior to award	1
Periodic audit	1
Pre-work plan	1
RFP method to determine needed resource availability	1
References from other agencies	1
Size and type of previous work	1
Winner interviewed by district staff	1

11. Are performance bonds required? If yes, how do you determine the amount of the bond?

Thirty-six states, four provinces and six other transportation agencies responded that performance bonds were required. Three states, three provinces and two other transportation agencies responded that performance bonds were not required.

Thirty-four states, four provinces and six other transportation agencies responded to the second question in this set. The ways in which they determined performance bond amounts and the number of responses are below.

100 percent of contract amount	17
By estimated expenditures for contract	4
Percentage of contract	4
10 percent of contract price	2
100 percent of amount when amount is greater than $50,000	2
50 percent of contract amount	2
$10,000 or 100 percent of contract	1
10 percent if amount is greater than $50,000	1
100 percent of amount if amount with Department is greater than $100,000	1
100 percent of contract amount if amount is greater than $25,000	1
100 percent of contract if amount is greater than $10,000	1
50 percent of amount if amount is greater than $25,000	1
Based on projected value of work	1
By statute	1
Not to exceed 10 percent of capital and surplus	1
Not to exceed established bonding limits	1
State's cost to complete the work	1
To cover faithful performance of contract	1
Unclear	1
Unknown -- done by procurement section	1

12. Are letters of credit acceptable in lieu of performance bonds?

Six states, one province and one other transportation agency responded that letters of credit were acceptable. Thirty-three states, six provinces and seven other transportation agencies responded that letters of credit were not acceptable in lieu of performance bonds.

13. What insurance coverage is required?

Thirty-nine states, six provinces and eight other transportation agencies responded to the question. The types of insurance and the number of responses for each were:

Workman's compensation	47	Bodily injury and property damage	1
Liability	44	Builder's risk policy	1
Property damage	44	Comprehensive auto	1
Auto	3	Comprehensive liability	1
Auto -- bodily injury	3	Contractor's bodily injury	1
Auto -- property damage	3	Contractor's property damage	1
Railroad	3	Contractual bodily injury	1
Hold harmless	2	Contractual property damage	1
Liability for bridge painting	2	Liability for bridge operations	1
No type specified	2	Liability in state's name	1
Umbrella liability	2	Liability/personal injury	1

Bodily injury	1	Marine liability	1
Worker's compensation and employer's liability	24	Owner's and contractor's protective insurance	1

In addition, Question Thirteen asked for coverage limits for the required insurance. Thirty-four states, five provinces and eight other transportation agencies responded that worker's compensation was required. Of these agencies, fifteen states, two provinces and three other transportation agencies responded that worker's compensation limits were required as set by law or agency regulation. Eleven states, one province and four other transportation agencies either provided no limits or unclear responses. The other responses are below.

- ***Idaho***. $700,000.
- ***New Jersey***. $150,000 for a Treasury contract.
- ***Hawaii***. $100,000.
- ***New Hampshire***. $100,000.
- ***Georgia***. Varies.
- ***Nevada***. Varies.
- ***Oregon***. Depends on the size and type of work.
- ***South Dakota***. To protect the public and satisfy claims.
- ***British Columbia***. No fault.
- ***Nova Scotia***. To protect the Province and cover equipment.
- ***Forest Service***. Varies by size and type of work and by state.

Thirty-one states, six provinces and seven other transportation agencies responded that liability insurance was required. Of these agencies, thirteen states, one province and two other transportation agencies either provided no limits or unclear responses. The remainder of the responses were:

- ***British Columbia***. $10,000,000.
- ***Mississippi***. $2,500,000.
- ***New Hampshire***. $1,000,000 per occurrence.
- ***Massachusetts Metropolitan District Commission***. $1,000,000 per occurrence and $3,000,000 aggregate.
- ***Ohio***. $1,000,000 per occurrence and $2,000,000 aggregate.
- ***Illinois***. Minimum of $1,000,000.
- ***Kansas***. $1,000,000 combined single limits.
- ***Arizona***. $1,000,000.
- ***Idaho***. $1,000,000.
- ***Maine***. $1,000,000.
- ***New Jersey***. $1,000,000 for a Treasury contract.
- ***Washington***. $1,000,000.
- ***Newfoundland***. $1,000,000.

- ***Quebec.*** $1,000,000.
- ***San Diego County, CA.*** $1,000,000.
- ***California.*** $500,000 per occurrence and $1,000,000 aggregate.
- ***Kent County, MI.*** $500,000 per occurrence.
- ***Hawaii.*** $500,000.
- ***Kentucky.*** Minimum of $300,000.
- ***Texas.*** $300,000 per occurrence.
- ***Florida.*** $100,000 per person and $300,000 per occurrence.
- ***North Carolina.*** $100,000.
- ***Hennepin County, MN.*** $100,000.
- ***Oregon.*** Depends on the size and type of work.
- ***South Dakota.*** To protect the public and satisfy claims.
- ***Nova Scotia.*** The amount usually carried by the contractor.
- ***Ontario.*** Varies.
- ***Forest Service.*** Varies by size and type of work and by state.

Thirty-one states, six provinces and seven other transportation agencies responded that property damage insurance was required. Of these agencies, eleven states, one province and two other transportation agencies provided no limits or unclear responses. The other responses were:

- ***British Columbia.*** $10,000,000.
- ***Mississippi.*** $2,500,000.
- ***Massachusetts Metropolitan District Commission.*** $1,000,000 per occurrence and $3,000,000 aggregate.
- ***Connecticut.*** $750,000 per occurrence and $1,500,000 aggregate.
- ***Ohio.*** $1,000,000 per occurrence.
- ***Arizona.*** $1,000,000.
- ***Maine.*** $1,000,000.
- ***Washington.*** $1,000,000.
- ***Quebec.*** $1,000,000.
- ***Hennepin County, MN.*** $1,000,000.
- ***San Diego County, CA.*** $1,000,000.
- ***Kansas.*** $1,000,000 combined single limits.
- ***Illinois.*** Minimum of $500,000.
- ***Maryland.*** $500,000 per occurrence.
- ***Kentucky.*** Minimum of $300,000.
- ***California.*** $250,000 per occurrence and $500,000 aggregate.

- ***New Hampshire.*** $250,000 per occurrence.
- ***Kent County, MI.*** $250,000 per occurrence.
- ***Iowa.*** $250,000 per occurrence and $250,000 aggregate.
- ***Hawaii.*** $100,000.
- ***North Carolina.*** $100,000.
- ***Florida.*** $50,000 per occurrence.
- ***Texas.*** $25,000 per occurrence.
- ***Idaho.*** Replacement value.
- ***Oregon.*** Depends on size and type of work.
- ***South Dakota.*** To protect the public and satisfy claims.
- ***Newfoundland.*** Full contract value and products.
- ***Nova Scotia.*** The amount usually carried by the contractor.
- ***Ontario.*** Varies.
- ***Forest Service.*** Varies by size and type of work and by state.

Thirty-five responses did not correspond with the three most popular types of insurance requirements. These responses are listed below by agency.

- ***Connecticut.*** Auto insurance with $500,000 per occurrence and $1,000,000 aggregate. Liability in the state's name with $750,000 per occurrence and $1,500,000 aggregate. Umbrella liability with limits corresponding to the combination of the other required liability insurance coverages.
- ***Delaware.*** The types of insurance and coverage limits depend on the type and value of the contract.
- ***Florida.*** Hold harmless required.
- ***Iowa.*** Bodily injury with $500,000 per occurrence and $500,000 aggregate. Bodily injury and property damage with $750,000 per occurrence and $750,000 aggregate. A comprehensive catastrophic liability policy (umbrella) can be used to aid in achieving other required coverage limits.
- ***Kansas.*** Railroad insurance with $2,000,000 per occurrence and $6,000,000 aggregate.
- ***Maryland.*** Liability and personal injury insurance with $1,000,000 per occurrence.
- ***Mississippi.*** Excess umbrella with $5,000,000.
- ***New Hampshire.*** Auto bodily injury with $500,000 per person and $1,000,000 per occurrence. Auto property damage with $500,000 per occurrence.
- ***New Jersey.*** Auto insurance with $1,000,000 for Treasury contracts.. Railroad insurance with $5,000,000 per occurrence for DOT contracts. Comprehensive liability with $5,000,000 per occurrence for DOT contracts. Comprehensive auto with $5,000,000 per occurrence for DOT contracts. Owner's and contractor's protective insurance with $5,000,000 per occurrence for DOT contracts. Marine liability insurance with $1,000,000 per occurrence for DOT contracts.

Worker's compensation and employer's liability with $100,000 per accident for DOT contracts. Liability for bridge painting with $500,000 aggregate for DOT contracts.

- ***North Carolina.*** Liability for bridge operations with $1,000,000 coverage.
- ***Ohio.*** Auto insurance.
- ***South Carolina.*** Liability for bridge painting at the contractor's discretion.
- ***Virginia.*** Railroad with $2,000,000 coverage.
- ***Wisconsin.*** Response unclear.
- ***Newfoundland.*** Builder's risk policy with $1,000,000 coverage.
- ***Nova Scotia.*** Hold harmless in all contracts.
- ***Massachusetts Metropolitan District Commission.*** Auto bodily injury with $1,000,000 per occurrence and $3,000,000 aggregate. Auto property damage with $500,000 coverage.
- ***Maricopa County, AZ.*** Auto bodily injury with $500,000 per occurrence. Auto property damage with $500,000 per occurrence. Contractor's bodily injury with $500,000 per occurrence. Contractor's property damage with $100,000 per occurrence and $100,000 aggregate. Contractual bodily injury with $500,000 per occurrence. Contractual property damage with $100,000 per occurrence and $100,000 aggregate.

14. What provisions are included for terminating contractors for poor performance?

Thirty-two states, seven provinces and six other transportation agencies responded to the question. The provisions and number of responses were:

Conditions given but no methods	5	If default, surety used for completion	1
Per specifications	5	Infraction reports	1
Unspecified	5	Make correct with money due contractor	1
7 days written notice	2	Normal procurement procedures for term	1
Documentation of poor performance	2	Notify contractor/15-day correct period	1
None	2	Notify contractor/rebuttal allowed	1
Notify contractor	2	Notify contractor/termination	1
Notify contractor/10-day correction	2	Only general methods given	1
Notify contractor/5-day correction	2	Performance rating every 3 months	1
30-day written notice	1	Response in French	1
By director if in state's best interest	1	Standard FAR procedures	1
Encumber bond	1	Standard contract terms/conditions	1
Deduct administrative costs for cancellati	1	Termination and possible debarment	1
Default and debarment clauses	1	Two warning letters	1
Committee review to terminate pre-qualification	1	Oral warning, then written warning	1

15. What are the contractor's traffic control responsibilities?

Thirty-eight states, seven provinces and eight other transportation agencies responded. There was a total of fifty-four responses (one state responded in two categories). The traffic control responsibilities and number of responses were:

All traffic control work	20	All on resurfacing contracts	1
In accordance with plans and standards	20	None -- provided by agency	1
Varies by contract	9	Signing	1
Same as for construction contracts	2		

16. Have you had problems attracting qualified bidders? If yes, what were the problems? How did you overcome the problems?

Thirty-eight states, seven provinces and eight other transportation agencies responded to the first question in the set. Of these agencies, eight states, two provinces and three other transportation agencies responded that they had had problems attracting qualified bidders.

The responses to the second question in the set should have corresponded with the agencies responding "yes" to the first question. However, seven states, two provinces and four other transportation agencies responded to the second question. Georgia responded "yes" to the first question but did not respond to the second. The Forest Service responded in the first question that they had had no problems attracting qualified bidders but in the second question mentioned that they had had a problem at locations where no maintenance had been contracted previously. The problems in attracting qualified contractors and the number of responses for each were:

Lack of qualified personnel/contractors	2	Lack of supply in rural areas	1
Complex bid documents	1	Liability and/or insurance	1
Contractors prepare improper bids	1	Misunderstanding of scope, bids too low	1
Contractors don't like snow removal	1	No bidders for mowing contracts	1
Documentation required for State work	1	Old, inadequate equipment (sweeping)	1
Environmental regulations	1	Roadside contractors may be small or new	1
Insurance (for snow and ice control)	1	Specialized work in remote areas	1
Labor considerations	1	Timing with contractors' work load	1
Roadside contractors may have trouble bonding	1	Where no maintenance had been contracted	1

Six states, two provinces and three other transportation agencies responded to the third question in the set. (Mississippi and Kansas City, MO responded to the second question in the set but not to the third.) The ways in which the problems with attracting qualified bidders were overcome and the number of responses for each are below.

Have agency crew do the work	3	Longer contract period	1
Bonding requirements	1	Longer solicitation time	1
By sending bids to other states	1	Include travel pay in contract	1
Committing to long-term contract maintenance	1	Make specifications more detailed and specific	1
Contacting potential bidders	1	Pre-bid meetings	1
Contract revisions and rebidding	1	Probably will not (low bid requirements)	1
Deleted performance bond requirement	1	Rescheduled work	1
Do not do the work	1	Not overcome yet	1
Expand contract work at slower pace	1		

17. Are actual contractor costs compared with in-house costs? If yes, how do you use these comparisons? How often are costs compared?

Thirty-nine states, seven provinces and eight other transportation agencies responded to the first question in the set. Of these agencies, twenty-one states, six provinces and six other transportation agencies responded that they compared actual contractor costs with in-house costs.

Twenty-one states, six provinces and six other transportation agencies responded to the second question in the set. The ways in which the cost comparisons are used and the number of responses for each were:

Contract justification	3	To determine if contract will be negotiated	1
To determine how to accomplish maintena in the future	3	To determine type and amount of work contracted	1
No formal procedure	2	To determine acceptable differences	1
Response not clear	2	To determine contract feasibility	1
To determine cost effectiveness	2	To determine future budgets	1
To determine viability of future contractin	2	To develop operational decisions and policy	1
Will be used for contract justification	2	To evaluate productivity, quality and costs	1
As government estimate for contract award	1	To increase in-house resources	1
For sweeping, same cost but fifty percent greater level of service	1	To determine adequacy and completeness of bids	1
Results are often inconclusive	1	Used in future evaluations	1
Spot check on selected activities	1	Used only if gross disparities are evident	1
To compare with bid	1	To decide to contract all work	1
To measure accomplishment, cost and production	1		

Twenty-one states, six provinces and five other transportation agencies responded to the third question in the set. Two agencies gave more than one response. The responses were:

Annually	11	Once	1
Each contract or project	9	Each program	1
Upon request or as needed	5	Monthly	1
Ongoing	3	Frequently	1
When new types of work are being considered for contracting	1	No set schedule	1

18. What items are included in the in-house costs used for cost comparisons? In the contractor costs?

Twenty-two states, six provinces and five other transportation agencies responded to the first question in this set. The items included in in-house costs and the number of responses were:

Direct labor	31	Overhead	22
Equipment rental	31	Office and shop rental	16
Materials	30	Support services	16
Fringe benefits	28	Utilities	15
FICA and retirement	26	Amortization of capital assets	14
Insurance	14	No standard procedure	1
Overall unit costs	2	Some items used vary by operating unit	1

Twenty-one states, six provinces and four other transportation agencies responded to the second question in the set. (Oregon and Hennepin County, MN, responded to the first question but not the second.) The items included in contractor costs and the number of responses were:

Bid price	30	Unit costs	1
Materials, if furnished by agency	20	No standard procedure	1
Agency's contract administration costs	15	Partial inclusion of administrative costs	1
Use of administrative costs varies by operational unit	1		

19. Describe your monitoring procedure. Who in the organization has responsibility for contract administration?

Twenty-eight states, six provinces and five other transportation agencies responded to the request to describe their monitoring procedure. The responses were:

- ***Arizona.*** The Area Superintendent generally is the contract administrator, who requests and defines work to be performed and has budget responsibility. Monitoring usually is done by the maintenance foreman or assistant. Periodic on-site inspections are made to ensure compliance with contract requirements; inspection findings are documented.
- ***Arkansas.*** Projects are monitored by a project inspector under the direction of a resident engineer.
- ***Delaware.*** Work records of personnel, including salaries of personnel, hours, machinery used and duration, are received and reviewed during contract performance.
- ***Florida.*** Computerized system.
- ***Georgia.*** Compare pay status reports.
- ***Hawaii.*** Field inspections.
- ***Idaho.*** District maintenance personnel inspect the work. Contract administration section also oversees the work.
- ***Iowa.*** An inspector is present on a project to ensure work is accomplished per specification and to document work. Projects are audited internally. Proposed project work is coordinated closely with contemplated construction activity.
- ***Kentucky.*** Strict construction-type work generally is handled by construction. Other types of work generally are reviewed informally by maintenance.
- ***Louisiana.*** Maintenance personnel observe progress and quality of work. Contractor submits daily reports of work force and accomplishment.
- ***Maine.*** Supervisory staff monitors all contract operations.
- ***Massachusetts.*** A foreman or engineer supervises each project.
- ***Michigan.*** Maintenance Division inspector or county foreman supervises the work.
- ***Mississippi.*** For sweeping contracts the area superintendent inspects work daily and maintains a diary of completed work. The diary is used to justify payment.
- ***Nevada.*** Work is performed under the direction of a state representative.
- ***New Hampshire.*** Bureaus of Construction, Materials and Research, and Engineering Audit all have a hand in monitoring.
- ***New Jersey.*** Routine maintenance is monitored by the by local crew supervisors. Large jobs are monitored by resident engineers and construction inspectors.
- ***North Carolina.*** A district engineer monitors progress and reports to the central maintenance staff monthly which is reported to the Board of Transportation monthly.
- ***Oklahoma.*** Maintenance Reporting System (MRS) has activities broken down into labor, equipment, and materials which can be compared to the contractor's bid price. BAMS tracks previous contracts by location, unit cost, etc.

- ***Pennsylvania.*** As-needed inspection for roadside and sign work. Full-time inspection for paving, guardrail work, and pavement marking.
- ***South Carolina.*** Resident maintenance engineer or construction engineer in a county administers the contracts (maintains diary, makes pay estimates, inspects work, and recommends final acceptance).
- ***Tennessee.*** Detailed bid prices are analyzed by item number, description and unit of measurement.
- ***Texas.*** A monthly cost comparison is possible using the maintenance management system.
- ***Utah.*** Contracts are assigned to maintenance or construction personnel. Construction inspection and documentation procedures are followed.
- ***Virginia.*** Administered and monitored by field personnel.
- ***Washington.*** Contract oversight is done by area superintendents or supervisors.
- ***Wyoming.*** Bid tabs, budget printouts, etc. Actual contract costs are broken down and compared to in-house costs.
- ***Alberta.*** Monitor monthly printouts of department financial reporting system. Year-end costs are compared with department costs for those activities that are similar.
- ***British Columbia.*** Area managers apply a quality assurance program to the work. The program includes inspection of work performance, management/planning reviews, and regular summary ratings reports. Contractors are responsible for quality control.
- ***Newfoundland.*** All costs are charged to the contract project number with monthly printouts of costs.
- ***Nova Scotia.*** Reports prepared annually by department crews covering each project.
- ***Ontario.*** Districts supervise contractors; maintenance management system; head office spot checks; internal audit.
- ***Saskatchewan.*** Large contracts are supervised by the resident construction staff similarly to capital projects. Small contracts are supervised by the local maintenance supervisors.
- ***Forest Service.*** On-the-ground checks and contractor progress reports.
- ***Hennepin County, MN.*** Field work monitored by field staff; invoices are approved prior to payment.
- ***Maricopa County, AZ.*** Usually monitored by maintenance inspectors. Complex projects, such as milling and recycling, are monitored by the construction engineer and his staff.
- ***Prince George's County, MD.*** Field inspection by county inspectors, ticket collection, measurement, material tests, etc. Sign-in/sign-out and route inspections for snow and ice removal.
- ***Kansas City, MO.*** Each construction project has a construction inspector assigned to it.

Thirty-seven states, seven provinces and seven other transportation agencies responded to the question about responsibility for contract administration. The positions responsible for contract administration and the number of responses for each were:

District maintenance engineer	24	District construction engineer	2
Central maintenance staff	19	Accounting staff	1
Area supervisor	14	Administrative assistants	1
Resident maintenance engineer	12	Area engineer	1
Foreman	10	Contracting officer representative	1
Construction personnel	4	District operations engineer	1
Resident construction engineer	3	Forest or district office inspector	1
District engineer	3	Regional superintendent of operations	1
Administration	2	Street restoration engineer	1
Central construction staff	2		

20. Describe any problems you have experienced with contractors' quality of work and how you resolved them.

Thirty-three states, six provinces and five other transportation agencies responded to the request to describe problems with contractors' quality of work. The responses were:

Unspecified	18	Incorrect number of equipment units/people	1
Insignificant	6	Non-response, poor performance	1
None	6	Not greasing drawbridges on schedule	1
Poor materials	3	Not having enough equipment for the job	1
Unacceptable work	3	Poor service	1
Contractor didn't realize what was expect	2	Quality and production (for bridge work)	1
Non-compliance with specifications	2	Scheduling priority	1
Poor workmanship	2	Unacceptable work methods	1
Percent movement and control (for herbicide treatment)	1	Cleanup/site restoration (for brush/tree removal)	1
Untimely work	1		

Twenty-four states, five provinces and four other transportation agencies provided ways in which they resolved problems with contractors' quality of work:

Withhold payment	8	Compensation deductions	1
Contractor corrects work at own expense	6	Corrective work	1
Meetings with contractor	5	Do not extend contracts	1
Penalty	5	Do not re-contract with firm	1
Exclude contractor from future bids	3	Go to next lowest bidder	1
Resolved in field	3	Infraction reports	1
Performance bonds	2	Issue stop order and resolve problem	1
Terminate contractor	2	Lower pre-qualification rating	1
Through specifications	2	Material penalties	1
10-percent holdback is retained	1	More frequent inspection and supervision	1
Added inspectors	1	Negotiate reduced payment	1
Potentially, may lead to default	1	Removal of work	1
Quality assurance specifications	1	Revision of contract documents	1
Reject material	1	Warranties on buildings and rest areas	1
Management plan changed to prevent problem	1		

21. Do you include performance penalties or incentives in your contracts?

Thirty-nine states, seven provinces and seven other transportation agencies responded to the question. Of these agencies, fourteen states, one province and three other transportation agencies responded that they include performance penalties or incentives.

22. Have you used maintenance bonds or other contractor warranties to ensure work quality for a period of time following work completion? If yes, describe the methods and identify the activities.

Thirty-nine states, seven provinces and seven other transportation agencies responded to the question. Of these agencies, seven states, no provinces and two other transportation agencies responded that they have used maintenance bonds or warranties.

Eight states, no provinces and two other transportation agencies responded to the request for descriptions of the methods and identification of the activities. The responses were:

- ***Illinois***. All maintenance work is handled like construction work.
- ***Maryland***. For all work there is a one-year warranty/bond for contract requirements and defects of equipment, material, design furnished and workmanship.
- ***New Hampshire***. For highway modifications in major roadside developments and for utility installation under permits. Bonds or warranties are not used extensively for maintenance contracts. An example of bond or warranty use is the replacement of electrical or mechanical equipment for drawbridges.
- ***North Dakota***. Performance bonds for highway work and warranties for building construction.
- ***South Dakota***. For all work the contractor is required to keep the performance bond in effect for one year after acceptance.
- ***Washington***. When a bond is required for any work, a one-year guarantee on material and workmanship is included.
- ***Wisconsin***. All work.
- ***Wyoming***. A one-year warranty on material for rest area building contracts and manufacturer warranties for building repairs.
- ***Massachusetts Metropolitan District Commission***. One-year warranty for all work.
- ***Kansas City, MO***. Two-year bond for cold milling and resurfacing and for concrete rehabilitation. One-year bond for slurry sealing and for crack sealing.

23. How do you determine the duration of contract time?

Thirty-three states, seven provinces and seven other transportation agencies responded to the question. The responses were:

Historical data	9	Inconvenience to public	1
Through experience	9	Longer term encourages better quality work	1
By season or by length of season	6	Measurable activities are converted to time	1
Size and use of contract	5	Most contracts have no time requirement	1
Type of materials needed	4	Multiple year with optional termination	1
By judgment	3	One year (for rest areas maintenance)	1
One year	3	One year with option for additional year	1
Seasonal weather conditions	2	One year with optional five years	1
Estimate reasonable time	2	One year with optional four years	1
Execution time	2	One year with optional one or two years	1
Usually to end of budget year	2	Pre-set contract time (e.g., one year)	1
Based on budget year and funds available	1	Project locations	1
Based on length for work with state force	1	Simulated critical path method	1
Contract dollar amount	1	Size and timing of contract	1
Discuss with purchasing department and contractors	1	One year (by law for non-encumbered contracts)	1
Districts request to limit time	1	Three years	1
Fiscal year restraints	1	Time needed to recover start-up costs	1
Type of work	1	Two years (for mowing)	1

24. Do you assess liquidated damages for failure to complete work on time? If yes, how is the amount of liquidated damages determined?

Thirty-nine states, seven provinces and seven other transportation agencies responded to the first question in the set. Of these agencies, twenty-nine states, four provinces and five other transportation agencies responded that they assess liquidated damages for failure to complete work on time.

Twenty-eight states, four provinces and four transportation agencies responded to the second question in the set. The responses and the number of each are below.

Based on contract dollars	13	Based on traffic disruption	1
Set by standard specifications	8	Extra administration costs for the contract	1
Based on number of days late	2	In contract	1
Based on supervision cost	2	In contract, arbitrarily established	1
Based on user and state costs	2	Inspectors' salaries with overhead	1
In contract, dollars per day	2	Roughly based on daily inspection costs	1
Percentage of contract amount	2	Ten percent of invoice (snow and ice)	1
Based on expected work to be completed per day	1	Roughly based on extra construction engineering costs	1
Termination (for snow removal)	1		

25. Describe any problems you have experienced with contractors' responsiveness and how you resolved them.

Thirty-two states, six provinces and six other transportation agencies responded to the first part of the request, namely, to describe problems with contractors' responsiveness. The problems described and number of responses for each were:

Unspecified	18	No performance at all	1
None	9	Not completing work on time	1
Not significant	5	Response to accidents (for guardrail repair)	1
Failure to commence work on time	2	Timeliness (for snow removal)	1
Based primarily on public safety	1	Too numerous to enumerate	1
Lack of availability (for specialty work)	1	Unable to proceed (snow removal)	1
Lack of production	1	Unspecified (for rest area maintenance)	1
Late guardrail repairs	1		

Twenty-one states, six provinces and six other transportation agencies responded to the second part of the request to describe how problems with contractor responsiveness were resolved. The responses and umber of each are listed below.

Meetings with contractor	5	Letter threatening default of contract	1
Cancel contract	3	Litigation	1
Withhold payment	3	Notify contractor/14-day correction period	1
Continual urging	2	Notify contractor/7-day correction period	1
Notify contractor of Department concern	2	Placement on default list	1
Penalties	2	Potentially, can lead to default	1
Removal from pre-qualified list	2	Pressure from bonding companies	1

Assess liquidated damages	1	Response times written in contract	1
Contract work with another contractor	1	Submission of work schedule (sometimes)	1
Debarment from bidding in future	1	Threat of liquidated damages in contract	1
Go to next lowest bidder	1	Through standard contract provisions	1
Good relationship with contractor	1	Verbal communications	1
Immediate contact	1	Warnings and threat of termination	1
Increased supervision (for snow removal)	1	Unclear	1
Management plan changed to prevent problem	1	No remedy (contractor with financial problems)	1
Ranged from issuing work orders to termination	1	Void minimum pay guarantees (for snow removal)	1

26. Describe any problems contracting has caused with in-house employees and how you resolved them.

Thirty-two states, six provinces and six other transportation agencies responded to the first part of the request to describe problems with in-house employees because of contracting. The responses were:

None	24	Can not contract traditional State work	1
Job security worries	6	Timing of in-house and contract work	1
Unspecified	6	Transition from workers to inspectors	1
Insignificant	4	Union fearful of losing work	1
Morale problems	2	Union is now charging "successor rights"	1

Ten states, three provinces and one other transportation agency responded to the second part of the request to describe ways in which the problems were resolved:

Contractors hired employees	2	Keep heavy in-house work load	1
Employees offered lateral transfers	2	Meetings with labor unions involved	1
Contracted "undesirable" maintenance early	1	Employees encouraged to form maintenance companies	1
Contracted as employee attrition set in	1	Work closely with employee	1
Employees were reassigned	1	Union grievance procedure	1
Ensure workers of future employment	1	None	1
Inspectors' handbook and training	1	Unknown	1

27. One concern in contracting maintenance services is retention of a minimum in-house staff. Do you have any guidelines for determining the minimum staff size? If yes, please describe or furnish a copy.

Thirty-seven states, six provinces and seven other transportation agencies responded to the question. Of these agencies, twelve states, three provinces and one other transportation agency responded that they have guidelines for determining minimum staff size.

Thirteen states, four provinces and one other transportation agency responded to the request to describe the guidelines for determining minimum staff size. (Virginia responded "no" to the question and noted that staff was kept at historical levels. Quebec answered "no" to the question and noted that a study was in progress regarding minimum staff size.) Summary descriptions of the guidelines are below.

- ***Arkansas.*** In-house staff determined by workload predictions and sometimes by fund availability. Contract maintenance projects do not affect staff size.

- ***Idaho.*** Winter maintenance requirements determine staff size. (The Department does not contract for winter maintenance, so staff size is not directly affected by maintenance contracts.)
- ***Iowa.*** Minimum staffing needs are based on the needs to properly conduct winter operations. A cap is placed on staffing by the legislature.
- ***Kentucky.*** Based on snow and ice responsibilities.
- ***Massachusetts.*** Based on 1986 staffing study.
- ***Michigan.*** The maintenance management system provides general staffing levels for direct state maintenance garages. The number of snow removal routes covered by each garage also dictates the minimum staffing at each location.
- ***Missouri.*** Seventy percent minimum, ninety-five percent maximum.
- ***Ohio.*** A quota for each district has been established. Of each quota, a general minimum guideline is recognized for maintenance operations.
- ***Oregon.*** Based on winter emergency needs.
- ***Tennessee.*** Based on maintenance management system calculations without regard for work distribution.
- ***Utah.*** The manpower needs are based on the winter snow plan, but the peak workload is in summer. This is why contracting can supplement the Department's needs.
- ***Virginia.*** Staff kept at historical levels; new needs satisfied by contracting.
- ***Wyoming.*** Staffing is based on snow control requirements. Snow removal is done in-house and seldom contracted.
- ***British Columbia.*** Staff is needed for contract administration only.
- ***Nova Scotia.*** Department maintains a base core of expertise and provides a basis for cost comparison. Department keeps enough staff for some sealing, crack filling, and paving.
- ***Ontario.*** Core staffing.
- ***Quebec.*** Study in progress but no results yet. Tendency is to contract maximum operation.
- ***Hennepin County, MN.*** Staff based on maintaining a minimum level of service for snow and ice control.

28. What, if any, reaction to contract maintenance have you had from the public?

Thirty-four states, seven provinces and seven other transportation responded to the question. Of these agencies, thirteen states, three provinces and six other transportation agencies responded that they had had no reaction from the public. An additional five states, one province and one other transportation agency responded that the reaction had been insignificant. The remaining responses were:

- ***Arizona.*** Very positive -- saving taxpayers money. Legislature is very receptive to granting funds for contract maintenance.
- ***Connecticut.*** Public questions the need for contracting when an in-house maintenance staff is available.

- ***Delaware.*** No adverse public reaction. If anything, the reaction has been positive because of previous poor response by in-house crews (caused by staff limitations).
- ***Idaho.*** Generally favorable but not much public reaction to date.
- ***Louisiana.*** Appears good so far.
- ***Maine.*** Somewhat negative in winter maintenance area.
- ***Mississippi.*** Good.
- ***North Carolina.*** No different than for in-house maintenance.
- ***Ohio.*** Mostly favorable because contract work usually results in getting the work done in a more timely manner and, thus, disrupts traffic less than in-house work does.
- ***Oklahoma.*** Reactions are good for specific activities but usually do not respond to emergencies as well as force account maintenance does.
- ***Oregon.*** Support for more.
- ***South Carolina.*** All positive.
- ***Tennessee.*** A higher level of maintenance has been noticeable to the motoring public. Overall, the reaction has been positive.
- ***Utah.*** Good response from the private sector.
- ***Washington.*** Contractor associations sometimes question the amount of work performed in-house. (Work performed by in-house employees is limited to $30,000 per project.)
- ***Wyoming.*** Mixed reaction as to quality and cost.
- ***Alberta.*** Positive reactions include references to downsizing the government staff, private sector increase and cheaper rates. Negative reactions include loss of in-house expertise, lowered standards, reduced responsiveness to maintenance needs.
- ***British Columbia.*** Quite good. The public had some initial unease about the anticipated quality of service. However, generally good performance and solid contract administration has led to steadily improved public perception and satisfaction.
- ***Saskatchewan.*** Initial reaction was negative. The level of service was reduced because of reduced funding and infrastructure deterioration, but much of the public attributed the reduced service level to contracting.

29. What benefits to the agency have been attained through contracting for maintenance services?

Thirty-five states, seven provinces and seven other transportation agencies responded to the question.

Improves use of in-house labor	14	Cost efficiency	1
Increased service levels	7	Covers limitations on in-house staff	1
Cost savings	6	Delay in construction expenditures	1
Reduces expenditures for speciality eqpt.	6	Emphasis on management	1
Levels work load	5	Fewer administrative problems	1
Reduction in in-house staff	4	Have completed slightly more work	1
Supplemented existing capability	4	Increased periodic maintenance	1
Ability to handle emergencies	3	Keeps equipment levels manageable	1
Better use of funds	3	Kept up with new needs	1
Improved response time	3	Maintenance capabilities maximized	1
Needs for specialized staff and equipment can be met	3	Circumvents environmental limitations on public employees	1
Availability of specialized tech. expertise	2	More competitive contractors	1
Flexibility	2	More effective use of manpower	1
Kept staff and equipment at present levels	2	More innovative contractors	1
Reduced seasonal employees	2	More work in the same time	1
Reduction of facilities and equipment	2	No data available	1
Avoid overhead costs for specialized work	1	Overall increased efficiency	1
Better completion	1	PR (work by sheltered workshops)	1
Better public image	1	Reduced burden on in-house shops	1
Better scheduling	1	Satisfied government's intentions to contract	1
Better work performance	1	Special needs met	1
Bought new equipment for in-house maintenance	1	Staff and equipment are not needed for remote specialized work	1
Can have personnel and equipment at less than peak demand	1	Provide services not possible with in-house staff	1
Can perform larger/more complex jobs	1	Stronger contracting industry	1
Cost effectiveness	1		

30. What problems, not covered above, have occurred because of contracting for maintenance services?

Twenty-two states, one province and three other transportation agencies responded to the question. The responses and number for each are below.

None	17
Bids over budget cause schedule problems	1
Budget has not kept up with public expectations	1
Continuing argument about maintenance versus construction work	1
Cost accounting/budgeting complicated	1
Historical data becomes obsolete	1
Inconsistent inspections	1
Increase in administrative staff	1
Losing in-house expertise	1
Middle managers spend faster and more	1
More dependence on private sector	1
Not maintaining fleet	1
Response sometimes delayed	1
Some "political" contracts were not productive	1
Traditional services of small contractors eliminated	1
Union complaints about work and overtime	1
Untrained maintenance employees used for inspection	1

32. Maintenance Contracting by Activity

The responses to this question are summarized on the following pages. The types of contractors for each activity and the basis of payments are summarized by the number of responses for each. Since some agencies use more than one type of contractor or basis of payment for activities, the totals may exceed the number of responses.

Types of Contractors by Activity

Roadway Surfaces

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Hand Patching	18	11	6	5	3	1		1						
Machine Patching	26	20	9	3	2	2		1						
Crack Sealing	34	20	18	3	3	2		1						
PCCP Joint Repair	27	19	9	2		1								
Seal Coating	37	29	14	3	1	2		1						
Planing/Milling	40	30	20					1						
Slabjacking	15	13	6		1									
Roadway Sweeping	31	15	16	4	4	2		1						
Heater Scarifier/ Thin Overlay	1	1						1						
Thin Overlay	1	1												
Slurry Seal	5	3	2											
Slab Repair	1	1	1											
Blade Unpaved Roads	2	2	2		1									
Sand Sealing	1	1												
Concrete Patching	1	1												
Fabric Underliner	1	1												

Shoulders

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Blade Unpaved Shoulder	13	8	5	4		2								
Patch Unpaved Shoulder	11	6	4	3		1								
Replenish Unpaved Shoulders	1	1												

Types of Contractors by Activity

Drainage

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Ditching	21	10	9	4		2		1						
Clean Culverts	20	8	11	3		1		2						
Clean Sewers	17	4	9	3		1		1						
Repair Minor Drainage Structures	23	14	10	3		1								
Replace Drainage Structures	23	19	10	2										
Clean Catch Basins	2		2											
Slip-Line Roadway Culverts	1	1												

Roadsides

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Mowing	40	14	23	5	4	1	1	1		5				
Herbicide Treatment	30	8	21	5		1								
Brush & Tree Cutting	30	12	16	4	2	2	1	5	1					
Landscape Maintenance	25	9	14	4	3	1	2	3						
Erosion Control	18	13	9	3				2						
Major Slide Repair and Removal	26	23	9	2										
Litter Pickup	40	10	8	5	4	1	24	21	9		1			
Fertilizer Application	1	1	1											

Types of Contractors by Activity

Bridge

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Bridge Cleaning	12	8	6	1		1								
Bridge Painting	41	24	22	2		1								
Minor Bridge Repairs	28	18	13	3		1								
Major Bridge Repairs	43	31	19		1									
Movable Span Maintenance	13	8	8		1									
Riprap Installation	1	1												
Tunnel Cleaning	1		1											
Deck Overlay	1	1	1											

Traffic

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Sign Repair	19	12	6	4	1	1								
Sign Cleaning	8	4	1	3		2								
Striping	27	16	13	3										
Pavement Message Painting	15	9	7	2										
Guardrail Maintenance	32	19	17	3										
Traffic Signal Maintenance	23	9	12	5	5									
Lighting Maintenance	28	11	19	3	3									1
Delineator Maintenance	9	6	3	3	3									
Fence Maintenance	25	13	13	2	2									
Attenuator Repair	17	10	6	3	3									
Raised Pavement Markers	1		1											
Sign & Guardrail Upgrades	1	1												

Types of Contractors by Activity

Winter and Emergency

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Snow & Ice Control	30	17	7	6	7	2	1							2
Emergency Maintenance	20	17	8	3	1	3								
Road Patrol	7	2		3	1	2								
Weather Forecasting	2	1											1	
Snow Fence Repair/Construction	1	1	1											

Services

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped	Utility Company	Consultant	Hired Equipment
Install Driveway Pipes	13	9	4	3		1								
Weigh Station Operations	4	1	1	3		1								
Rest Area Maintenance	36	8	22	3	1	1		2	1		5			1
Trash Collection	24	7	14	2		1	2	1			1			
Bridge Safety Inspections	15	3	10	3		2								
Bridge Operations	8	3	1	2	1	1								
Emergency Call Services	10	2	5	2		1								
Ferry Operation	2		2											
Hauling Sand	1		1											
Work for Other Department Units	1	1	1											
Work for Other Agencies	1	1	1											
Towing	1		1											

Types of Contractors by Activity

Materials

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Hired Equipment	Material Producer
Sign Fabrication	21	9	10	2		1		4						
Aggregate Production	39	26	20	2		1								1
Asphalt Mix Production	40	31	15	1										1
Drainage Materials	1		1											
Sanding Rock	1	1	1											
P.C. Concrete	1		1											

Equipment

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Commercial Garages
Equipment Service	24	7	15	2		2								1
Equipment Repair	30	9	19	2		1								1
Dry Dock & Ferry Repair/Maintenance	2		2											

Types of Contractors by Activity

Improvements

Activity	Number of Responses	Highway Contractor	Specialty Contractor	County Agency	City or Municipality	Other State Agency	Adopt-a-Highway Program	Prison Labor	Offender Program	Landowner Permits	Handicapped Set-aside	Utility Company	Consultant	Hired Equipment
Resurfacing	42	39	9	2										
Roadway Improvements	22	20	6	1										
Shoulder Improvements	19	16	4	2										
Drainage Improvements	24	22	5	1										
Roadside Improvements	18	15	5	1	1									
Traffic Operation Improvements	20	15	8		1									
Structure Improvements	18	17	5											
Sign/Striping Improvements	2		2											

Types of Units of Measures

Roadway Surfaces

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Hand Patching	18	12	4		3	1	1	1			
Machine Patching	26	21	4		5	1	1	1			
Crack Sealing	34	29	3		3	1	1	1			1
PCCP Joint Repair	27	22	2		1	1	1	1			1
Seal Coating	37	33	4		2	1	1	1			
Planing/Milling	40	36	3		7		1				
Slabjacking	15	14	3								
Roadway Sweeping	31	20	5		8		1	1			
Heater Scarifier/ Thin Overlay	1	1					1				
Thin Overlay	1	1									
Slurry Seal	5	5			1						
Slab Repair	1	1									
Blade Unpaved Roads	2	2	1		2						
Sand Sealing	1	1									
Concrete Patching	1	1									
Fabric Underliner	1	1									

Shoulders

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Blade Unpaved Shoulder	13	8	3		3			1			
Patch Unpaved Shoulder	11	6	2		2			1			
Replenish Unpaved Shoulders	1	1									

Types of Units of Measures

Drainage

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Ditching	21	13	5		6			1			
Clean Culverts	20	11	4		8			1			
Clean Sewers	17	8	3		6			1			
Repair Minor Drainage Structures	23	15	4		7			1			
Replace Drainage Structures	23	18	6		3						
Clean Catch Basins	2	1			1						
Slip-Line Roadway Culverts	1	1									

Roadsides

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Mowing	40	24	8		7		4	1			
Herbicide Treatment	30	20	9	2	4						
Brush & Tree Cutting	30	15	10	1	11			1			
Landscape Maintenance	25	12	9		5		1	1			
Erosion Control	18	13	2		4			1			
Major Slide Repair and Removal	26	24	4	2	7						
Litter Pickup	40	13	5	1	10		7	1			2
Fertilizer Application	1	1	1								

Types of Units of Measures

Bridge

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Bridge Cleaning	12	9	4		1						
Bridge Painting	41	20	23	1	4						
Minor Bridge Repairs	28	18	11		4			1			
Major Bridge Repairs	43	34	17	4	2						
Movable Span Maintenance	13	9	3	2	1						
Riprap Installation	1	1									
Tunnel Cleaning	1	1									
Deck Overlay	1	1									

Traffic

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Sign Repair	19	14	3		2			1			
Sign Cleaning	8	3	3		2						
Striping	27	25	1		2			1			
Pavement Message Painting	15	12	1		2						
Guardrail Maintenance	32	27	3		2			1			
Traffic Signal Maintenance	23	13	3	1	7			1			
Lighting Maintenance	28	18	7	2	5			1	1		
Delineator Maintenance	9	5	1		2			1			
Fence Maintenance	25	21	3		2			1			
Attenuator Repair	17	11	3		3			1			
Raised Pavement Markers	1	1									
Sign & Guardrail Upgrades	1	1									

Types of Units of Measures

Winter and Emergency

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Snow & Ice Control	30	7	6		17	1		1		1	
Emergency Maintenance	20	11	7	1	11			1			
Road Patrol	7	1	1		3			1		1	
Weather Forecasting	2	1	1								
Snow Fence Repair and Construction	1	1									

Services

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agree-ment	No Depart-ment Cost	Cost	Unit Price per Month	Handi-capped Set-aside	Daily Crew Rate
Install Driveway Pipes	13	9	2		1		1	1			
Weigh Station Operations	4	1			2						
Rest Area Maintenance	36	16	13	1	7			1		1	1
Trash Collection	24	11	6	1	5		1			1	
Bridge Safety Inspections	15	3	7	2	2						
Bridge Operations	8	1	4		1			1			
Emergency Call Services	10	3	3		2						
Ferry Operation	2	2									
Hauling Sand	1	1									
Work for Other Department Units	1	1									
Work for Other Agencies	1	1									
Towing	1	1									

Types of Units of Measures

Materials

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agreement	No Department Cost	Cost	Unit price per Month	Handicapped Set-aside	Daily Crew Rate
Sign Fabrication	21	15	4	1	1					1	
Aggregate Production	39	38	3								
Asphalt Mix Production	40	38	3							1	
Drainage Materials	1	1									
Sanding Rock	1	1									
P.C. Concrete	1	1									

Equipment

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agreement	No Department Cost	Cost	Unit Price per Month	Handicapped Set-aside	Daily Crew Rate
Equipment Service	24	13	8	1							
Equipment Repair	30	13	12	3	10				1		
Dry Dock & Ferry Repair & Maintenance	2	1	1								

Types of Units of Measures

Improvements

Activity	Number of Responses	Unit Price	Lump Sum	Cost Plus Fixed Fee	Hourly Rate	City Agreement	No Department Cost	Cost	Unit Price per Month	Handicapped Set-aside	Daily Crew Rate
Resurfacing	42	40	6		1						
Roadway Improvements	22	21	2		1						
Shoulder Improvements	19	17	2		2						
Drainage Improvements	24	21	4		3						
Roadside Improvements	18	14	3		3						
Traffic Operation Improvements	20	15	6		1						
Structure Improvements	18	16	5								
Sign/Striping Improvements	2	1	1								

Appendix D

Bibliography

AASHTO, *AASHTO Maintenance Manual 1987*, American Association of State Highway and Transportation Officials, Washington, D.C. (1987) 263 Pages

AASHTO, *A Guide for Methods and Procedures in Contract Maintenance*, American Association of State Highway and Transportation Officials, Washington, D.C. (1987) 33 Pages

Alwin, Lawrence F., *Review of Maintenance Management Controls*, Office of the State Auditor, Austin, Texas (February 1989) 50 Pages

Bauman, Richard D., and Jorgensen, William, *Contract Maintenance in Urban Areas*, Transportation Research Report No. 951 Maintenance Management Systems in Evolution, Transportation Research Board, National Academy of Sciences (1984) Pages 120-124

Baxter, Daniel H., and Russo, Roderick N., *Contracting Maintenance for Traffic Signal Systems (Abridgment)*, Transportation Research Report No. 1021, Transportation Research Board, National Academy of Sciences (1985) pp 33-36.

Blaine, J. Hugh, *Contract Maintenance in Ontario*, Transportation Research Report No. 951 Maintenance Management Systems in Evolution, Transportation Research Board, National Academy of Sciences (1984) Pages 101-106

Byrd, L. G., *NCHRP Synthesis of Highway Practice 149: Partnerships for Innovation: Private-Sector Contributions to Innovation in the Highway Industry*, Transportation Research Board, National Research Council, Washington, D.C. (July 1986) 42 pp.

Cook, Kenneth E., *Use of Contract Services by State DOTs*, TRNews (November-December 1985) Pages 24-29

Cox, Brian E., *Contract Maintenance in the United Kingdom*, Transportation Research Report No. 951 Maintenance Management Systems in Evolution, Transportation Research Board, National Academy of Sciences (1984) Pages 112-119

Davis, Frank W., et al, *Privatization is More than Contracting Out*, Transportation Research Report No. 1156, Transportation Systems Planning and Management, Transportation Research Board, National Academy of Sciences, Washington, D.C. (1988) pp 66-72.

Florida Department of Transportation, *Attachment A, Rules of the State of Florida, Department of Transportation, Chapter 14-22, Contractors - Highway - Qualification to Bid*, (1989), 10 Pages

Florida Department of Transportation, *Contract Maintenance Administration and Inspection*, (March 1, 1988), 161 Pages

Florida Department of Transportation, *District Contracting Procedures*, (Undated), 61 Pages

Gould, Roger, *Maintenance Quality Evaluation FY '88*, Iowa, Department of Transportation, 38 Pages

Harp, Darrell W., *Contractor Post-Qualification Practices in New York*, A presentation at the annual Transportation Research Board meeting, Washington, D.C., (January 1989), 12 Pages

Hatry, Harry P., Voytek, Ken, and Holmes, Allen E., *Analysis of Service Delivery Alternatives: Building Innovation into Program Reviews*, The Urban Institute, Washington, D.C. (December 1987).

Harral, Clell G., Henriod, Ernesto E., and Graziano, Peter, *An Appraisal of Highway Maintenance by Contract in Developing Countries*, Report No. TRP1, The World Bank (April 1986). 43 Pages

Jorgensen, J.S., and Whitman, John C., *Maintenance by Contract -- A State of the Art Review*, Transportation Research Report No. 951 Maintenance Management Systems in Evolution, Transportation Research Board, National Academy of Sciences (1984) Pages 139-142

London, Rosanne, *Determining Privatization Feasibility*, The Privatization Review, Volume 5, Number 3 (Summer 1990) pp 24-32.

McMullen, Clifford C., *NCHRP Synthesis of Highway Practice 125: Maintenance Activities Accomplished By Contract*, Transportation Research Board, National Research Council, Washington, D.C. (July 1986).

Miller, Charles R., *NCHRP Synthesis of Highway Practice 148: Indicators of Quality in Maintenance*, Transportation Research Board, National Research Council, (July 1989).

Ortgies, Bernhard H., *Iowa's Experience with General Contract Maintenance*, A presentation at the annual Transportation Research Board meeting, Washington, D.C., (January 1984), 16 Pages

Ronk, Cheryl O., *A Look at Using Contractors and Government Employees on Public Works Projects*, Michigan Road Builders Association, Lansing, Michigan (1986).

Sellers, Martin P., Ph.D., *Privatization of Urban Services in North Carolina*, The Privatization Review, Volume 5, Number 3, (Summer 1990) pp 51-65.

Shay, James W., *Contractors Offer Options for Maintenance*, Roads and Bridges, (March 1990), Pages 51-54

Suspension, Debarment, and Disqualification of Highway Construction Contractors, NCHRP Legal Research Digest, (May 1990) 27 pp.

Texas State Highway and Public Transportation Department, *Contract Maintenance*, a training outline, (September 1989) 74 Pages

Texas State Highway and Public Transportation Department, *Maintenance Contracts*, (June 14, 1989) 65 Pages

Texas State Department of Highways and Public Transportation,*Questions and Answers Concerning Routine Maintenance Contracts*, (1990) 23 Pages

Texas Transportation Institute, Report TTI: 2-18-86-380-1F, *Cost Evaluation Procedures Concerning the Use of Contractors and State Forces in routine Maintenance and Mowing Projects*, Summary Report 380-1F, Vol. I and Research Report 380-1F, Vol. I, (October 1988)

Washington State Department of Transportation, Directive D 51-30, *Highway Maintenance Contracts - $30,000 or Less*, (October 14, 1985) 2 Pages

Washington State Department of Transportation, Directive D 27-02, *District Level Contracts for Highway and Local Agency District Ad and Award Construction Projects*, (January 1, 1990) 35 Pages

THE TRANSPORTATION RESEARCH BOARD is a unit of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. It evolved in 1974 from the Highway Research Board which was established in 1920. The TRB incorporates all former HRB activities and also performs additional functions under a broader scope involving all modes of transportation and the interactions of transportation with society. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings. The Board's program is carried out by more than 270 committees, task forces, and panels composed of more than 3,300 administrators, engineers, social scientists, attorneys, educators, and others concerned with transportation; they serve without compensation. The program is supported by state transportation and highway departments, the modal administrations of the U.S. Department of Transportation, the Association of American Railroads, the National Highway Traffic Safety Administration, and other organizations and individuals interested in the development of transportation.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Frank Press is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research and recognizes the superior achievements of engineers. Dr. Robert M. White is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Stuart Bondurant is acting president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purpose of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Frank Press and Dr. Robert M. White are chairman and vice chairman, respectively, of the National Research Council.

TRANSPORTATION RESEARCH BOARD
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

ADDRESS CORRECTION REQUESTED