Research Report 8, August 1968

university of idaho
Moscow, Idaho

engineering experiment station

Idaho Highway Maintenance Study

PART I

Maintenance Fund Allocation

by R. D. Mason

PART II

Highway Maintenance Classification

by C. W. Hathaway

PART III

Field Maintenance Practices

by G. W. Kennaly

SPONSOR

Idaho Department of Highway
(Research Project No. 39)

IDAHO HIGHWAY MAINTENANCE STUDY

Part I

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Engineering Experiment Station
College of Engineering
University of Idaho
Moscow, Idaho

In Cooperation With

the

IDAHO DEPARTMENT OF HIGHWAYS

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FOREWORD

The Idaho Highway Maintenance Study is the final report of a cooperative research investigation conducted at the University of Idaho in the Department of Civil Engineering and financially sponsored by the Idaho Department of Highways as Research Project 39. The project was administered through the University of Idaho Engineering Experiment Station. Part I entitled "Maintenance Fund Allocation" is essentially the thesis of R. D. Mason, as presented in partial fulfillment for his Master of Science Degree in Civil Engineering. Part III, "Field Maintenance Practices", is a similar product of G. W. Kennaly for the same purpose. Part II, "Highway Maintenance Classification", was written by C. W. Hathaway, Associate Professor of Civil Engineering, who also served as project director and as the major professor to the two graduate students.

Besides providing financial support, the Idaho Department of Highways made several other notable contributions to this investigation. Of greatest significance was the invaluable assistance of Mr. L. F. Erickson, Research and Materials Engineer and Mr. Roy Jump, Maintenance Engineer in planning and conducting the study. District Engineers and District Maintenance Supervisors coordinated the field studies with the schedules of the field maintenance crews. Maintenance men throughout the State graciously answered the voluminous questionnaires and provided the basic data required for Part III.

Special thanks go to the secretarial staff, Mrs. Gloria Smith, Mrs. Beatrice Roy and Mrs. Pat Hartwell who have typed, reproduced and assembled the report.

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SUMMARY

The first objective of this study was to determine how states, other than Idaho, allocate their funds for highway maintenance and to ascertain which states have established distinct levels of maintenance and standards of maintenance for different classes of highways. The second objective was to write FORTRAN digital computer programs for the formulae of those states using this method of allocation for highway maintenance funds and to compare the results of the computerized formulae (using Idaho data) with Idaho's past expenditures for highway maintenance.

Of the eleven states that now utilize a formula for the allocation of maintenance funds, only six states sent formulae which could be programmed. The majority of the remaining states allocate their highway maintenance funds by precedence. It was also indicated that the majority of states do not differentiate between the level of maintenance nor the standard of maintenance for different highway classifications.

Results of the computerized formulae indicated the allocation per Idaho State Highway District should be in the same range, percentagewise, even though the formulae were based upon different criteria. The comparison of the results indicated that some inequities may exist in the present highway maintenance fund allocation system utilized by the Idaho Department of Highways.

PART I

MAINTENANCE FUND ALLOCATION

by

R. D. Mason

CHAPTER I

INTRODUCTION

The allocation of maintenance funds in an equitable manner, consistent with the true proportionate needs of a highway system, is a subject of concern to highway administrators. In recent years the maintenance costs for Idaho's highway system have increased at a rate approximately twice that of maintenance revenues (1). One possible reason for this escalation of maintenance costs is that the level of maintenance for certain items (i.e., mowing, snow removal, patching, painting, and similar items) or classes (i.e., primary, secondary, or interstate) may be greater than it should be.

Previous research has attempted to correlate maintenance costs with certain highway variables such as snowfall, roadway width, surface type, and pavement thickness (2,3). However, in both of these studies it was assumed that the levels and standards of maintenance were the same for all items and classes.

In this study the level of maintenance is defined as the control which describes when a certain maintenance function will be performed and as such reflects the serviceability of a highway to the motorist. Items such as mowing grass when it reaches a specified height or patching a hole as soon as it has formed are examples of levels of maintenance. Standards of maintenance pertains to such items as the routine to be followed in patching a hole or the height to which the grass should be mowed and accordingly pertains to the physical act of performing a maintenance operation.

The question to be answered is: Can maintenance funds be allocated according to some formula which would take into consideration not only highway variables but also the level of maintenance that should be provided for the different classes and items in the highway system? This phase of the study did not attempt to answer this question in full. This aspect of the study was concerned, rather, with the application of other states' formulae to Idaho data and to compare the results obtained with Idaho's past expenditures.

I. PURPOSE

According to the Bureau of Public Roads, average maintenance costs per mile have increased 100 per cent in the last twelve years (4). From 1955 to 1964 the State of Idaho reported the following increases: (1) state highway mileage increased approximately 4 per cent (4708 to 4881 miles); (2) maintenance cost per mile increased approximately 27 per cent ($987.20 to $1258.00); (3) money spent on maintenance rose approximately 32 per cent

($4,648,000 to $6,140,500); and (4) total highway funds from state sources increased about 48 per cent($23,760,000 to $35,164,000) (1). However, during the period 1960 to 1964 maintenance costs rose 15 per cent while state revenue increased only 6.5 per cent (1).

According to recent annual reports of the Idaho Department of Highways (5), greater than 40 per cent of Idaho's state highway user revenues are alloted to maintenance each year. This fact emphasizes that it is important to utilize these funds in the most effective and efficient manner which is, at the same time, consistent with the needs of highway system.

In addition, the maintenance costs for the different highway districts vary considerably in the State of Idaho. The allocation of highway maintenance funds by the use of a formula which takes into account various highway variables (lane miles, surface area, type, etc.), operating characteristics (vehicle miles, ton miles, etc.), and previous expenditures (snow removal costs, physical maintenance costs, traffic services costs, and previous maintenance fund requirements) may be one of the possible solutions for reducing the probability of a disproportionate allocation.

II. OBJECTIVE

The objective of this investigation was two fold. The first objective was to prepare a questionnaire which was to be mailed to each of the other 49 state highway departments. Questions were to be asked concerning the individual state's method of maintenance fund allocation and whether or not the state had prescribed standards and/or levels of maintenance for its highway system. The second objective was to write digital computer programs for the formulae received from other states regarding allocation of maintenance funds, to apply data from Idaho's highway system to these formulae, and to compare the results obtained with Idaho's past expenditures for maintenance.

III. BACKGROUND

William J. Parman (2), in his master's thesis work entitled, A Pilot Study of Maintenance Costs of Idaho Highways, questioned whether or not the level of maintenance should be the same for all classes of highways; subsequently, he recommended that the subject of level of maintenance be pursued further in an attempt to correlate level of maintenance with class of highway. This project was the result of Parman's recommendations.

In order to avoid the possibility of duplicating effort, the publication, Highway Research in Progress, 1965 (6), was examined to determine what research was being done in the field of highway maintenance. Several letters were written to those institutions which indicated they were pursuing either level of maintenance or maintenance fund allocation; however, there was no germane material obtained from their replies.

CHAPTER II

PURPOSE AND RESULTS OF THE QUESTIONNAIRE

In order to determine the present procedures employed by the other states in the field of maintenance fund allocation and levels and standards of maintenance, a simple questionnaire, a copy of which is located in Appendix A on page 39 was sent to each state highway department. The questions were devised so that they could be answered either "yes" or "no"; in addition, provision for comments was available if the interviewee was so inclined. The most important question for this phase of the study was question 5 in regard to maintenance fund allocation. The other five questions were asked primarily in order to form guidelines for the subsequent phases of the study. The responses to the questionnaire are tabulated in Appendix A, pages 40 through 42.

Response to the questionnaire was 100 per cent; however, some states had to be mailed as many as three copies of the questionnaire before a response was obtained. On the first mailing a 60 per cent response was obtained, and after the second mailing only six had not answered. The answers ranged from a straight line down the "no" column to a three-page letter from the State of Washington. In a majority of the responses the interviewee either wrote a letter or clarified his answers on the questionnaire itself.

The comment which interviewees made most frequently (with the returned questionnaire) was that their states' policy was to maintain their highway system in its original or subsequently improved condition. This is the comment that one should expect to hear, for this is the purpose of a maintenance division in a highway system and is the usual definition for highway maintenance. In some of the comments reference was given to other germane information which was subsequently requested.

Five states, in returning the questionnaire, also sent along their states' maintenance manual. Because of this, it was decided to request the maintenance manuals of the other states rather than to prepare a second questionnaire concerning the methods employed by the states in their maintenance functions. This procedure was followed because it was anticipated that a faster and more complete response would be obtained.

In some instances a few states replied to two questionnaires, and the answers did not agree 100 per cent in any case. This fact was disturbing because it pointed toward the questionability of the answered questionnaires. In those cases where two questionnaires were received, the answers to the one with the most "impressive signature" (title) were tabulated.

At the time that the maintenance manuals were requested, a copy of an interim report giving a tabulation of answers to the questionnaire was also sent to each highway department. The number of responses to the interim report was 35 which was much better than anticipated. Many states expressed their appreciation and requested the final results of the study. Twenty-three highway maintenance manuals were received or promised; these manuals were of great assistance in the later phases of the study.

As an afterthought, the questionnaire (page 39)was sent to the Canadian Provinces. Four of the seven provinces replied to the questionnaure and the results are tabulated in Appendix A on page 42.

It is interesting to note that those Canadian Provinces which responded indicated a more progressive attitude in the field of highway maintenance that the states (indicated by the predominance of the positive answers). However, if the other three Provinces had answered, their results may have contained more negative answers.

British Columbia indicated that a formula (in addition to precedence) is used for highway maintenance fund allocation; however, upon requesting their procedure, the Department of Highways answered that a formula is "not exactly" used at this time. Their procedure seems to be similar to that of the State of Connecticut which is based upon precedence and justifiable increases. For British Columbia, the justifiable increases are dependent upon traffic volumes, industrial expansion and the corresponding road development.

CHAPTER III

COMMENTS ON QUESTIONNAIRE

As was indicated previously, many of the interviewees qualified their answers to the questionnaire. Some of the comments are paraphrased below in order to indicate the relative reactions generated by the questions.

I. QUESTION ONE

Has your state adopted standards for physical maintenance of its highway system?

Mr. C. I. Brown (7) (Assistant Maintenance Engineer for the State of California) wrote that maintenance of each highway is determined "in the discretion" of those authorities charged with said highways--taking into consideration traffic requirements and available funds. Mr. Larue Delp (8) (Engineer of Maintenance for Kansas State Highway Committion) writes that his state's policy is to maintain the standard at which the highway was originally constructed. Mr. M. J. Snider (9) (Chief Engineer of the Missouri State Highway Commission) says that the highways are to be maintained in their constructed or subsequently developed condition in such a way as to contribute to the safety, convenience, appearance and the preservation and protection of the roadway. Mr. E. S. Hunter (10) (Maintenance Engineer for the Oregon State Highway Department) commented that even though the standards are not established in "black and white" they are real and do indeed exist. Mr. E. Belsheim (11) (Assistant Chief Maintenance Engineer for the Department of Highways of the Province of Alberta) wrote that even though no standards are in writing, each District Engineer is instructed as to the standards of maintenance for each highway.

II. QUESTION TWO

Do you use different maintenance standards for the different road classifications - i.e., interstate, primary, secondary, urban, rural, etc?

Mr. T. J. Hopgood (12) (Director of the Division of Maintenance for the Department of Highways for Kentucky) stated in his letter that his state uses a different standard of maintenance for the more heavily traveled roads even though there is no policy covering standards as such. Mr. Snider (9) (Missouri) said that the fact that the roads are constructed to different standards "dictates" a requirement for different maintenance standards. Mr. Hunter (10) (Oregon) stated that "emphasis" is placed upon interstate first, then primary, and finally secondary highways. Mr. J. L. Stackhouse (18) (Assistant Director for Maintenance for the Department of Highways of the Washington State Highway Commission) says that his state does have different standards for different classifications; in addition a standard, required by the people who use the facility, is adhered to.

Mr. John Walter (14) (Assistant State Maintenance Engineer of the Highway Commission for the tate of Wyoming) replied that different standards are "based largely" upon traffic volumes and/or economic considerations. He further stated that the Interstate received top priority, and that the priority between Primary and Secondary Roads was dependent upon school bus and commuter traffic. Mr. Belsheim (11) (Alberta) indicated that maintenance standards for different highways were based upon load restrictions, surface type, and volume.

III. QUESTION THREE

Do you base standards for physical maintenance on traffic volumes?

Mr. Delp (8) (Kansas) replied that the volume of work "certainly" reflects the traffic volumes, but that the standard does not. Mr. Snider (9) (Missouri) said that traffic volumes dictate, to a large degree, what a "satisfactory" level of maintenance is to be. Mr. Stackhouse (13) (Washington) implied that higher standards are required on higher volume highways in order to reduce the possibility of accidents (a lower volume roadway should have a less chance of accidents if everything else is equal). Mr. J. A. Dennison (15) (Senior Maintenance Engineer for the Department of Highways of British Columbia) stated that traffic volumes are used to a great degree in the determination of standards for physical maintenance. In addition, as was stated above, British Columbia partially utilizes traffic volumes in the determination of maintenance fund allocation.

IV. QUESTION FOUR

Have you adopted different levels of service criteria for different road classifications - i.e., interstate, primary secondary, urban, rural, etc.?

Mr. Delp (8) (Kansas) wrote that although different levels have not been adopted for different road classifications, Interstate and Primary roads were serviced first in direct relation to traffic volumes. Mr. Stackhouse (13) (Washington) also indicated that the Interstate system had number one priority and other classes of highways received service according to their traffic volumes or importance. Mr. Belsheim (11) (Alberta) said that, generally, a different level of maintenance was provided for the different types of roads; however, the more heavily traveled roads received first consideration for snow and ice control. Mr. R.A. Scott (16) (Maintenance Engineer for the Department of Highways and Transportation of the Province of Saskatchewan) replied that a different level was observed in the winter only--for control of ice and snow. He also stated that a "bare pavement" policy was observed for: (1) intercity routes (this includes the Trans Canada Highway), (2) non-intercity routes with average daily traffic volumes greater than 500, and (3) dust free routes which provide important connections.

V. QUESTION FIVE

For allocation of maintenance funds between the major highway districts or divisions, do you use:

(a) Legislative criteria?
(b) Formula?
(c) Precedence?
(d) Other?

Mr. Snider (9) (Missouri) wrote that his state bases its maintenance fund allocation on "many" years cost records for the various types of highways. He also indicated that public demand was an important factor to be considered. Mr. John McMeekin (17) (Maintenance Engineer for the Department of Roads in Nebraska) replied that the Program and Planning Section of the Department of Roads rated the State's highways every other year in order to determine maintenance requirements. In addition, the cost records of previous years, section variability (climate, topography, and geology), and availability of funds are considered in determining the relative allocation between districts. Mr. Jim West (18) (Chief Maintenance Engineer for the Utah State Department of Highways) said that highway maintenance allocation is estimated by the individual District Engineer, District Maintenance Supervisor, and Shed Foreman who "go over" each section of roadway in order to estimate the maintenance costs. Mr. Walter (14) (Wyoming) stated that highway maintenance funds were distributed as equitably as possible--taking into account number of employees, geological location (climate and topography), and the funds available.

VI. QUESTION SIX

Does your maintenance cost accounting procedures follow the AASHO Uniform Accounting Manual?

Mr. Brown (7) (California) replied that policy and statutes required deviation from AASHO guidelines. Mr. H. J. Rathfoot (19) (Chief Maintenance Engineer for the Highway Department of Michigan) said that AASHO guidelines are followed in a modified form in which record keeping was simplified by reducing the number of work items. Mr. Walter (14) (Wyoming) responded that his state follows the AASHO Uniform Accounting Manual "very closely."

One other comment which was noticed quite often and stated by Mr. Darrell G. Vail (20) (Maintenance Engineer for the Department of Highways of Colorado), who is the Chairman of the AASHO Committee on Maintenance Standards, was that there was a great need for studies in the area of maintenance standards.

CHAPTER IV

FEASIBILITY OF ALLOCATION FORMULA

According to the results of the questionnaire, 64 per cent of the states use precedence for allocation of maintenance funds to their highway districts; other states base their allocation on such items as legislative criteria, formula, needs, and sufficiency rating. The State of Idaho utilizes precedence for the allocation of highway maintenance funds, but it is desired that a formula be devised which would eliminate this procedure--if possible.

A statistical analysis was made of the maintenance expenditures for Idaho's highway districts for the years 1961 through 1965. The analysis considered the percentage of money allocated to each district per year as compared to the total allocation for the State for each year. The results revealed that the maximum standard deviation was approximately 0.7 per cent. Table I illustrates the relative standard deviation for highway maintenance expenditures for the years 1961 through 1965.

The writer is aware that the use of a five year period is quite small in the determination of a standard deviation; however, the small values obtained indicate that a high degree of precedence is employed in the determination of a district's share of the maintenance fund or that their respective needs are consistently similar.

A formula which is based upon physical items such as lane miles, operational characteristics such as vehicle or ton miles, and climatic conditions such as snowfall (and subsequent snow removal) should offer a means whereby each district would receive its true proportionate share.

In his report, Parman (2) found that climatic conditions (including such factors as snowfall, precipitation, and degree days,) were the most "potent" variables in maintenance expenditures. This can be explained by the fact that the geography of Idaho is so dissimilar. If the State of Idaho were not so large (approximately 510 miles long), the variability of the factors would not be so influential.

TABLE I

DISTRIBUTION OF IDAHO STATE HIGHWAY MAINTENANCE

EXPENDITURES FOR SALARIES AND WAGES

FOR THE YEARS 1961-1965

State Highway District	1961 %	1962 %	1963 %	1964 %	1965 %	Ave. %	σ %
1	15.21	15.90	16.06	16.14	15.83	15.84	0.47
2	15.06	15.14	15.09	14.80	15.08	15.03	0.33
3	18.76	18.68	18.79	18.76	18.44	18.68	0.41
4	18.02	18.30	17.98	17.82	17.61	17.94	0.69
5	17.86	17.12	16.86	17.36	17.93	17.43	0.19
6	15.09	14.86	15.22	15.12	15.11	15.08	0.27

Of course, it is realized that precedence will still be required to determine the relative trends (and hence any constants in an equation) in the districts; however, the equation constants should not be based upon one year's experience, but they should be derived from, at least, five year trends. If every year the equation constants were determined for the previous five years, the resulting equation should perform the desired function (allocation in an equitable manner).

CHAPTER V

SOURCES OF FORMULAE

Question Five of the questionnaire was asked in order to determine the means by which the individual states allocate their maintenance funds. If a reply indicated that a formula was used for this purpose, a letter was written requesting the formula, its application, and what data were required for its successful application.

Of the eleven states which indicated that a formula was used for maintenance fund allocation, only six sent formulae which could be programmed: (1) Maryland, (2) Massachusetts, (3) Oklahoma, (4) Oregon (5) Virginia, and (6) West Virginia. West Virginia uses seperate formulae for primary and secondary maintenance.

I. MARYLAND

For the distribution of maintenance funds to its seven "Maintenance Districts," the State of Maryland (21) utilizes the parameters of vehicle miles and square yards of pavement surface; in addition, funds for special maintenance functions are set up outside of the normal maintenance budget and are not distributed by formula. From the formula, the percentage of the total budget which each district receives is the sum of 25 per cent of the district's percentage of annual vehicle miles and 75 per cent of the district's percentage of square yards of surface area. The formula is straight forward and very easy to apply.

II. MASSACHUSETTS

The Commonwealth of Massachusetts (22) makes use of the cost per lane mile concept for allocation of its maintenance funds to its eight highway districts. The estimated cost per lane mile is determined for the three main areas of maintenance: (1) physical maintenance, (2) snow and ice control, and (3) traffic services. For the 1967 fiscal year, Massachusetts highway maintenance allocation is based upon the following approximate percentages: (1) 39.13 per cent for physical maintenance, (2) 24.78 per cent for snow and ice control, and (3) 26.07 per cent for traffic services. The percentages are based upon the statewide averages for every class and type of highway without regard to the pavement's age or to the volume which it supports. The relative percentages are reviewed periodically to compensate for cost changes.

III. OKLAHOMA

The State of Oklahoma (23) actually utilizes a method rather than a formula; the method is based upon wages and salaries of the authorized personnel per district. This method is used because it is assumed that

the number of authorized personnel is a yardstick of the number of miles, the nature of terrain, and the type of improvements to be made. The percentage of maintenance wages and salaries per district, as compared to the total maintenance wages and salaries for the State, is the criterion upon which the districts receive their highway maintenance allocation. In the state highway districts, the total of wages and salaries is increased by 21.82 per cent to cover such items as vacations, sick leave, holidays, jury service, military leave, workman's compensation, State's share of social security, and State's contribution to the retirement fund. Special maintenance funds are limited by the State legislature and are distributed equally to the highway districts.

IV. OREGON

In Oregon (24), the allocation of highway maintenance funds to its five divisions is dependent upon ton miles, past expenditures, and lane miles. The factors are weighted as follows: (1) 50 per cent for ton miles, (2) 25 per cent for the past three years expenditures, and (3) 25 per cent for lane miles. In 1962 the following respective weights were used: 15, 10, and 75 per cent; in 1963 the ratio was changed to 20, 20, and 60 per cent; and in 1964 the present weights were established. The interesting fact is that ton miles has assumed greater importance than past expenditures as experience with the formula has increased. This would seem significant, because the emphasis is placed on load repetitions which is a common criterion for pavement design. The same procedure is used by the divisions to distribute the money to the State's sixteen districts; however, in some instances local conditions may be such that it is necessary to "juggle" (by judgment) the allocation in order to meet special situations which may arise. In order to make a good judgment in juggling the allocation, field budget recommendations are reviewed as an aid to good decisions.

V. VIRGINIA

The formula utilized by the Commonwealth of Virginia (25) is applicable only to its interstate system; it is based upon vehicle-miles and lane miles. From the State's lump sum allocation for its highway system, a specified amount is removed for weighing stations, rest areas, and landscaping; the remainder is then distributed by formula. The distribution factor is determined by weighting the district's per cent of lane miles as 75 per cent and the district's per cent of vehicle miles as 25 per cent. Virginia attempted to use the above method on their primary highway system; however, it did not yield a satisfactory distribution because of the inability to include all "pertinent variables."

VI. WEST VIRGINIA

As was stated previously, West Virginia (21) uses a different formula for the allocation of maintenance funds for its primary and secondary highway systems. For the primary system the total number of lane miles of untreated (primitive, unimproved, graded and drained, soil surface, and gravel or stone,) treated (surface treated), bituminous, and concrete pavement are multiplied by the following weights, respectively: 1.0, 1.46, 1.32 and 1.31. These factors were determined by research conducted by the State of West Virginia. The weighted mileages are then added and the sum is divided

into the individual weighted mileages; the results are then multiplied by the total allocation for primary maintenance; the products next are divided by the respective mileages of pavement types (not weighted) and the allocation per mile of pavement type is determined. An example calculation is illustrated on page 18.

The formula for the Secondary Highway System is done basically the same way. The difference is that the pavement types are unimproved (primitive, unimproved, graded, and drained), traffic bound (soil surface and gravel or stone) and paved (surface treated, bituminous, concrete, and brick); these have the weights 0.5, 2.50, and 4.36 respectively. The example (page 18) illustrates this procedure.

VII. OTHER STATES

The States of Connecticut, North Carolina, and Vermont sent formulae which could not be programmed for the computer. Connecticut (27) bases its allocation on precedence plus justifiable increases. North Carolina indicated in the returned questionnaire that it utilizes certain "plus factors" in determining the mileage of its highway system; however, the actual formula was never received. The average cost per mile (statewide) is used as a yardstick in the State of Vermont (30), but it is not strictly adhered to as a formula; no other information was received concerning the formula so it could not be investigated further.

Delaware and Ohio, the other two States which indicated the use of a formula, sent no information on their method.

WEST VIRGINIA'S CALCULATIONS FOR PRIMARY ROUTINE MAINTENANCE ALLOCATION FOR

JULY 1, 1965 THROUGH DECEMBER 31, 1965

ALLOCATION BASED ON MILEAGE INVENTORY TABLES AS OF DECEMBER 31, 1965

$ 3,227.500.00	TO BE ALLOCATED
-40,000.00	DEDUCTED FOR MAINTENANCE OF ROADSIDE PARKS
$ 3,187,500.00	BALANCE TO BE ALLOCATED BY FOLLOWING FORMULA

TYPE	MILEAGE		WEIGHT		MILEAGE WEIGHTED		SUM OF WEIGHTED MILEAGE		FACTOR
UNTREATED	19.14	x	1.00	=	19.14	-	6,784.43	=	.0028212
TREATED	152.93	x	1.46	=	223.28	-	6,784.43	=	.0329106
BITUMINOUS	4,599.94	x	1.32	=	6,071.92	-	6,784.43	=	.8949786
CONCRETE	358.85	x	1.31	=	470.09	-	6,784.43	=	.0692896
	5,130.86				6,784.43				1.0000000

.0028212	x	$ 3,187,500.00	=	8,992.58	÷	19.14	$469.8317659
.0329106	x	3,187,500.00	=	104,902.53	÷	152.93	685.95;2849
.8949786	x	3,187,500.00	=	2,852,744.29	÷	4,599.94	620.1698913
.0692896	x	3,187,500.00	=	220,860.60	÷	358.85	615.4677441

CHAPTER VI

CODING OF THE FORMULAE FOR THE IBM 1620

FORTRAN language was used for the programming of the formulae. In each formula it was assumed that the total allocation to be distributed would be one thousand dollars; hence the relative distribution resulting from each of the formulae could be compared quite easily. The data for the programs were obtained from the Idaho Department of Highways for the years 1961-1965. The year 1964 was used for the basis of comparing the results of the different formulae. This year was chosen because, at the beginning of the study, it was the most recent year with all data compiled.

I. MARYLAND

The actual program for the State of Maryland is located in Appendix C on page 49. As has been stated, Maryland bases its formula on vehicular miles and square yards of pavement surface. In the program AREA1, VEHM1, and ALCA1 refer to surface area, the number of vehicular miles, and the resulting highway maintenance fund allocation, respectively, for the State Highway District 1 of Idaho. AREA2, VEHM2, and ALCA2 refer to State Highway District 2, etc. AREAT and VEHMT refer to the total surface area and vehicular miles for the State of Idaho.

II. MASSACHUSETTS

Since Massachusetts considers physical maintenance, snow and ice control, and traffic services separately, it was decided to compute the allocation per district for each of the three categories as well as the total allocation per district. The alpha-numeric names, TØLM1, etc. (page 50) refer to the total number of lane miles in the highway districts and State.

ALCP1, ALCS1, ALDT1, and SUM1 refer to the allocation for physical maintenance, the allocation for snow and ice control, the allocation for traffic services and the total allocation for State Highway District 1, respectively.

III. OKLAHOMA

Oklahoma's formula (page 51) was the easiest of the formulae to program. Actually, Oklahoma did not send a copy of their actual procedure, so the writer abandoned further consideration of the method for some time; however, after considering the implied method, it was thought that the relative wages and salaries per district should be a fairly good indication of the relative maintenance requirements per district, for the relative wages and salaries should indicate the relative maintenance requirements. For this reason, the formula written considers only wages and salaries of those people concerned directly with highway maintenance.

As before, WAGS1, and ALCA1, refer to the wages and salaries and the total allocation for State Highway District 1, respectively.

IV. OREGON

The State of Oregon seems to be the most progressive state as far as maintenance fund allocation by formula is concerned. As was stated above, the three factors, ton miles, lane miles, and past experience, were weighted at 50, 25, and 25 per cent, respectively. In the program (page 52), TØTM1, TØTL1, PAEX1, and SUM1 refer, respectively, to the total ton miles, total lane miles, and average of the previous three years' experience of maintenance fund allocation, and the total allocation for Idaho's Highway District 1. The other alpha-numeric names refer to the other districts and the State as a whole, just as in previous formulae.

V. VIRGINIA

Even though Virginia applies its formula only to its interstate system, it was decided to apply the formula to the whole of Idaho's highway system. In Virginia's formula (page 53), VEHM1, TØTL1, and ALCA1 refer to the vehicle miles, lane miles and allocation as described above.

VI. WEST VIRGINIA

The formula utilized by West Virginia for its primary highway system is dependent upon the type of pavement. In the formula (page 54), TØMU1, TØMT1, TØMB1, TØMC1, and ALCA1 refer to the total miles (not lane miles) of untreated, treated, bituminous, and concrete pavements, and the allocation for State Highway District 1 just as before. UNTR, TRDT, BITU, and CØNC, refer to the total miles of untreated, treated, bituminous and concrete pavement for the whole State. UNTRA, TRTDA, BITUA, and CØNCA are the weighted mileages for the different types of pavements as shown in the example on page 18. SUM is the arithmetic total of UNTRA, TRTDA, BITUA and CØNCA. FACTU, FACTT, FACTB, and FACTC are the factors for the different pavement types as shown in the above example. ALCAU, ALCAT, ALCAB, and ALCAC are the allocation per mile for the different types of highway pavement.

West Virginia's formula for secondary highway maintenance is practically the same as its formula for Primary highway maintenance; the only difference is the weight factors and the different classification of highways. In the formula (page 54) UPRV, TRFB, and PVED refer to the total miles (not lane miles) of unimproved, traffic-bound and paved roads, respectively. TØMU1, TØMT1, and TØMP1 refer to the total miles of unimproved, traffic-bound, and paved roads for State Highway District 1 as before. UPRVA, TRFBA, and PVEDA refer to the respective weighted mileages for the different classes of roads. SUM is the arithmetic total of UPRVA, TRFBA, and PVUDA. FACTU, FACTT, and FACTP are the factors as shown in the example, page 18. ALCAU, ALCAT, and ALCAP are the allocation per mile for the different types of roads.

CHAPTER VII

RESULTS OBTAINED FROM THE FORMULAE USING IDAHO DATA

The data for the year of 1964 were selected because they were from the most recent year with complete information available at the beginning of this study. When averages were required such as in the formulae of Oklahoma and Oregon, the data were taken from the year 1961 through 1965.

The computer results from the printout are shown in Table II below.

TABLE II

TOTAL ALLOCATION FOR HIGHWAY MAINTENANCE ALLOTED TO EACH DISTRICT ON THE BASIS OF THE PROGRAMMED FORMULAE

State Highway District	Maryland %	Mass. %	Oklahoma %	Oregon %	Virginia %	West Virginia** %
1	16.57	16.07	16.14	*18.42	16.74	15.63
2	21.41	21.62	*14.90	20.52	21.25	21.73
3	21.82	20.28	18.76	22.42	21.88	19.51
4	12.54	14.22	*17.82	12.96	12.95	14.66
5	13.18	12.50	*17.36	13.25	12.76	12.55
6	14.49	15.31	15.12	*12.34	14.42	15.93

*Indicates numbers which were discarded in the statistical analysis.

**The column entitled, "West Virginia" was obtained by multiplying the respective primary mileage by the primary allocation factor, multiplying the secondary mileage by the secondary allocation factor, adding them together and then dividing by the sum of the primary and secondary mileage for the district in question.

A statistical analysis of the results was performed in order to determine if there was any correlation between the different formulae. In some instances one of the values was discarded because of its difference from the others. The results are shown in Table III below. The values which were discarded are indicated by an asterisk in Table I on page 21.

TABLE III

AVERAGE AND STANDARD DEVIATION OF THE

RESULTS OF THE DIFFERENT FORMULAE

FOR EACH HIGHWAY DISTRICT

State Highway District	Average %	Standard Deviation %
1	16.23	0.44
2	21.31	1.21
3	20.78	1.45
4	13.47	0.93
5	12.85	0.35
6	15.05	0.62

The resulting standard deviations are interesting because they are not very large even though the comparison was made upon formulae which considered different parameters for determining the allocations.

In the determination of the standard deviation the equation for non-biased results was used (n-1 in the denominator). This was done because there were so few observations.

CHAPTER VIII

COMPARISON OF RESULTS WITH IDAHO'S PAST EXPENDITURES

Table IV illustrates the actual expenditures per state highway district expressed as percentages for the years 1963-1965. In addition, the table includes the average allocation (with one standard deviation included) per district from the formulae. The standard deviation is included to show the range in which a reasonable confidence is to be expected.

TABLE IV

RELATIVE EXPENDITURES PER DISTRICT FOR THE YEARS 1963-1965

COMPARED WITH THE AVERAGE FORMULAE RESULTS

State Highway District	1963 %	1964 %	1965 %	Average %	Formulae Results One Standard Deviation From the Average %
1	14.24	17.01	14.86	16.23	15.79 to 16.67
2	18.53	13.66	15.59	21.31	20.10 to 22.52
3	18.13	28.87	21.00	20.78	19.33 to 22.23
4	19.44	18.42	17.83	13.47	12.54 to 14.40
5	16.91	16.86	16.71	12.85	12.50 to 13.20
6	12.76	15.19	14.02	15.05	14.43 to 15.67

Observation of Table IV indicates that State Highway District 1 fell both above and below for the years studied; State Highway District 2 was well below the formulae results; State Highway Districts 3 and 6 approached the formulae results, and State Highway Districts 4 and 5 were well above results predicted by the formulae.

The average results give an indication of the range in which the allocation may be expected to fall according to the formulae. However, it must be remembered that these formulae are from other states, none of which has the extremes in weather or terrain which exist in Idaho. Figure 1, page 25, was constructed to show the graphic relationship between Idaho's immediate past expenditures and the formulae results.

I. OKLAHOMA

It is interesting to note from Figure 1 that the only formula which is consistently in, or near, the 1963-1964 range is that of the State of Oklahoma. However, it must be remembered that Oklahoma formula is based upon wages and salaries; in addition the results of the Oklahoma formula are based upon Idaho data for the years 1961-1965, and therefore the results should be closely aligned with the past expenditures provided that maintenance personnel are assigned consistent with maintenance requirements. Another interesting fact concerning the Oklahoma results is that for four districts the results are extreme; i.e., the results are quite different from all of the other formulae results.

II. MARYLAND AND VIRGINIA

The two formulae which consistently yield the same results are those of the states of Maryland and Virginia (Maryland - surface area and vehicle miles; Virginia - lane miles and vehicle miles). In each case vehicle miles are weighted 25 per cent and the remaining factor is weighted at 75 per cent; essentially lane miles and surface area should not be too significantly different, proportionally, for the only variable would be pavement width. In only two of the six districts (Districts 1 and 6), did the allocation resulting from the formulae of Maryland and Virginia fall within the range of the 1963-1965 Idaho expenditure range.

III. MASSACHUSETTS

The resulting allocation from the formula of Massachusetts is within or at the edge of 1963-1965 Idaho expenditure range for State Highway Districts 1, 3, and 6. Recall that Massachusetts uses the following factors for allocation of maintenance funds: (1) physical maintenance - 39.13 per cent; (2) snow and ice control - 26.09 per cent; and (3) traffic service - 34.78 per cent. Appendix Tables B-1 and B-2 on pages 45 and 46 illustrate Idaho's expenditures for these three categories for 1963 through 1965. It is easily observed from Table B-1 that Idaho's expenditures for the above mentioned classifications of maintenance do not even approach Massachusetts' percentages for the same three categories. Also, it must be realized that Massachusetts has a much greater amount of money available for allocation ($3450 per lane mile for fiscal 1967 as compared to Idaho's $1240 per mile for 1964) (23). Also notice that Massachusetts' allocation is per lane mile while Idaho's allocation is per mile only.

Observation of Table B-2 indicates that no precise pattern is followed in which Idaho money is spent for the three phases of maintenance (physical maintenance, snow and ice control and traffic services) for the years 1963 through 1965. In fact, the table seems to point out the variability of funds spent within the State's Highway Districts. Both money expenditures and percentages indicate that no district is predominant in the field of physical maintenance; however, State Highway Districts 3 and 5 seem to predominate both money and percentages for traffic services and snow and ice control, respectively. State Highway District 5 is the district which, geographically, should receive the most severe winters in the State; this fact is supported by the expenditures for snow and ice control indicated in Table B-2. State Highway District 3 serves greater traffic volumes than any other district and therefore it should be the district which would spend the most money on traffic services.

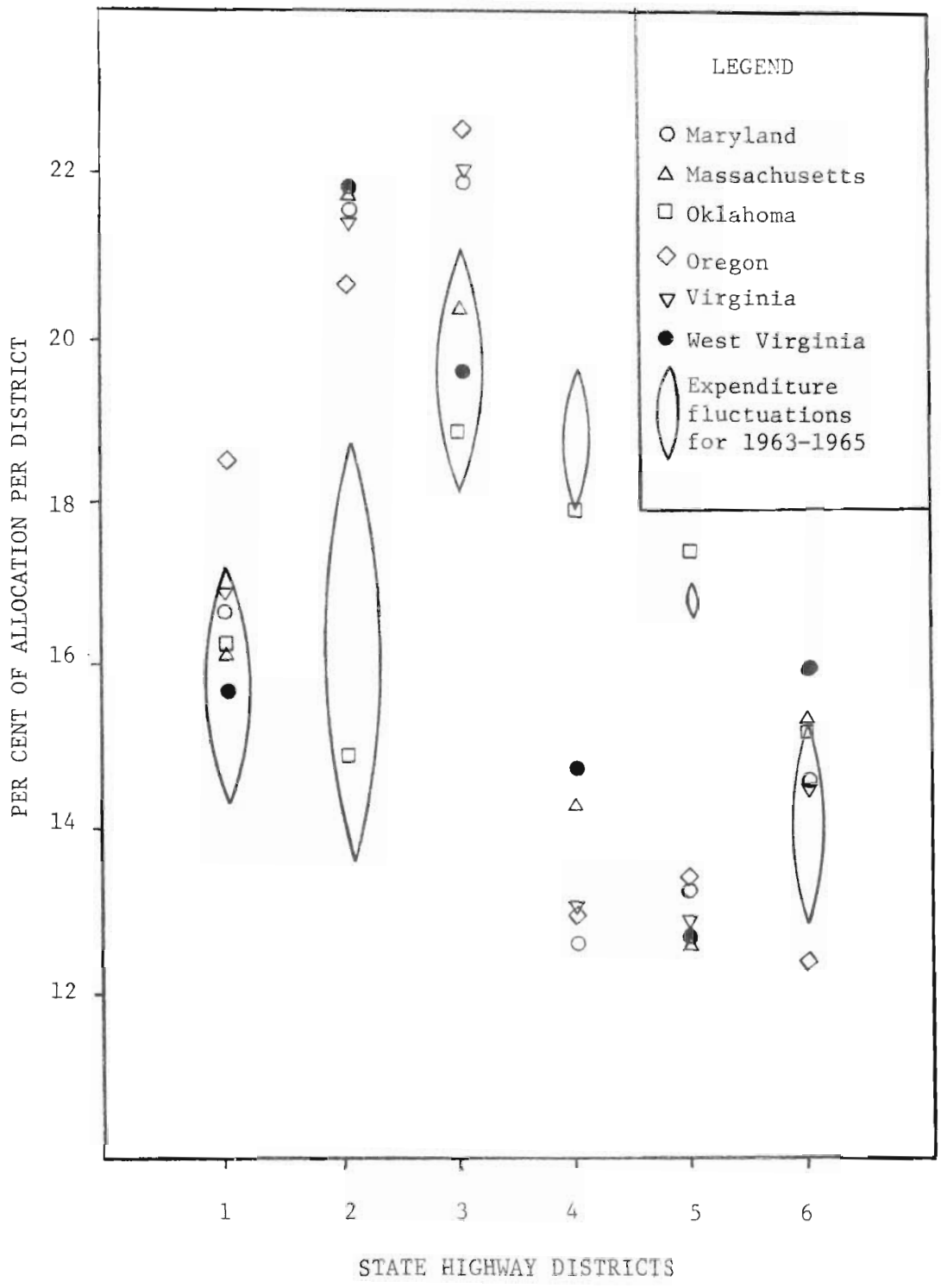

Figure 1. Comparison of formulae results from the various states with Idaho's actual expenditure for the years 1963 through 1965 (formulae data for the year 1964).

From the above discussion, it is concluded that a formula based solely upon the three phases of maintenance (as does Massachusetts) would not work in Idaho because of the wide variation in geography.

IV. OREGON

From Figure 1 it is observed that the allocation resulting from the formula of Oregon does not fall within the 1963-1965 range in any of the districts. This, to the writer, is noteworthy because Oregon seems to have taken great pains in the determination of the formula as indicated by their change in factor weights. Also, Oregon seems to be a state which has to cope with the same problems, geographically, as Idaho, and therefore a much better correlation was anticipated. Another reason why better correlation was anticipated is that according to Oregon's formula ton miles is weighted at 50 per cent which should give an indication of physical maintenance necessary; from Table B-1 it is seen that physical maintenance in Idaho accounts for about 56 per cent of the total allocation per year. These results may indicate that certain districts are not receiving their fair share of the highway maintenance budget.

V. WEST VIRGINIA

Figure 1 indicates that the allocation predicted from West Virginia's two formulae lies within the 1963-1965 range only twice. In the writer's opinion, maintenance funds cannot be allocated on the basis of lane miles alone in the State of Idaho because of the wide geographical variation which exists in the State. West Virginia is a relatively small state, and the extremes in geography are not present; hence, their formula may be very ideal for their situation.

Results of Question Five of the questionnaire indicate that 64 per cent of the states utilize precedence, either solely or in conjunction with other criteria, for the distribution of highway maintenance funds. From this fact the writer concludes that the majority of these state highway departments are conservative in their approach to the problem of maintenance fund allocation.

Eighty-two per cent of the states report adhering to the American Association of State Highway Officials (AASHO) guidelines for accounting purposes as indicated by Question Six. This indicates that the standard accounting procedure is recognized as an effective and efficient system by a great majority of the states.

Observation of Figure 1 (page 25) indicates that, for the years considered, a possible inequitable allocation of highway maintenance funds has been exercised by the Idaho Department of Highways. This conclusion is based upon the fact that the formulae consider different criterion for their establishment of the resulting allocation, and even though different criterion are utilized, they all indicate that the same inequities exist (Figure 1). Results indicate that State Highway Districts 1, 3, and 6 are receiving "about" their proportionate needs; however, the results indicate that State Highway District 2 is possibly not receiving its needs for highway maintenance allocation, and State Highway Districts 4 and 5 are receiving more money than the various formulae indicate is necessary. Excluding the obvious extreme values in Figure 1, the range of allocation for State Highway District 2 should be about 20 to 22 per cent of the state highway maintenance budget; however, from 1963-1965 this District received only 14-18 1/2 per cent.

Figure 1 also indicates that State Highway District 4 should receive from 12 1/2 to 14 1/2 per cent of the allocation, but for the year 1963 through 1965 it received 18 to 19 1/2 per cent. Also State Highway District 5 received from 16 1/2 to 17 per cent of the allocation for the study years, but the formulae indicated that it should receive only 12 1/2 to 13 1/2 per cent.

In the writer's opinion, the possibility of using any one of the formulae, which were discussed in this study, for the allocation of highway maintenance funds is very small. If the State of Idaho were not so large and were more homogeneous, the possibility of utilizing a formula similar to those studies would be much more favorable.

The method employed by the State of Oklahoma is based strictly on precedence; however; it is the only formula which gave consistent results within the range of past expenditures. From this fact, any future formulae should possibly consider past wages and salaries as the most significant factor in any such formuale.

II. RECOMMENDATIONS

Part III of this study is an intensive review to determine what variations in standards and levels of maintenance are being practiced in Idaho's State Highway Dsitricts by field personnel. It is recommended that the results of the study of Part III be scrutinized with most care in order

CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

The reader should be aware that the conclusions drawn from this study were based upon the results of questionnaires sometimes in conflict with other information received. Also, it must be emphasized that this study was based upon the data of only five years (1961-1965) at the most. As was previously stated, the comparison for cost allocation was carried out for the year 1964, and all data were for that year except in cases of precedence in Oklahoma's and Oregon's formulae; hence the following conclusions must be considered with these facts in mind.

1. CONCLUSIONS

Answers to Question One indicate that only 42 per cent of the states have set prescribed standards for physical maintenance of their highway system; maintenance manuals were received from 23 states (46 per cent). A maintenance manual certainly sets standards for physical maintenance; therefore, this inequality (42 versus 46 per cent) points to the questionability of the responses to the questionnaire. The fact that the majority of the states have not set standards indicates a possible lack of managerial control. No other germane information was received from others in the field of highway maintenance that supports this statement. To further emphasize this statement, the following is quoted from a recent engineering publication (4): "Maintenance operations in the past generally have not been as well organized, well managed or efficient as they might have been...."

Sixty per cent of the states do not officially distinguish between the classes of highways in their maintenance procedures. This is a great injustice to the driving public unless, of course, these states have an abundance of money to maintain their highway systems. Even so, the interstate system should receive top priority in maintenance practices.

Replies to the third question show that 66 per cent of the states do not base their standards for physical maintenance on traffic volumes. Some roadways are capable of supporting a much greater volume of traffic than others and relative volumes for different types of highways should give an indication as to the expected amount of maintenance or preventive maintenance to be performed.

Only 48 per cent of the states have set different levels of service criteria for the different classes of highways in their system according to the results of Question Four. If the remaining states have the necessary funds to maintain all of their systems in a high level of maintenance category, this is justified. This is highly improbable, however, because some highways just do not require as high a level of service as others, and hence they will not receive it.

to determine whether or not the allocation of maintenance funds predicted by the formulae are realistic, because these results should give an indication as to the relative standards and levels of maintenance throughout the state.

Since the method employed by the State of Oklahoma is the only formula which gave results that were consistently in the range of Idaho's past expenditures, it is recommended that wages and salaries be the basis of any future formula with a weight as high as 70 per cent. Any such formula should be based strictly on precedence, for any one state highway district should not increase the mileage of its system significantly within the period of a year. It is further recommended that the remaining 30 per cent be alloted to the three areas of maintenance (physical maintenance, snow and ice control, and traffic services). The weights of the individual parameters of the three areas of maintenance should also be determined by precedence. The number of years to consider in determining precedence should be no less than five.

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REFERENCES CITED

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3. Suterwala, Z.K., and Lawrence Mann, Jr., A Formula for the Allocation of Maintenance Funds for Highways Using a Mathematical Model to Predict Maintenance Costs. Louisiana State University Engineering Experiment Station, Bulletin No. 72, Baton Rouge, 1963.

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5. Idaho Board of Highway Directors, Fourteenth Annual Report of the Idaho Department of Highways. Fiscal year July 1, 1964, to June 30, 1965, page 20.

6. Highway Research Board, Highway Research in Progress, Division of Engineering and Industrial Research, National Academy of Sciences - National Research Council, Washington, D.C., September 1965.

7. Letter from C.I. Brown, Assistant Maintenance Engineer, Division of Highways, State of California, Sacramento, California, July 23, 1966.

8. Letter from Larue Delp, Engineer of Maintenance, State Highway Commission of Kansas, Topeka, Kansas, November 23, 1965.

9. Letter from M. J. Snider, Chief Engineer, Missouri State Highway Commission, Jefferson City, Missouri, January 18, 1966.

10. Letter from E. S. Hunter, Maintenance Engineer, State Highway Department, State of Oregon, Salem, Oregon, December 16, 1965.

11. Letter from E. Belsheim, Assistant Chief Maintenance Engineer, Department of Highways, Government of the Province of Alberta, Edmonton, Alberta, Canada, March 4, 1966.

12. Letter from T.J. Hopgood, Director, Division of Maintenance, Department of Highways, Commonwealth of Kentucky, Frankfort, Kentucky, November 29, 1965.

13. Letter from J. L. Stackhouse, Assistant Director of Maintenance, Department of Highways, Washington State Highway Commission, Olympia, Washington, December 3, 1965.

14. Letter from J. E. Walter, Assistant State Maintenance Engineer, Wyoming State Highway Commission, Cheyenne, Wyoming, November 23, 1965.

15. Letter from J.A. Dennison, Senior Maintenance Engineer, Department of Highways, The Government of the Province of British Columbia, Victoria, British Columbia, Canada, March 15, 1966.

16. Letter from R.A. Scott, Maintenance Engineer, Department of Highways and Transportation, Province of Saskatchewan, Regina, Saskatchewan, Canada, March 17, 1966.

17. Letter from J. McMeekin, Maintenance Engineer, Department of Roads, State of Nebraska, Lincoln, Nebraska, November 26, 1965.

18. Letter from J. West, Chief Maintenance Engineer, Utah State Department of Highways, Salt Lake City, Utah, January 11, 1966.

19. Letter from H. J. Rathfoot, Chief Maintenance Engineer, Highway Department, State of Michigan, Lansing, Michigan, November 29, 1965.

20. Letter from D. G. Vail, Maintenance Engineer, Department of Highways, State of Colorado, Denver, November 24, 1965.

21. Letter from G. A. Smith, Bureau of Maintenance, State Roads Commission, State of Maryland, Baltimore, Maryland, March 4, 1966.

22. Letter from B. C. Parker, Maintenance Engineer, Department of Public Works, Commonwealth of Massachusetts, Boston, Massachusetts, February 15, 1966.

23. Letter from H.B. McDowell,Standards and Requirements Engineer, State of Oklahoma Department of Highways, Oklahoma City, Oklahoma, February 2, 1966.

24. State Highway Department, State of Oregon, "Maintenance Procedures Study in Oregon." Unpublished leaflet available from the Oregon State Highway Department.

25. Letter from C. O. Leigh, Assistant Maintenance Engineer, Department of Highways, Commonwealth of Virginia, Richmond, Virginia, February 4, 1966.

26. The State Road Commission of West Virginin, "Calculations for Primary Routine Maintenance Allocation." Unpublished leaflet available from the West Virginia State Road Commission.

27. State Highway Department, State of Connecticut, "Budget Control," Chapter 16, Construction and Maintenance Manual.

28. Letter from L.W. Brownell, Maintenance Engineer, Department of Highways, State of Vermont, Montpelier, Vermont, March 15, 1966.

APPENDIX A

QUESTIONNAIRE SENT TO STATE HIGHWAY DEPARTMENTS

PLEASE RETURN TO:
Assoc. Professor C. W. Hathaway
Engineering Experiment Station
University of Idaho
Moscow, Idaho 83843

	Yes	No
1. Has your state adopted standards for physical maintenance of its highway system?		
2. Do you use different maintenance standards for the different road classifications - i.e., interstate, primary, secondary, urban, rural, etc.?		
3. Do you base standards for physical maintenance on traffic volumes?		
4. Have you adopted different levels of service criteria for different road classifications - i.e., interstate, primary, secondary, urban, rural, etc?		
5. For allocation of maintenance funds between the major highway districts or divisions, do you use:		
(a) Legislative criteria?		
(b) Formula?		
(c) Precedence?		
(d) Other?		
6. Does your maintenance cost accounting procedures follow the AASHO uniform accounting manual?		

If the answer to questions 1 to 5 is yes, would you send us a copy of your procedure. Additional comments on their effectiveness and usefulness would be appreciated. Also any remarks will be most welcome.

TABLE A

SUMMARY OF RESPONSES TO

QUESTIONNAIRE

STATE	QUESTION								
	1	2	3	4	5a	5b	5c	5d	6
Alabama	No	No	No	No			X	X	Yes
Alaska	No	Yes	No	Yes			X		Yes
Arizona	Yes	No	No	Yes			X		
Arkansas	No	Yes	No	No			X		Yes
California	No	No	No	No			X		No
Colorado	No	No	No	No			X		No
Connecticut	Yes	No	Yes	No		X			Yes
Delaware	No	No	No	No	X	X			No
Dist. of Col.	No	No	No	No				X	No
Florida	Yes	Yes	Yes	Yes			X		Yes
Georgia	Some	Yes	Partially	Yes					Partially
Hawaii	No	Yes	Yes	Yes	X		X		Yes
Idaho	Yes	Yes	Yes	Yes			X	X	Basically
Illinois	No	No	No	Yes	X		X	X	No
Indiana	No	No	No	No					No
Iowa	Yes	Yes	Some	Yes				Need	Yes
Kansas	Yes	No	No	No				Need	Yes
Kentucky	No	No	No	No					Yes
Louisiana	No	No	No	No			X		Yes
Maine	No	Yes	Yes	Yes			X		Yes

TABLE A (CONTINUED)

STATE	QUESTION								
	1	2	3	4	5a	5b	5c	5d	6
Maryland	Yes	Yes	Yes	Yes		X			Yes
Massachusetts	Yes	No	No	No		X	X		No
Michigan	Yes	No	No	No				Need	No
Minnesota	Yes	No	No	Yes			X		Yes
Mississippi	No	No	Yes	No			X		Yes
Missouri	Yes	Yes	Yes	Yes			X	X	Yes
Montana	No	No	No	No			X	X	Yes
Nebraska	Yes	Yes	Some	Yes			X	(c)	Yes
Nevada	Yes	No	No	No			X		No
New Hampshire	No	No	No	Yes			X		No
New Jersey	No	No	No	No			X		Yes
New Mexico	No	No	No	Yes			X		Yes
New York	No	No	No	No	X		X		(e)
North Carolina	No	Yes	Yes	Yes		X			No
North Dakota	No	No	No	(a)				X	Yes
Ohio	No	No	No	No		X			Yes
Oklahoma	Yes	Yes	No	Yes		X			Yes
Oregon	Yes	Yes	Yes	Yes		X	X		No
Pennsylvania	No	No	No				X		In Part
Rhode Island	No	No	No	No			No Criterion		Yes
South Carolina	No	Yes	To Some extent	Yes			X and Judgment		
South Dakota	No	No	No						Yes

TABLE A (CONTINUED)

STATE	QUESTION								
	1	2	3	4	5a	5b	5c	6	
Tennessee	No	No	No	No			X		Yes
Texas	No	Yes	Yes	No			X	X	No
Utah	No	No	No	No				X and estimation of need	
Vermont	Yes	No	No	No	X	X(b)	X		Yes
Virginia	Yes	Yes	Yes	Yes		X	X		Yes
Washington	Yes	Yes	Yes	Yes			X		Yes
West Virginia	Yes	Yes	No	Yes	X	X			Yes
Wisconsin	No	No	No	Yes					Can be correlated
Wyoming	No	Yes	Yes	Yes				(d)	Yes
PROVINCES OF CANADA									
Alberta	Yes	Yes	Partially	Yes			X		
British Columbia	Yes	Yes	Yes	Yes		X	X		
Quebec	Yes	Yes	Yes	Yes			X		
Saskatchewan	No	No	No	Yes	X		X		

(a) Yes - Interstate
No - Primary sec.

(b) Distribution to Districts

(c) Suff. rating 2 Year

(d) Need and funds Avail.

(e) Not entirely

APPENDIX B

TABLE B-1

PERCENTAGE OF ALLOCATION WITHIN THE INDIVIDUAL DISTRICTS OF THE

STATE OF IDAHO FOR THE THREE AREAS OF MAINTENANCE FOR THE YEARS 1963-1965

	1963			1964			1965		
Dist.	Physical Maint.	Snow and Ice Control	Traffic Services	Physical Maint.	Snow and Ice Control	Traffic Services	Physical Maint.	Snow and Ice Control	Traffic Services
1	62.695	13.027	24.278	59.925	29.160	19.915	55.465	13.573	30.962
2	66.578	7.994	25.248	45.802	19.915	34.283	57.852	11.121	31.027
3	63.003	8.728	28.269	52.678	17.799	29.523	63.152	10.640	26.208
4	72.482	10.045	17.473	59.459	17.346	23.195	65.547	12.532	21.921
5	59.567	17.777	22.656	45.101	29.641	25.258	47.688	23.909	28.403
6	55.371	16.010	28.619	50.551	26.385	23.064	53.339	18.229	28.432
Overall	63.938	11.922	24.150	51.923	22.769	25.308	57.574	14.786	27.640

TABLE B-2

PERCENTAGE OF ALLOCATION PER DISTRICT UTILIZED FOR PHYSICAL MAINTENANCE

SNOW AND ICE CONTROL, AND TRAFFIC SERVICES FOR THE YEARS 1963-1965

	Physical Maintenance (In Thousands of Dollars)						Snow and Ice Control (In Thousands of Dollars)						Traffic Services (In Thousands of Dollars)					
	1963		1964		1965		1963		1964		1965		1963		1964		1965	
Dist.	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$
1	14	466	19	602	15	531	16	97	16	202	14	130	14	180	13	200	17	296
2	20	649	12	372	16	560	13	78	12	162	12	108	20	245	18	279	18	300
3	17	575	18	577	23	837	13	80	15	141	21	258	21	258	21	323	20	347
4	22	725	21	664	19	692	16	100	15	194	14	132	14	175	17	259	14	231
5	16	514	15	455	14	503	25	153	23	299	28	252	16	196	17	254		300
6	11	371	15	464	13	456	17	117	19	242	17	156	15	192	14	212	14	243
Total	100	3300	100	3134	100	3579	100	625	100	1294	100	919	100	1246	100	1527	100	1717

APPENDIX C

FORTRAN PROGRAM C-1

MARYLAND FORMULA

```
CPRØGRAM FØR DISTRIBUTIØN OF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
THE STATE ØF MARYLAND
      READ1,AREA1,AREA2,AREA3,AREA4
    1 FØRMAT (4F12.3)
      READ5, AREA5,AREA6,AREAT
    5 FØRMAT(3F12.3)
      READ4,VEHM1,VEHM2, VEHM3,VEHM4,VEHM5,VEHM6,VEHMT
    4 FØRMAT(7F11.0)
      ALCA1=(AREA1/AREAT*0.75+VEHM1/VEHMT*0.25)*1000.
      ALCA2=(AREA2/AREAT*0.75+VEHM2/VEHMT*0.25)*1000.
      ALCA3=(AREA3/AREAT*0.75+VEHM3/VEHMT*0.25)*1000.
      ALCA4=(AREA4/AREAT*0.75+VEHM4/VEHMT*0.25)*1000.
      ALCA5=(AREA5/AREAT*0.75+VEHM5/VEHMT*0.25)*1000.
      ALCA6=(AREA6/AREAT*0.75+VEHM6/VEHMT*0.25)*1000.
      PRINT3
    3 FØRMAT (51HALLØCATIØN PER DISTRICT PER 1000 DØLLARS (MARYLAND)////)
      PRINT2, ALCA1,ALCA2,ALCA3,ALCA4,ALCA5,ALCA6
    2 FØRMAT (7HDIST.  14XF14.8,//7HDIST. 24XF14.8,//7HDIST. 34XF14.8,//7H
      1DIST. 44XF14.8,//7HDIST. 54XF14.8,//7HDIST. 64XF14.8)
       END
12376974.72117044512.90815782820.53410684100.534
10200512.37412025747.94778114669.018
0438311345.0471372315.0523148805.0213201610.0316453540.0274948295.2337435910.
```

FORTRAN PROGRAM C-2

MASSACHUSETTS FORMULA

```
CPRØGRAM FØR DISTRIBUTIØN OF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF MASSACHUSETTS
      READ1,TØLM1,TØLM2,TØLM3,TØLM4,TØLM5,TØLM6,TØLMT
    1 FØRMAT(7F9.3)
      ALCP1=(TØLM1/TØLMT*391.3)
      ALCP2=(TØLM2/TØLMT*391.3)
      ALCP3=(TØLM3/TØLMT*391.3)
      ALCP4=(TØLM4/TØLMT*391.3)
      ALCP5=(TØLM5/TØLMT*391.3)
      ALCP6=(TØLM6/TØLMT*391.3)
      ALCS1=(TØLM1/TØLMT*260.9)
      ALCS2=(TØLM2/TØLMT*260.9)
      ALCS3=(TØLM3/TØLMT*260.9)
      ALCS4=(TØLM4/TØLMT*260.9)
      ALCS5=(TØLM5/TØLMT*260.9)
      ALCS6=(TØLM6/TØLMT*260.9)
      ALCT1=(TØLM1/TØLMT*347.8)
      ALCT2=(TØLM2/TØLMT*347.8)
      ALCT3=(TØLM3/TØLMT*347.8)
      ALCT4=(TØLM4/TØLMT*347.8
      ALCT5=(TØLM5/TØLMT*347.8)
      ALCT6=(TØLM6/TØLMT*347.8)
      SUM1=ALCP1+ALCS1+ALCT1
      SUM2=ALCP2+ALCS2+ALCT2
      SUM3=ALCP3+ALCS3+ALCT3
      SUM4=ALCP4+ALCS4+ALCT4
      SUM5=ALCP5+ALCS5+ALCT5
      SUM6=ALCP6+ALCS6+ALCT6
      PRINT2
    2 FØRMAT(56HALLØCATIØN PER DISTRICT PER 1000 DØLLARS (MASSACHUSETTS)
     1////)
      PRINT6,SUM1,SUM2,SUM3,SUM4,SUM5,SUM6
      PRINT3
    3 FØRMAT(35HALLØCATIØN FOR PHYSICAL MAINTENANCE//)
      PRINT6,ALCP1,ALCP2,ALCP3,ALCP4,ALCP5,ALCP6
      PRINT4
    4 FØRMAT(35HALLØCATIØN FOR SNØW AND ICE CØNTROL//)
      PRINT6,ALCS1,ALCS2,ALCS3,ALCS4,ALCS5,ALCS6
      PRINT5
    5 FØRMAT(31HALLØCATIØN FOR TRAFFIC SERVICES//)
      PRINT6,ALCT1,ALCT2,ALCT3,ALCT4,ALCT5,ALCT6
    6 FØRMAT(7HDIST. 14XF14.5,//7HDIST. 24XF14.5,//7HDIST. 34XF14.5,117H
     1DIST. 44.5,//7HDIST. 54XF14.5,//7HDIST. 64XF14.5////)
      END
01669.63002246.59602108.08101478.32401298.99201590.96010392.583
```

FORTRAN PROGRAM C-3

OKLAHOMA FORMULA

```
CPRØGRAM FOR DISTRIBUTIØN ØF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF ØKLAHØMA
      READ1,WAGS1,WAGS2,WAGS3,WAGS4,WAGS5,WAGS6,WAGST
    1 FØRMAT(7F10.2)
      ALCA1=WAGS1/WAGST*1000.
      ALCA2=WAGS2/WAGST*1000.
      ALCA3=WAGS3/WAGST*1000.
      ALCA4=WAGS4/WAGST*1000.
      ALCA5=WAGS5/WAGST*1000.
      ALCA6=WAGS6/WAGST*1000.
      PRINT2
    2 FØRMAT(51HALLØCATIØN PER DISTRICT PER 1000 DØLLARS (ØKLAHØMA)////)
      PRINT3, ALCA1,ALCA2,ALCA3,ALCA4,ALCA5,ALCA6
    3 FØRMAT(7HDIST. 14X14.8,//7HDIST. 24XF14.8,//7HDIST. 34XF14.8,//7H
     1DIST. 44XF14.8,//7HDIST. 54XF14.8,//7HDIST. 64XF14.8)
      END
0540698.900495805.690628594.080597140.890581464.600506377.963350082.13
```

FORTRAN PROGRAM C-4

OREGON FORMULA

```
CPRØGRAM FØR DISTRIBUTIØN OF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF ØREGON
      READ1,TØTM1,TØTM2,TØTM3,TØTM4,TØTM5,TØTM6,TØTMT
    1 FØRMAT(7F11.0)
      READ9,TØTL1,TØTL2,TØTL3,TØTL4,TØTL5,TØTL6,TØTLT
    9 FØRMAT(7F9.3)
      READ7,PAEX1,PAEX2,PAEX3,PAEX4,PAEX5,PAEX6,PAEXT
    8 FØRMAT(7F11.2)
      SUM1=(TØTM1/TØTMT*0.5+TØTL1/TØTLT*0.25+PAEXT*0.25)*1000.
      SUM2=(TØTM2/TØTMT*0.5+TØTL2/TØTLT*0.25+PAEXT*0.25)*1000.
      SUM3=(TØTM3/TØTMT*0.5+TØTL3/TØTLT*0.25+PAEXT*0.25)*1000.
      SUM4=(TØTM4/TØTMT*0.5+TØTL4/TØTLT*0.25+PAEXT*0.25)*1000.
      SUM5=(TØTM5/TØTMT*0.5+TØTL5/TØTLT*0.25+PAEXT*0.25)*1000.
      SUM6=(TØTM6.TØTMT*0.5+TØTL6/TØTLT*0.25+PAEXT*0.25)*1000.
      PRINT2
    2 FØRMAT(49HALLØCATION PER DISTRICT PER 1000 DØLLARS (ØREGØN)////)
      PRINT3,SUM1,SUM2,SUM3,SUM4,SUM5,SUM6
    3 FØRMAT(7HDIST. 14XF14.8,//7HDIST. 24XF14.8,//&HDIST. 34XF14.8//7H
      DIST. 44XF14.8,//7HDIST. 54XF14.8,//7HDIST. 64XF14.8)
      END
0858371230.0906350480.1022766500.0388163265.0480905385.0407283060.4063839920.
01669.63002246.59602108.08101478.32401298.99201590.96010392.583
02826349.4302913058.9503500492.4403402932.7703090447.1602575284.4018371570.15
```

FORTRAN PROGRAM C-5

VIRGINIA FORMULA

```
CPRØGRAM FØR DISTRIUBTIØN ØF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF VIRGINIA
      READ1,TØTL1,TØTL2,TØTL3,TØTL4,TØTL5,TØTL6,TØTØT
    1 FØRMAT(7F9.3)
      READ2,VEHM1.VEHM2,VEHM3,VEHM4,VEHM5,VEHM6,VEHMT
    2 FØRMAT(7F11.0)
      ALCA1=(TØTL1/TØTLT*0.75+VEHM1/VEHMT*0.25)*1000.
      ALCA2=(TØTL2/TØTLT*0.75+VEHM2/VEHMT*0.25)*1000.
      ALCA3=(TØTL3/TØTLT*0.75+VEHM3/VEHMT*0.25)*1000.
      ALCA4=(TØTL4/TØTLT*0.75+VEHM4/VEHMT*0.25)*1000.
      ALCA5=(TØTL5/TØTLT*0.75+VEHM5/VEHMT*0.25)*1000.
      ALCA6=(TØTL6/TØTLT*0.75+VEHM6/VEHMT*0.25)*1000.
      PRINT3
    3 FØRMAT(51HALLØCATIØN PER DISTRICT PER 1000 DØLLARS(VIRGINIA)////)
      PRINT4ALCA1,ALCA2,ALCA3,ALCA4,ALCA5,ALCA6
    4 FØRMAT(7HDIST. 14XF14.8,//7HDIST. 24XF14.8,//7HDIST. 34XF14.8,//7H
     1DIST. 44XF14.8,//7HDIST. 54XF14.8,//7HDIST. 64XF14.8)
      END
01669.63002246.59602108.08101478.32401298.99201590.96010392.583
0438311345.0471372315.0623148805.0213201610.0316453540.0274948295.2337435910.
```

FORTRAN PROGRAM C-6

WEST VIRGINIA (PRIMARY) FORMULA

```
CPRØGRAM FØR DISTRIBUTIØN ØF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF WEST VIRGINIA (PRIMARY MAINTENANCE)
      READ1,UNTR,TRTD,BITU,CØNC
    1  FØRMAT(4F8.3)
      READ2, TØMU1,TØMU2,TØMU3,TØMU4,TØMU5,TØMU6,TØMUT
    2 FØRMAT(7F8.3)
      READ3,TØMT1,TØMT2,TØMT3,TØMT4,TØMT5,TØMT6,TØMTT
    3 FØRMAT(7F8.3)
      READ4,TØMB1,TØMB2,TØMB3,TØMB4,TØMB5,TØMB6,TØMBT
    4 FØRMAT(7F8.3)
      READ5,TØMC1,TØMC2,TØMC3,TØMC4,TØMC5,TØMC6,TØMCT
    5 FØRMAT(7F8.3)
      UNTRA=UNTR*1.0
      TRTDA=TRTD*1.46
      BITUA=BITU*1.32
      CØNCA=CØNC*1.31
      SUM=UNTRA+TRTDA+BITUA+CØNCA
      FACTU=UNTRA/SUM*1000.
      FACTT=TRTDA/SUM*1000.
      FACTB=BITUA/SUM*1000.
      FACTC=CØNCA/SUM*1000.
      ALCAU=FACTU/UNTR
      ALCAT=FACTT/TRTD
      ALCAB=FACTB/BITU
      ALCAC=FACTC/CØNC
      ALCA1=(TØMU1*ALCAU+TØMT1*ALCAT+TØMB1*ALCAB+TØMC1*ALCAC)
      ALCA2=(TØMU2*ALCAU+TØMT2*ALCAT+TØMB2*ALCAB+TØMC2*ALCAC)
      ALCA3=(TØMU3*ALCAU+TØMT3*ALCAT+TØMB3*ALCAB+TØMC3*ALCAC)
      ALCA4+(TØMU3*ALCAU+TØMT4*ALCAT+TØMB4*ALCAB+TØMC4*ALCAC)
      ALCA5+(TØMU5*ALCAU+TØMT5*ALCAT+TØMB5*ALCAB+TØMC5*ALCAC)
      ALCA6+(TØMU6*ALCAU+TØMT6*ALCAT+TØMB6*ALCAB+TØMC6*ALCAC)
      PRINT 6
    6 FØRMAT (51HALLØCATIØN PER DISTRICT PER 1000 DØLLARS (W VA PRI)////)
      PRINT7,ALCA1,ALCA2,ALCA3,ALCA4,ALCA5,ALCA6
    7 FØRMAT(7DIST. 14XF14.8,//7HDIST. 24XF14.8,//7HDIST. 34XF14.8,//7H
     1DIST. 44XF14.8,//7HDIST. 54XF14.8,//7HDIST. 64XF14.8////)
      PRINT8,FACTU,FACTT,FACTB,FACTC
    8 FØRMAT(16HUNTREATED FACTØR5XF9.4,//14TREATED FACTØR7XF9.4,//17HBI
     1TUMINØUS FACTØR4XF9.4,//15CØNCRETE FACTØR6XF9.4)
      PRINT9,ALCAU,ALCAT,ALCAB,ALCAC
    9 FØRMAT(////53HALLØCATIØN PER 1000 DØLLARS ALØTTED FØR DISTRIBUTIØ
     1N//29HUNTREATED ALLØCATION PER MILE4XF14.8,//27HTREATED ALLØCATION
     2 PER MILE6XF14.8,//30HBITUMINØUS ALLØCATION PER MILE3XF14.8,//28HC
     3ØNCRETE ALLØCATIØN PER MILE5XF14.8)
```

FORTRAN PROGRAM C-6 (CONTINUED)

```
      PRINT10,SUM
   10 FØRMAT(////16HWEIGHTED MILEAGE3XF14.4////)
      END
0046.7300010.7653155.9260028.433
0000.0000014.1830032.5470000.0000000.0000000.0000046.730
0000.0000010.7650000.0000000.0000000.0000000.0000010.765
0458.818074. 0290631.1760415.6780408.5010500.7243155.926
0012.5530000.5430000.2770000.4970014.5630000.0000028.433
```

FORTRAN PROGRAM C-7

WEST VIRGINIA (SECONDARY) FORMULA

```
CPRØGRAM FØR DISTRIBUTIØN ØF HIGHWAY MAINTENANCE FUNDS BY THE FØRMULA ØF
 THE STATE ØF WEST VIRGINIA (SECØNDARY MAINTENANCE)
      READ1,UPRV,TRFB,PVED
    1 FØRMAT(3F8.3)
      READ9,TØMU1,TØMU2,TØMU3,TØMU4,TØMU5,TØMU6,TØMUT
    9 FØRMAT(7F8.3)
      READ8,TØMT1,TØMT2,TØMT3,TØMT4,TØMT5,TØMT6,TØMTT
    8 FØRMAT(7F8.3)
      READ7,TØMP1,TØMP2,TØMP3,TØMP4,TØMP5,TØMP6,TØMPT
    7 FØRMAT(7F8.3)
      UPRVA=UPRV*0.5
      TRFBA=TRFB*.25
      PVEDA=PVED*4.36
      SUM=UPRVA+TRFBA+PVEDA
      FACTU=UPRVA*1000./SUM
      FACTT=TRFBA*1000./SUM
      FACTP=PVEDA*1000./SUM
      ALCAU=FACTU/UPRV
      ALCAT=FACTT/TRFB
      ALCAP=FACTP/PVED
      ALCA1=TØMU1*ALCAU+TØMT1*ALCAT+TØMP1+ALCAP
      ALCA2=TØMU2*ALCAU+TØMT2*ALCAT+TØMP2+ALCAP
      ALCA3=TØMU3*ALCAU+TØMT3*ALCAT+TØMP3+ALCAP
      ALCA4=TØMU4*ALCAU+TØMT4*ALCAT+TØMP4+ALCAP
      ALCA5=TØMU5*ALCAU+TØMT5*ALCAT+TØMP5+ALCAP
      ALCA6=TØMU6*ALCAU+TØMT6*ALCAT+TØMP6+ALCAP
      PRINT5
    5 FØRMAT(54HALLØCATIØN PER DISTRICT PER 1000 DØLLARS (W. VA. SEC.)//
     1//)
      PRINT4,ALCA1,ALCA2.ALCA3,ALCA4,ALCA5,ALCA6
    4 FØRMAT(7HDIST. 14XF14.8,//7HDIST. 24XF14.8,//7HDIST. 34XF14.8,//
     17HDIST. 44XF14.8,//HDIST. 54XF14.8,//HDIST. 64XF14.8////)
      PRINT2,FACTU,FACTT,FACTP
    2 FØRMAT(23HUNIMPRØVED EARTH FACTØR4XF9.4,//20HTRAFFIC BØUND FACTØR7
     1XF9.4,//12HPAVED FACTØR15XF9.4)
      PRINT3,ALCAU,ALCAT,ALCAP,SUM
    3 FØRMAT(////57HALLØCATION PER THØUSAND DØLLARS ALLØTTED FØR DISTRIB
     1UTIØN//36HUNIMPRØVED EARTH ALLØCATION PER MILE4XF14.8,//33HTRAFFIC
     2 BØUND ALLØCATION PER MILE7XF14.8,//25HPAVED ALLØCATION PER MILE15
     3XF14.8,////16HWEIGHTED MILEAGE4XF14.8)
      END
0005.6350255.3911376.798
0000.0000000.0000000.0000005.6350000.0000000.0000005.635
0020.2120055.9040050.6690114.9120000.0000013.6940255.391
0260.1090234.5910251.4850197.6470178.5120254.4271376.798
```

PART II

HIGHWAY MAINTENANCE CLASSIFICATION

by

C. W. Hathaway

SUMMARY

Classification of work performed by maintenance men is essential for cost accounting and for efficient analyses of highway maintenance expenditures. In addition, it is important that a distinction be made in the cost accounting procedures between betterment or reconstruction work done by maintenance crews which improves the highway facility and maintenance work which simply preserves the highway in its original or improved condition.

Highway maintenance operations are classified by the various state highway departments in a variety of ways. A logical classification system should be sufficiently detailed to permit a comprehensive analysis of highway expenditures by highway administrators, and sufficiently simple and straight forward to be readily understood by lay persons, such as legislators, who want to use the results as well as the maintenance men who provide the original data. Finally, the classification system must be organized so that the information sought is provided in the most direct manner.

It is proposed that maintenance operations be classified in the following categories: traffic services; maintenance of traveled way; maintenance of shoulders, side approaches, and sidewalks; maintenance of drainage systems; maintenance of bridges and structures; maintenance of the roadside; maintenance of buildings and yards; emergency and disaster repairs; and administrative and miscellaneous operations. Each maintenance operation category is further subdivided into logical maintenance activities, some of which constitute more detail than is necessary for cost accounting purposes but which are useful for clearly defining the work included in a particular maintenance operation category.

CHAPTER I

INTRODUCTION

Classification of the diverse work performed by state highway maintenance personnel is essential to organizing the work in an orderly manner necessary for meaningful analyses and discussion. A classification system can take a variety of forms, but for greatest effectiveness and utility, it should be designed around the predominant purposes to be served by the system.

Probably the greatest use made of maintenance work classification systems is to define a logical and orderly breakdown for assignment of maintenance expenditures. These classified expenditures are then used for evaluating the efficiency of work techniques, for making cost estimates, for preparing budgets and for compiling reports. Comparisons also can be made readily in terms of unit costs, for different times, for different locations, for different classes of highways, and for different weather conditions, to mention only a few of the possibilities. Every organization has much to gain from meaningful cost records and much of the reliability of these records rests on the classification framework.

I. PURPOSE

It is the purpose of this report to present a system for classifying the work routinely performed by maintenance men of the Idaho Department of Highways so that costs for providing traffic services and highway maintenance, when properly assigned to the various categories, can be analyzed expeditiously with efficiency, reliability, and understanding.

II. SCOPE

The previously stated purpose is fulfilled by first making a distinction between the routine work of highway maintenance and traffic services and the more involved work which actually constitutes an improvement to a highway facility. Next, major maintenance operations are broadly classified as a traffic service, or according to a functional segment of the highway. These categories permit casual users to readily understand the nature of the work. Finally, each major maintenance operation is divided into roadway elements or selected work activities which are logically related and which can be defined by examples and specific job descriptions.

In addition to the verbal descriptions, each major maintenance operation and its subdivisions is assigned a four digit cost accounting code number so that data may be more readily manipulated by use of computers. Use of

computers is essential to reliable and expeditious sorting and compiling of the voluminous quantities of data associated with maintenance cost accounting. Moreover, computers afford an economical means for analyzing these data which, due to the volumes involved, might not be practical otherwise.

The numerous examples and job descriptions, as well as the many code numbers, provide much greater refinement than is necessary for routine cost analysis purposes. Consolidation of several activities under one code number may be desirable to afford simplicity for classifying imput data, but this must be a decision of the persons who will be using the data after it is compiled. On the other hand, the extensive detail presented does help to define the exact nature of each major operation and maintenance activity and, as such, does give greater assurance that the costs will be accurately assigned. Field studies described in Part III of this publication indicate that incorrect cost assignments are presently being made and that part of the problem is attributable to lack of understanding of the various classifications being used. Obviously, the results of any data analysis are only as reliable as the accuracy with which the imput data are assigned.

Two assumptions have been made which limit the scope of this report. It has been assumed that the primary purpose of maintenance classification systems is to provide an efficient means for making cost analyses. To permit complete comparisons, cost data must be identified with the characteristics of the source of the information, such as the class of the highway, the location on the route, or the traffic volumes served. Techniques presently used by the Department appear to satisfactorily provide this information.

A second assumption is that the magnitude of the work is not so important as the functional element of the highway on which the work is done. Present cost accounting codes make a distinction, for example, between work done by one or two men on the travelway and work done by more than two men. Similar examples can be made for work done on the roadside and drainage system. The proposed classification system does permit some qualifications by the magnitude of the work involved but this consideration is not recognized as paramount.

III. BACKGROUND

Accounting and maintenance publications of many state highway organizations and the American Association of State Highway Officials (AASHO) were studied in an attempt to find a consistency in the manner in which maintenance work is classified and defined. The primary finding of this study was that there is a notable lack of similarity between the several organizations studied, particularly as the refinement became greater. Accordingly, the classifications and detailed descriptions presented follow the general concepts found in many publications, but the foremost consideration at all times was the useful application of the system within the frame work already established by the Idaho Department of Highways.

CHAPTER II

CLASSIFICATION AND DEFINITION OF MAINTENANCE OPERATIONS

Work performed by highway maintenance crews is, on occasions, of a nature which properly cannot be identified as highway maintenance because the work results in an enhancement of the facility as originally constructed. Therefore, before maintenance operations are classified, it is pertinent that a distinction be made between highway maintenance work and the other general classes of work that are done on highway facilities. Such distinctions are especially necessary if meaningful maintenance cost comparisons are to be made.

I. GENERAL WORK CLASSIFICATIONS

The most common general highway work classifications are construction, reconstruction, betterment and maintenance. Construction is usually recognized as involving all new work with little, if any, attempt made to salvage any value from the existing facility. In many highway organizations, construction is done by contract rather than by personnel within the organization. Accordingly the construction class of work will not be considered further.

Reconstruction and betterment differ primarily in the magnitude of the improvement to a highway whereas maintenance results in no improvement at all. Although definitions for all three terms are given here, the importance of simplicity suggests that the work performed by maintenance forces be classified as only betterment or maintenance. The term reconstruction (as well as construction) should be reserved for work of a major nature on an existing highway done by contract.

Reconstruction

Reconstruction has been defined as the substantial improvement of an existing facility or its component parts to a degree that new, supplementary or considerably improved traffic service is provided and significant geometric or structural improvements are effected. (1) This class of work normally involves realignment or the use of standards well above those of the existing highway. The AASHO Manual of Uniform Highway Accounting Procedures (1) lists on page 4, several typical examples of work that might be considered as reconstruction.

Betterment

Betterment work in the AASHO Manual refers to projects which are not so extensive as reconstruction projects nor require use of either materials or standards that are of a higher type than used on the existing facility.

It is proposed here, however, that betterment be defined as any work done by maintenance forces which is a capital improvement, which enhances the quality of the highway, and which provides a service to traffic thereon greater than that which was provided by the original construction.

Examples of betterment projects are:

1. Placing substantial surfacing material on a travelway in excess of what was originally provided.

2. Sealcoating of a structurally sound travelway to provide improved skid resistance or surface reflectivity.

3. Resurfacing a concrete or bituminous travelway with a 3/4-inch or more lift of asphaltic material for a length of more than 500 feet per mile.

4. Addition of auxiliary lanes, such as climbing lanes, storage lanes or speed-change lanes.

5. Addition of less than 500 feet of frontage road.

6. Widening of existing travelways without changing the number of lanes.

7. Resurfacing, stabilizing or widening of shoulders for more than 500 feet, and sideroad approaches.

8. Minor changes in alignment or profile such as easing horizontal curves or flattening a vertical curve.

9. Improving curve superelevation by regrading or resurfacing.

10. Substantial flattening of side slopes.

11. Extending old culverts or building of headwalls.

12. Replacing a culvert with one of larger size.

13. Installation of additional culverts.

14. Widening or strengthening a bridge.

15. Replacement of signs or signals for ones of a higher standard.

16. Installation of new or an improved type of guardrail.

17. Installation of roadside delineators where not previously installed.

Maintenance

"Highway Maintenance" may be described as the preservation and upkeep of a highway and all its appurtenances within the rights of way in a condition as good as originally constructed or subsequently improved, and the provision of services to insure safe, economic and convenient traffic operations. Highway maintenance can logically be separated into two distinct classes of work; viz., physical maintenance, which is preservation of the highway in its original or improved condition, and traffic services, which is providing for traffic operations.

It should be noted from the above descriptions that highway maintenance generally does not result in a better facility than was produced by the original construction or subsequent reconstruction or betterment. Rather, highway maintenance consists of correcting deficiencies in the highway which have developed as a result of age, wear, damage, weather, disaster, etc., or it consists of taking steps to prevent the development of imminent deficiencies, sometimes referred to as preventive maintenance.

II. CLASSIFICATION OF MAINTENANCE OPERATIONS

The major maintenance operations have been classified according to the broad type of work being performed and each major classification, in turn, is further broken down into specific activities. Finally, examples are cited for each specific activity to give maximum definition as to the nature of the various maintenance operations.

Each major maintenance operation has been identified by a series of numbers from 1000 to 1099. The different operations are separated by steps of 10. Within each major operation, specific activities are identified by enumeration within the 10 number range of that area of operation.

Traffic Services (1000)

Traffic services consists predominately of the work necessary to insure that the motorist can safely and conveniently find his way to his destination on a roadway that is otherwise physically and structurally adequate. Included in this category is inspection of the roadway for deficiencies of all types, provision of all traffic control devices and control of snow and ice conditions.

A summary of the different work activities associated with traffic services is given below:

1001 A. Routine Patrol and Inspection

1002 B. Signs, Delineators, Mile Posts, Hazard Markers, Historical Markers, Barricades, Bridge Signs and Reflectors

1. Cleaning and Refurbishing Sign Faces
2. Repair and Replacement
3. Installation
4. Post Straightening, Repair, & Replacement
5. Installation & Removal of Seasonal or Temporary Signs

6. Inspection
7. Weed & Brush Removal--specifically to prevent obscuring of traffic control device

1003 C. Signals & Flashing Beacons

1. Electronic & Electrical Repair & Maintenance
2. Bulb Replacement
3. Repair, Maintenance, Replacement of Heads, Cabinets Misc. Hardware
4. Repair, Maintenance, Replacement of Standards, Suspension Systems
5. Inspection

1004 D. Pavement Markings and Raised Traffic Separators

1. Spotting and Painting New Lines, Symbols, Islands, Separators
2. Repainting Lines, Symbols, Islands & Separators
3. Removing Pavement Markings
4. Curb Painting
5. Temporary Tape Markings

1005 E. Illumination, Torches, Lanterns, Hazard Lights, Bridge Lighting

1. Installation & Removal
2. Repair, Replacement & Maintenance of Hardware
3. Servicing Luminaires
4. Electrical Repairs

1006 F. Guide Posts & Guard Rails, Earth or Rock Berms, Rock Walls

1. Installation
2. Repair, Replacement, Maintenance

1007 G. Snow Control & Removal

1. Removal & Necessary Preparation of Equipment
2. Snow Fence Installation, Removal & Repair
3. Installation & Removal of Snow Markers
4. Snow Removal from Signs

1008 H. Ice & Compacted Snow Control

1. Sanding (Application, Storage, Handling)
2. Salting & Chemicals (Application, Storage, Handling)
3. Removal

1009 I. Accident Damage Repair (When Repair Costs are Reimbursable)

Maintenance of the Traveled Way (1010)

The first major physical maintenance operation is traveled way maintenance. The traveled way is defined as that portion of the roadway for the movement of vehicles, exclusive of shoulders and local approaches. Work in this category may be on the surfacing layer or into the bases and the subgrade. In cases where it is not obvious where the traveled way ends and the shoulder begins, a width of 12 feet on either side of the center line should be considered as traveled way.

The following list summarizes the specific activities within this classification of maintenance operations:

1011 A. Damaged Surface Area Repair (Holes, Cracks, Raveling, Surface Wear)

1. Deep Patch - Pre-Mix Patching
2. Skin Patch - Paint Patch
3. Built-up Surface Treatment Patch
4. Poured Concrete
5. Gravel Replacement
6. Crack and Joint Filling
7. Seal Coat Patching
8. Dig Out & Replace - Soft Spots in Surfacing

1012 B. Surface Strengthening - (Corrugations, Settlement, Rutting Extensive Raveling)

1. Burning & Planing
2. Discing & Planing
3. Tear Up & Relay
4. Half Sole - Overlay - Second Story Surfaces
5. Grading & Dragging
6. Leveling by Area Buildup
7. Mudjacking & Subsealing
8. Leveling Asphalts by Grading & Cutting
9. Dust Pallatives & Stabilizers
10. Bituminous Surface Treatment

1013 C. Rejuvenating - (Aging, Drying, Oxidizing)

1. Seal Coat
   a. Chip or Sand Seal
   b. Slurry Seal
   c. Fog Seal
2. Patented and Proprietary Products
3. Kerosene and Sand

1014 D. Sanding for Bleeding

1015 E. Correcting Deficient Base, Subbase or Subgrade Material

1016 F. Buildup of Superelevation

Maintenance of Shoulders, Side Approaches and Sidewalks (1020)

Shoulders, side approaches and sidewalks pertains to all of those areas actually used by vehicles or pedestrians for travel or stopping exclusive of the traveled way. Physical maintenance of these areas is a major maintenance operation consisting of numerous work activities similar to those required for traveled way maintenance. Since these areas do not receive the heavy traffic of the traveled way, it is not quite as critical that they be maintained as soon as failure occurs or appears imminent. On the other hand, deterioration of these areas without attention is unsightly, can be inconvenient or hazardous to the occasional users, and can lead to deterioration of the traveled way. It is apparent, therefore,that this maintenance operation is also important.

Work acitivities in the maintenance of shoulders, side appraoches and sidewalks has been broken down as follows:

1021 A. Shoulder Repair and Upkeep

1. Patching
2. Crack & Joint Filling
3. Dig Out & Replace Soft Spots
4. Tear Up & Relay
5. Half Sole, Relay or Second Story Surfacing
6. Leveling by Building Up Washed, Broken or Settled Sections
7. Bituminous Surface Treatment
8. Grading & Dragging & Shaping
9. Graveling
10. Seal Coat
11. Frost Heave Control
12. Base, Subbase or Subgrade Replacement
13. Seeding or Sodding
14. Berm or Ridge Removal
15. Widening
16. Chloride Treatment

1022 B. Side Approaches; Bus, Mail and Other Turnouts; Median Crossovers; Rest Area Accesses & Parking Areas

1. Patching
2. Bituminour Surface Treatment or Seal Coat
3. Grading, Dragging or Shaping
4. Graveling
5. Widening

1023 C. Sidewalks, Curbs, Islands & Surfaced Medians

1. Patching
2. Graveling
3. Shaping
4. Cleaning
5. Replacing

Maintenance of Drainage Systems (1030)

The 1030 series of work activities pertains to the upkeep of all drainage facilities to insure the proper removal of excess surface and subsurface waters. Normally this work will be confined to the rights of way, although stoppages in stream channels beyond the rights of way can result in damages to the roadbed and accordingly must be given appropriate attention.

Work activities related to the maintenance of the drainage system does not constitute an imposing list but this category must not be underestimated in importance in the overall economic operation of a highway. Examples of work done in the proposed classifications are cited below:

1031 A. Pipes and Appurtenances

1. Cleaning, Rodding, & Flushing Culverts & Siphons (Trash, Ice, Soil)
2. Cleaning Catch Basins & Inlets
3. Cleaning, Rodding & Flushing Underdrains, Subdrains, Horizontal Drains & Sidedrains
4. Culvert Extension
5. Endwalls & Headwalls
6. Storm Sewers
7. Repair or Replacement of Culverts
8. Chloride Application to Thaw Entrances

1032 B. Ditches, Gutters, Spillways & Embankment Protectors

1. Cleaning (Trash, Sloughing, Ice)
2. Shaping & Grading
3. Patching & Rebuilding
4. Check Dams
5. Chloride Application to Free Flow

1033 C. Channels, Crown Ditches, & Benches

1. Cleaning & Trash Removal
2. Riprap
3. Reshaping

1034 D. Dry Wells

1035 E. Pumps, Sumps

Maintenance of Bridges and Structures (1040)

Maintenance of bridges and structures involves the preservation and protection of the strength of these units and the integrity of the component parts. Maintenance work on or in the vicinity of bridges and highway structures, which is primarily directed toward insuring the free flow of drainage waters, preserving of roadside slopes or keeping motorists informed of and alert to normal highway conditions, should be considered as drainage maintenance, roadside maintenance, or traffic services, respectively.

Work on guardrail and guide posts is considered by a few organizations to be in the nature of maintenance of structures. It is equally common practice for this work to be construed as traffic services and has been placed in that category in this report.

Types of work identified as maintenance of bridges and structures are summarized as follows:

1041 A. Routine Inspection & Investigations

1042 B. Structural Maintenance & Repairs

1. Painting, Sanding, Cleaning, Treating
2. Structural Repair, Super - & Sub-structure
3. Piers, Piling, Footings, Wing Walls, & Barrels Maintenance
4. Shoes, Rollers, Rockers, Bearing Plates, Clean & Repair
5. Abutment Walls

1043 C. Surfacing Maintenance & Repairs

1. Surface or Deck Repair, Crack & Joint Filling
2. Skid Proofing, Resurfacing, Seal Coating, Grinding
3. Cleaning Surface & Weep Holes, Flushing
4. Expansion Joints Maintenance

1044 D. Rails & Bridge Appurtenances

1. Handrails, Painting, Straightening, Replacing
2. Parapet Walls or Bridge Rails, Painting, Straightening, Replacing
3. Curbs, Sidewalks, & Wheel Guards, Repair & Replace
4. End Post Repair
5. Approach Guardrail

1045 E. Miscellaneous Structures

1. Tunnels, including Fans, Pumps, (Washing, Paint, Clean)
2. Truck Scales
3. Buildings
4. Cattle, Machinery & Pedestrian Passes
5. Cattle Guards

1046 F. Accident Damage Repair (When Repair Costs are Reimbursable)

Maintenance of the Roadside (1050)

Roadside maintenance involves the upkeep of all portions of a highway that are outside of or beyond the roadway and which are not involved directly with the drainage systems. Continuous medians that are depressed or otherwise unimproved are maintained under this category. Activities in this category are largely housekeeping in nature and result in highway roadsides being

kept true to uniform cross sections and presentable in appearance to the traveling public. Removal of brush which creates sight distance obstructions would appropriately be identified as roadside maintenance as would the care for facilities designed to protect the traveled way from slides or rolling rock.

A separate section of roadside maintenance is the care for the grounds and facilities in roadside parks, rest areas, picnic areas, etc. Access routes and parking spaces for these roadside areas are cared for as a part of the shoulders and side approaches.

Work involved in roadside maintenance is outlined below:

1051 A. Shrubs, Grass, Weeds & Brush Contol

1. Mowing
2. Weed Eradication (Around Posts, On Islands, Other)
3. Brush Cutting & Removal
4. Landscaping

1052 B. Side Slope Maintenance & Control

1. Foreslope & Backslope Grading & Filling
2. Walls, Wire Mesh, & Cribbing Repair & Preservation
3. Erosion Control - Seeding, Sodding, Planting, Mulching, Cultivating, Wire Mesh

1053 C. Miscellaneous Roadside Maintenance

1. Trash, Litter & Debris Pickup (Roadside & Litter Barrel)
2. Illegal Sign Removal
3. Fence Repair

1054 D. Rest Areas, Picnic Areas, Parks, Turnouts (Recreational Areas)

1. Building & Structures Maintenance
2. Replacing Supplies & Servicing Facilities
3. Area and Grounds Maintenance - Except Accesses & Parking Surfacing

Maintenance of Buildings and Yards (1060)

Maintenance of buildings, yards, and the equipment therein is a final separate maintenance operation which is of a routine and repetitive nature. This category might reasonably be divided into two lesser classifications; viz., (A) Buildings, Sheds and Grounds, and (B) Equipment and Machinery. The equipment and machinery category pertains to those items normally stored and used on the maintenance grounds rather than equipment and machinery used in the field for direct highway maintenance.

Emergency and Disaster Repairs (1070)

Emergency and disaster repairs are a separate operation, distinguished primarily by the fact that the work is totally unpredictable in time, magnitude and location. Still, maintenance forces are called upon, to some degree, when damages result from emergency or disaster situations and, accordingly, a budget and cost accounting code is necessary.

The emergency and disaster category shall be used for any extensive maintenance, repair, replacement or relocation necessitated by fire, flood, earthquake, storm, or other exceptional cause. Expenditures charged to this account should be submitted with an expenditure document of explanation indicating the scope of the work done, the cause of the disaster, and the location.

Administrative and Miscellaneous Operations (1080)

Discussion with field personnel reveals a need for a category which involves time spent by maintenance forces at all levels on activities not directly related to the highway maintenance. Activities mentioned include transporting equipment between areas or to the central shop, traveling to and attending meetings, time spent on public relations, time spent in getting dead animals removed by other agencies or owners, and lastly, routine administration such as general supervision or issuing trip and access permits.

CHAPTER III

CONCLUSIONS AND RECOMMENDATIONS

I. CONCLUSIONS

A method for classifying work done by maintenance forces is essential if cost records are to be kept in a manner that will permit making reliable, meaningful and efficient cost analyses and comparisons. The classifications must be sufficiently straight forward and descriptive so that they are readily understood by all persons who work with the data. In addition, each classification should be detailed to a degree that input data can be assigned with confidence and accuracy. Furthermore, a distinction should be made between maintenance work that merely preserves the highway in its original condition, and other classifications of work by maintenance men that actually constitutes an improvement to the highway.

The organization of a maintenance work classification system should be dictated by the purposes to be served. Since the predominant purpose of most maintenance classification systems is to identify logical groupings for making cost analyses, the proposed system divides the work by the type of traffic service rendered or by the functional element of the highway on which the work was performed. Neither the magnitude of the work, as long as it is maintenance, nor the amount of equipment and personnel is considered significant because it is assumed that the most productive methods available at the time will be employed to get the job done.

II. RECOMMENDATIONS

It is recommended that a clear distinction be made between work performed by maintenance forces which does and which does not result in an improvement to the original condition of the highway. The present maintenance classification system should be revised so that more meaningful analyses can be made of maintenance expenditures. A review of the classifications described in this report should be made with the objective of selecting categories which will provide the refinement needed for the purposes to be served but at the same time be sufficiently simple to conform to the adeptness of field personnel to do bookkeeping.

SUMMARY

The purpose of this investigation was to study field maintenance operations of the Idaho Department of Highways and to determine the variety of maintenance practices employed in performing each specific operation. The standards of maintenance and the levels of maintenance presently used for each major maintenance operation were also determined.

A detailed questionnaire covering a variety of maintenance operations was used to obtain the data needed for the investigation. Maintenance men responsible for maintaining sections of highway selected for study were interviewed and their responses to the specified questions were recorded in the questionnaire by student research assistants assigned to the investigation. The 26,300 responses recorded in the questionnaire were manually compiled in the form of statewide summaries of area foremen responses and maintenance men responses.

The data analysis indicated that overall maintenance operations were performed in the same basic manner throughout the state but that no set basis was used in determining the standards and levels of maintenance for the various maintenance operations. Even though a wide range of practices were reported for each operation, the number of responses comprising the extreme ends of the range was usually insignificant.

The nature of the questionnaire responses revealed that the maintenance man did not thoroughly understand all of the maintenance charge purpose codes and did not always report maintenance charges correctly. The responses did indicate that the majority of maintenance men had a practical knowledge of current maintenance operations and practices and effectively used this knowledge in maintaining Idaho's highways.

REFERENCES CITED

REFERENCES CITED

1. "Manual of Uniform Highway Accounting Procedures," American Association of State Highway Officials, Washington, D.C., 1960

PART III

FIELD MAINTENANCE PRACTICES

by

G. W. Kennaly

CHAPTER I

INTRODUCTION

In 1966 the Idaho Department of Highways spent approximately seven million dollars to maintain the 4,900 miles of highway on the present state system (1,2). By the time the Interstate Highway System is completed, it is estimated that Idaho will have approximately 5,500 miles of state highways to maintain. This rapid increase in highway mileage, combined with the increasing costs of maintenance, has caused State Highway officials to pose some important questions. Obviously the question of how to satisfy motorists' needs through maintenance at least cost is the most important question and one which probably has many answers. This investigation is one of a series of research projects at the University of Idaho for the Idaho Department of Highways having the general objective of better clarifying future highway maintenance demands (3, 4).

In February, 1966, this phase of the project was started and initial efforts were concentrated on literature review and project planning. During the summer of 1966 field interviews were conducted throughout the State with maintenance personnel of the Idaho Department of Highways regarding techniques used to solve maintenance problems. Information concerning the physical specifications used in performing each particular maintenance operation (herein defining the standard of maintenance) and the measure of service provided by the operation or the control used to determine when each particular maintenance operation should be performed (herein defining the level of maintenance) was also obtained during the interviews.

I. OBJECTIVE

The objective of this investigation was to study field maintenance operations as practiced by the Idaho Department of Highways. The study established for each major maintenance operation the standard and level of maintenance presently used by the majority of the Department's maintenance men. Variation of present maintenance practices occurring throughout the State was also studied.

II. SCOPE

Officials of the Idaho Department of Highways are aware that maintenance operations throughout the State are being performed with a variety of maintenance procedures. By knowing what standards and levels of maintenance are presently being used by maintenance men and by studying the range of variation for each maintenance operation, Department officials

may be able to select suitable standards and levels of maintenance which are more uniform in scope than those presently being practiced. The standards and levels of maintenance selected should represent the most practical, efficient and economical procedure for performing each specific maintenance operation and should also take into account the type and amount of traffic using each facility, and the different physical and environmental conditions. The adoption and use of the selected standards by maintenance men should result in the taxpayer receiving the maximum return for each dollar spent for maintenance.

III. BACKGROUND

During the thirty year period from 1935 to 1965, the national average of the state highway maintenance cost index, based on a 1935 average cost index of 100, had increased 350 per cent (2, 5, 7). As shown in Figure 1, a similar trend in maintenance expenditures can be noted within the Idaho Department of Highways. During the past twelve year period (1955-1966) the average maintenance cost per mile of highway has increased 43 per cent ($987.20 to $1410.99), while during the same period of time, state highway mileage increased only 4 per cent (4708 to 4894 miles) and available state highway monies increased only 39 per cent ($13,347,000 to $18,502,000) (1, 2, 4).

To date research in highway maintenance has been conducted on a somewhat limited basis. Due to the enormous size and complexity of the overall maintenance function, advanced techniques and concepts will be required to adequately fulfill future maintenance demands. Research studies in Louisiana, North Carolina, Virginia, Utah and Idaho have helped to provide some of the knowledge and techniques needed for improving general highway maintenance operations (6). These research studies have also pointed out that substantial variations in total quantity of work, quality of workmanship, productivity and unit costs were present in the highway maintenance field, and that maintenance personnel did not customarily use standardized work methods primarily because no specific definitive standards were available.

In 1965, William J. Parman (3), in his master's thesis entitled A Pilot Study of Maintenance Costs of Idaho Highways, based his analysis of maintenance costs on the concept that the same level of maintenance was provided for all highways with no distinction made between the interstate, primary, secondary, and urban classes of facilities. He did recognize the possibility that in actual practice the class of facility could influence the level of maintenance provided and therefore recommended that additional research be performed to determine if the class of the facility was in fact a significant factor in determining the level of maintenance.

Since no specific data were available concerning standards and levels of maintenance, Idaho Highway Department officials decided that the standards and levels of maintenance operations should be studied to determine the number and variety of techniques presently being used by the State's highway maintenance men. This investigation is a result of that decision.

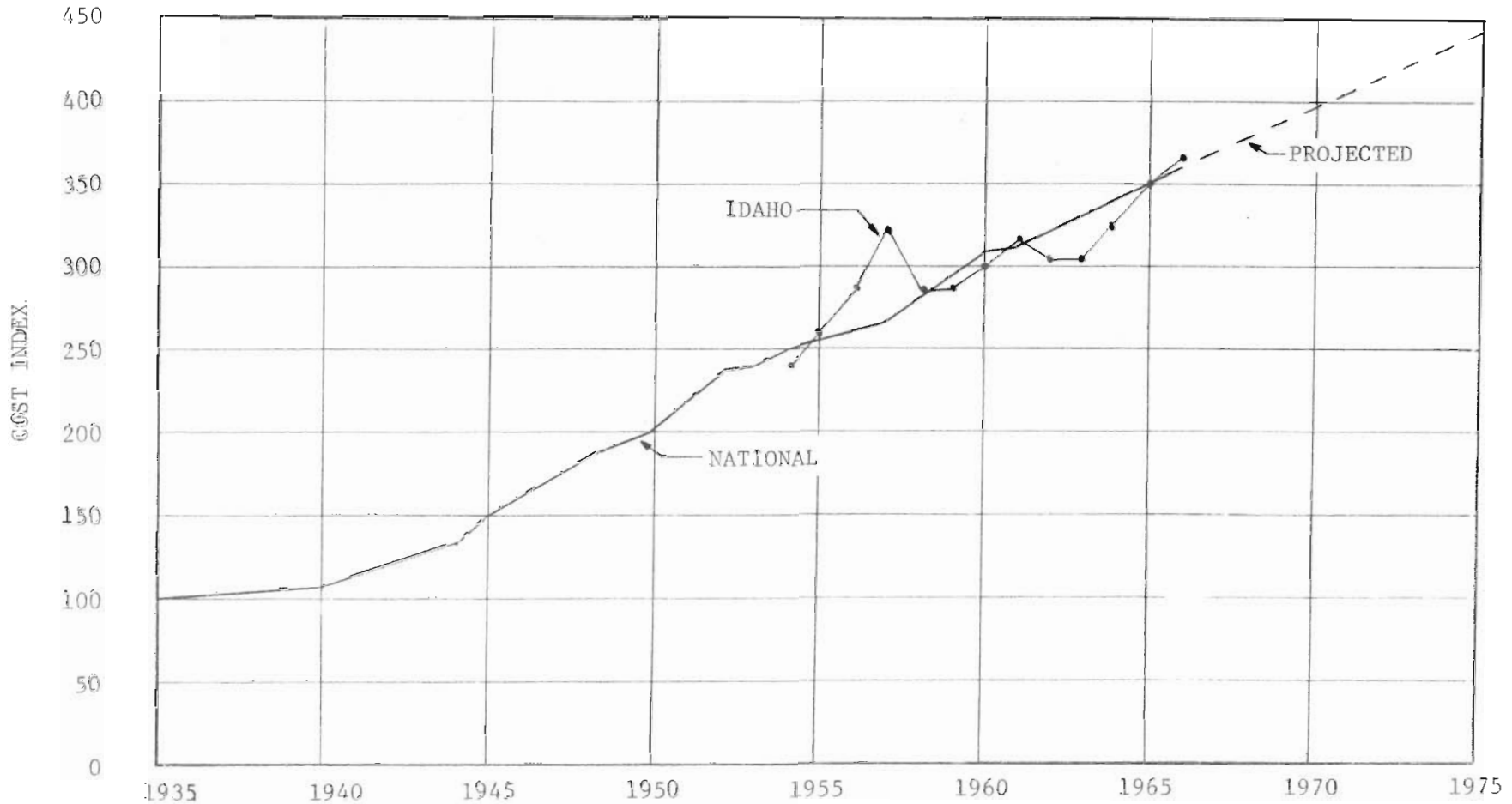

Figure 1. Highway Maintenance Cost Trends

CHAPTER II

DATA COLLECTION

A detailed questionnaire was used to obtain the data needed to determine the manner in which the variety of maintenance operations presently used in Idaho were performed. Questions pertaining to the standard and level of maintenance associated with each operation were also included in the questionnaire.

By interviewing maintenance personnel throughout Idaho during the summer of 1966, student research assistants completed 166 questionnaires. Each of the 41 maintenance areas and approximately 76 per cent of the individual maintenance sections are represented in the study.

I. DEVELOPMENT OF THE QUESTIONNAIRE

A brief study of the 21 charge purpose codes found in the Idaho Department of Highways Maintenance and Accounting Manuals (8,9), and listed in Table A-1 of Appendix A, page 133, provided an indication as to the range of maintenance operations presently performed within Idaho. However, a more detailed breakdown of maintenance activities was needed to permit comprehensive coverage of all of the maintenance operations and to provide information concerning the standards and levels of maintenance used for each maintenance activity.

Using the Accounting Manual of the American Association of State Highway Officials (AASHO) (10) as a reference, a listing of all 64 types of maintenance activities presently used in Idaho was compiled.

The final step in the development of the questionnaire was the preparation of questions pertaining to each specialized activity. From one to a maximum of eight questions were asked about each activity. The resulting 22-page questionnaire contained 194 questions which covered the majority of maintenance activities performed.

II. SELECTION OF STUDY SECTIONS

A total of 145 maintenance sections representing 76 per cent of the 191 maintenance sections in Idaho was selected for study.

On a mileage basis, the study sections represent 3156 miles or approximately 65 per cent of the total 4894 miles maintained on the 1966 system (2). Table 1, page 88, illustrates the breakdown, by district and facility type, of the section mileage included in the study.

TABLE I

NUMBER OF MILES OF HIGHWAY REPRESENTED IN THE STUDY

State Highway District	Section Miles Studied	Type of Facility		
		Interstate	Primary	Secondary
1	458	48	236	174
2	596	32	454	110
3	405	51	302	52
4	515	--	346	169
5	549	62	369	118
6	633	85	321	227
TOTALS	3156	278	2028	850

William J. Parman's report (3) and the Log of the Federal Aid Primary System and the State Federal Aid Secondary System (11) were used to determine the sections for which adequate weather and climate data, pavement data, and roadway data were available. Parman's study sections were primarily selected on the basis that these physical and environmental data would be available for future reference and would permit correlation of characteristics with the data obtained from subsequent studies.

The sections studied in this investigation should provide a reliable representation of actual maintenance operations, standards, and levels used throughout the State, regardless of the availability of physical environmental data. A list of the maintenance sections selected from the 1963 revised edition of the six District Maintenance Section Maps is given in Appendix B, page 145. A map showing the general location of the study sections is also located in Appendix B, page 147 and the six District Maintenance Section Maps are located on pages 148 through 153.

III. FIELD WORK

Field work for this investigation consisted of interviewing a selected sample of 166 field maintenance personnel or approximately 40 per cent of the men while they were performing a "routine" day's work. The interviews

were conducted by three senior engineering students during the summer of 1966. Prior to conducting interviews in a district, the maintenance foremen and supervisory staff were briefed as to the purpose and procedure of the study.

Conduct of Inquiry

Field operations within a maintenance area usually began with the interviewer accompanying the area foreman on a day-long inspection tour of the area. During the tour the interviewer became familiar with the area highway system, prepared a specific interview schedule, and whenever possible became acquainted with the area's maintenance men. Also during the tour he interviewed the area foreman and recorded the foreman's responses.

The remainder of the time spent in each area was devoted to interviewing the field maintenance men responsible for maintaining the sections selected for study. Prior to the interview of the area foreman, the maintenance men did not know which sections were selected for study.

Summation of Total Field Work

Each maintenance area is represented in the study by an area foremen's questionnaire and from one to six maintenance men's questionnaires. A total of 41 area foremen's questionnaires, 121 maintenance men's questionnaires, 3 District Maintenance Supervisor's questionnaires, and one special crew foreman's questionnaire was completed by the research assistants.

Every highway in the state system was traveled by the interviewers either during the actual interviews or during the area tours. Almost every type of maintenance operation covered in the questionnaire was observed during the field work and a total of 3652 pages of data were recorded during the interviews.

CHAPTER III

DATA COMPILATION AND ANALYSIS

Data compilation consisted of summarizing the area foremen's and the maintenance men's responses to questions contained in the questionnaire. The first of three steps involved summarizing the maintenance men's responses at the maintenance area level. The maintenance area summaries were then combined to form district level summaries. These three were combined to form the final statewide summary used in the analysis. The area foremen and maintenance men responses were compiled in the same manner.

The analysis of data was primarily confined to the maintenance men's responses pertaining to standards and levels of maintenance, to significant variations in practices found existing between districts and to the range of practices found within present overall maintenance operations. In general the majority of maintenance men reported standards and levels for the various maintenance operations which were in conformance with the ASSHO recommended maintenance practices.

Each maintenance operation was essentially performed in the same manner throughout the State. The standards and levels of maintenance reported by the maintenance men did not differ significantly between classes of highways; that is, basically the same maintenance practices were reported for interstate Highway facilities as for primary and secondary highways. The mowing operation was the only activity reported in which the present maintenance practice depended somewhat on the class of the facility.

I. DATA COMPILATION

In order to effectively analyze the voluminous amount of data contained in the original questionnaire a certain amount of consolidation and organization of the data was necessary. Due to the unknown possible range of the responses at the beginning of this study, no attempt was made to compile the data by electronic computer techniques.

A total of 1346 types of responses was compiled for the 194 questions on the questionnaire. Approximately 7400 area foremen's responses and 18,900 maintenance men's responses were compiled for the state summaries. These summaries, representing maintenance practices reported by area foremen and maintenance men throughout the State of Idaho, are respectively located in Appendix C, page 155 and Appendix D, page 197.

II. DATA ANALYSIS

The composite district and state summary of maintenance men responses was used as the basic data source for the analysis. The following discussion on the data analysis conforms to the same sequence of operations as that followed in the summary and as that listed in Appendix A, page 131.

Due to the large number of responses recorded, those pertaining to standards and levels of maintenance and those which point out significant operational differences between districts will be discussed. The other responses are cited in the appendixes to show the complete range of maintenance practices in the State.

The percentages used in the analysis have been rounded to the nearest whole per cent and are based on the total number of responses per question and unless noted otherwise, are used in that regard throughout the discussion.

Unusual or Disaster Maintenance

Unusual or disaster maintenance operations are usually due to unpredicted occurrences such as floods, slides, and other causes which physically disrupt the highway. All operations needed to restore proper and safe operating characteristics to the facility are, upon proper authorization, classified as unusual or disaster maintenance operations. Maintenance crews assigned to such operations charge all of their time, equipment rental, and other expenses to this code, regardless of the actual type of maintenance activity performed on the facility.

Sixty-six of the 121 maintenance men interviewed reported they had never been involved in any type of unusual or disaster maintenance. Most of the maintenance work done in this classification was a result of a major flood occurring over the section. Approximately 8 per cent of the responses referred to major slides as being the cause for needed disaster maintenance and the remaining 9 per cent of the responses dealt with other unspecified causes.

The occurrence of unusual or disaster maintenance was rather evenly distributed throughout the State. District 1, Pocatello, reported more major floods than did the other districts. Similarly District 5, Coeur d'Alene, reported the most major slides. Since no time data were collected for this operation, the frequency of occurrence could not be determined.

Roadway Patrol Inspection

Roadway patrol inspection constitutes many small operations not directly related to the major maintenance operations. The roadway patrol inspection charge code, originally recommended by Parman (3), and subsequently adopted by the Idaho Department of Highways, provides the

maintenance man a charge code to which he may charge any time spent in routine inspections and performing minor services.

The questionnaire data indicate that at the time of this study only 7 per cent of the maintenance men did not use the roadway patrol inspection charge code. Approximately 23 per cent of the maintenance men who did use the charge code used it only to report the actual driving time required to patrol the roadway section. The remaining 70 per cent of the maintenance men used the charge code to cover a variety of small traffic-service-type jobs.

The majority of the small jobs reported dealt with clearing the travelway of some obstacle which presented a possible hazard to the motorist. Other items such as Saturday patrol, emergency sign maintenance, and litter pickup were also reportedly charged to roadway patrol inspection.

The maintenance men reporting Saturday patrol did not specify whether it included performing small jobs or was limited to Saturday driving time only. In most cases the maintenance men referred to other small jobs in addition to Saturday patrol, and their responses were recorded under the appropriate small job classifications. To obtain uniformity in the data compilation, Saturday patrol responses were identified under small jobs even though Saturday patrol may have only included driving time.

Approximately 41 per cent of the maintenance men who charged small job operations to roadway patrol inspection indicated that the charge was based on the type of job performed and not on the amount of time needed to complete the operation. Other maintenance men reported time limits up to four hours as the criteria used to classify an operation as a small job. However, a one- to two-hour time limit was most commonly used by the maintenance men to classify work as roadway patrol inspection.

The responses concerning roadway patrol inspection indicate that some maintenance men are using a roadway patrol inspection procedure which seems to have a great deal of merit. These maintenance men first drive over and inspect their entire section and while doing so make a note of locations which will require attention during the day. Emergency operations such as removing obstacles from the travelway and sanding icy spots are performed as they are encountered. Upon completing the inspection of the section and by knowing the location and the type of maintenance needed on the section, the maintenance man then schedules the entire day's operation and completes the needed tasks on the return trip to the maintenance shed or obtains additional help. This inspection method can only be effectively used for the one maintenance man - one section concept of maintenance management. The type of operation which groups maintenance men into work "gangs" is not compatible with this type of inspection technique.

Some of the maintenance men expressed concern about the possibility of over-charging time to roadway patrol inspection. They

felt that an excessive amount of time charged to this code would indicate a lack of actual physical maintenance for their sections. They were also of the opinion that the supervisors rated the maintenance man's performances based on the amount of physical maintenance actually reported for the section. The amount of time charged to the various charge codes could be used to determine the quantity of maintenance being performed on each section, and the maintenance man was reluctant to charge the correct amount of time to a non-productive type of charge code such as roadway patrol.

Another item concerning cost accounting deals with the procedure used by the maintenance men to report roadway patrol inspection charges. The responses indicate that many maintenance men, to simplify their own record keeping, do not charge roadway patrol inspection time on a daily basis or as it otherwise occurs. Instead, they lump together the daily charges and report the weekly total as occurring during one day. The result is that the cost records for one day report the total weekly time charge to roadway patrol inspection and the record for the other days' operations report no roadway patrol inspection being performed. This procedure does not create any serious problems when using yearly totals for cost accounting but serious drawbacks could develop if shorter periods were required for study purposes.

Travelway -- Routine Repair

Repairing the travelway is probably the most important maintenance operation performed by the maintenance men. A properly maintained travelway surface is needed to provide a comfortable, economic, and safe surface for modern high speed vehicles.

Travelway Patching. When asked to define routine travelway patching, approximately 74 per cent of the maintenance men responses were: "Any patching on travelway by one or two men." Approximately 14 per cent of the responses were further qualified by a reply of: "Any patching on travelway by a section man or a crew of maintenance men."[1] Another 10 per cent of the responses dealt with items concerning shoulder patching, roadway patrol inspection, sign maintenance, and litter pickup. All of these items were incorrectly reported under travelway patching.

The method of permanently patching pot-holes used by 50 per cent of the interviewed maintenance men consisted of: 1) removing the failed

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[1]The quoted material used in this report has been paraphrased and is set off only for clarity.

material from the hole; 2) squaring up the edges of the hole; 3) painting the hole with tack oil; 4) filling the hole with either a hot or cold mix bituminous material; and 5) compacting the material with the wheels of the maintenance truck. Six methods of permanently patching pot-holes were reported and varied from the above method to simply filling the hole with premix or gravel and compacting the material with truck wheels.

Temporary patching, used when weather or other conditions would not justify a permanent type patch, consisted of either filling the hole with asphalt premix or gravel and compacting the material with the truck wheels. Some of the maintenance men reported that many times the premix type of temporary patch would actually form a bond with the existing surface material and would not have to be repatched with the permanent type patch. In all cases temporary gravel patches were replaced with permanent patches as soon as favorable conditions permitted. The method used to patch a pot-hole was primarily determined by the existing weather conditions and the size and type of pot-hole.

Approximately 98 per cent of the interviewed maintenance men tried to maintain a surface free of hazardous pot-holes. Seventy-seven per cent of the maintenance men indicated they patched pot-holes when the pot-holes were first observed in the travelway. Twelve per cent patched pot-holes when the pot-holes became hazardous to vehicular travel.

Only a small variation in pot-hole patching practices occurred between operating districts, and it was confined primarily to the use of temporary patches during periods of bad weather or during the spring break-up. District 4 and District 6 reported higher percentages of temporary patching operations than did the other four districts.

Travelway Joint and Crack Filling. To prevent water from entering the base material through the travelway surface, all exposed joints and cracks in the surface must be filled with some type of an impervious material. The method used to accomplish this maintenance operation by approximately 70 per cent of the interviewed maintenance men was: 1) clean the crack by brooming or blow clean with compressed air; 2) fill the crack with a hot impervious asphaltic material; and 3) add some type of cover material. Other methods consisted of filling the crack with premix, filling the crack with slurry mix, and using a road oil-reject mixture to fill the crack. Fourteen per cent of the maintenance men reported that joints and cracks were not filled on their sections.

A variety of crack filling materials were used by the maintenance men. Hot road oil and hot tar were reported most often, with premix and reject sand or sand slurries also being widely used. The cracks were reported to have been filled annually either in the fall or spring by approximately 40 per cent of the maintenance men. Eight per cent filled the cracks as they occurred, 10 per cent filled cracks during hot

weather and 10 per cent filled cracks after pot-hole patching had been completed.

The maintenance men's opinions concerning joint and crack filling techniques varied. Many responses indicated that some improvement is needed in present crack filling operations. Not being able to obtain a filler material which is both flexible and durable was the source of many complaints. No significant variation of this operation existed between the six operating districts.

Travelway - Special Repair

Special repair of the travelway is basically the same operation as routine travelway repair discussed in the last section. The prime difference is that more men are used to perform the work and sometimes specialized equipment such as motor patrols or compaction rollers are also used.

Approximately 50 per cent of the maintenance men reported that they did not use the special repair charge code. When working with the special maintenance crew, 34 per cent of the interviewees charged their time to the special repair code and 4 per cent of the men charged to the special repair code because specialized equipment was used during the operation.

Eight of the nineteen men interviewed in District 4 used a rather interesting method of reporting special repair charges. These men reported special repair charges only when working with a shed gang crew on any section in the district other than their own. This indicates that when the maintenance man was working with a gang crew on his own section, he charged his time to the routine repair charge code and the other members of the crew charged their time to the special repair charge code, even though they jointly performed the same operation.

The predominant special repair operation consisted of patching small sections of the travelway surface which could not be effectively patched by the one or two men normally assigned to the maintenance section. A small section was described by the maintenance men as ranging from just larger than pot-hole size to over one mile in length. The specialized maintenance was usually required due to either a soft roadbase or worn out surface material, both of which usually required a continuing maintenance effort on the part of the section maintenance man.

The standards used for special repair operations were similar to the repair standards reported for routine repair. The maintenance men indicated that ordinarily the same quality of material was used for special repair as was used for routine repair, but better quality workmanship resulted by using the specialized equipment.

Tear Up and Relay

Fifty per cent of the maintenance men responses specified that a completely worn out surface was the criterion used to determine when a section received tear up and relay maintenance. Another 25 per cent of the responses indicated that a failure in the roadbase was the cause for the needed maintenance.

Although the maintenance men perform some tear up and relay operations and are generally aware when a section needs to be torn up and relayed, the operation is primarily a special crew function. Ninety-one per cent of the maintenance men involved with tear up and relay reported that they only assisted the special crew, and that the district office supervisors actually made the decision to perform the work and determined the standards to be employed.

Half Sole

Adding additional layers of surface material in the form of a half sole was primarily reported as a special crew function. The respective district office supervisors determined the standards used to half sole a section and scheduled the half soling operation with the special crew. Approximately 80 per cent of the maintenance men did indicate, however, that a section should be half soled if it has a surface which is rough and expensive to maintain but still has a good solid base foundation. Ten per cent of the maintenance men reported that they had never used the half sole charge code.

Seal Coat

Approximately 97 per cent of the maintenance men specified that the special crew and district office supervisors determined the standards and scheduling of all major seal coat operations. The maintenance men did indicate that a cracked and dried out surface was a good indication that the section needed a seal coat. Some maintenance men preferred to seal coat all new roadmats, small patched areas and pot-hole patches. Sealing small areas and pot-hole patches was usually performed by the maintenance men as part of the routine repair operation and not as a separate seal coat operation.

Shoulders and Side Approaches

A number of specific maintenance operations such as blading or pulling shoulders, replacing shoulder materials, and reshaping shoulders, were included in the questionnaire under this charge code. Proper shoulder maintenance is needed to assure that the shoulder will provide the lateral strength needed to support the edges of the travelway surface. Since eventual failure of the travelway surface is possible due to the lack of proper shoulder maintenance, the shoulder maintenance operation becomes a very important function in overall maintenance operations.

Blading or Pulling Shoulders. Thirty-one of the total 121 interviewed maintenance men reported that the shoulder pulling operation was no longer performed on their sections. These men indicated that present district office policy was to let the grass grow on the shoulder to form a turf-sod material. Eleven other maintenance men were responsible for sections with paved or bituminous surface treated shoulders and also did not pull shoulders.

A depression appearing between the shoulder material and the travelway surface material was indicated in 41 per cent of the maintenance men responses as the criterion used to determine when a shoulder needed to be pulled. Eleven per cent of the responses indicated the sections were pulled on an annual basis either in the spring or the fall. In District 5, eleven maintenance men reported that on their sections the shoulders were pulled when the sod built up above the oil mat so as to impede the drainage from the travelway surface. No significant variation of practices was reported in the other five administrative districts.

The area foreman determined when to pull shoulders for 64 per cent of the sections requiring the operation. Twenty-four per cent of the responses indicated the district office supervisors made the decision when shoulders on a section should be pulled, and 10 per cent of the responses indicated this decision was the individual maintenance man's responsibility.

Pulling shoulders was reported as being performed in three distinct manners. The operation used actually depended on the reason for initially performing the maintenance. If a gap between the shoulder material and the travelway surface material existed, then a motor patrol was used to pull material from the ditch and blade the material back over the shoulder, filling the exposed gap. When the needed material could not be pulled from the ditch, additional material was hauled in with dump trucks and spread over the shoulder with the motor patrol. If the sod was higher than the travelway surface, the sod was cut down with the motor patrol and the excess material hauled off in trucks.

Replacing Shoulder Material. Frequently some of the shoulder material is either displaced or lost, and a low spot or depression results in the shoulder. These low spots must be filled with additional shoulder material to preserve the structural and geometric characteristics of the roadway.

A low spot or hole in the shoulder large enough to create a hazard for the motorist was reported to have been filled immediately by 19 per cent of the maintenance men. Thirteen per cent of the maintenance men specified that they filled all sizes of holes in the shoulder as the holes occurred, and 12 per cent filled a hole or low spot when it was one to three inches deep. Other responses such as "holes in shoulder are not filled," "holes filled when complaints received about dropoff," and "fill holes if they require five or six cubic yards or more of material," were also recorded in the questionnaire by the research assistants.

Sixty-five per cent of the maintenance men's responses indicated either gravel or rejects were used to fill holes or low spots occurring in the shoulder. Premix was used according to 22 per cent of the responses and in 9 per cent of the replies the maintenance men reported using any material that was readily available. In 73 per cent of the cases the new material was compacted to about the same standards as the original shoulder material and in only 6 per cent of the cases was water used in the compaction process.

Erosion Control of the Shoulder. Proper erosion control is necessary to prevent material losses from the shoulder and to reduce other expensive shoulder maintenance operations. Fifteen of the 121 interviewed maintenance men indicated shoulder erosion was not a problem on their sections, and 19 maintenance men did not do any type of erosion control maintenance on the shoulders of their sections. Sixty-three of the maintenance men allowed natural vegetation to grow as an erosion control and 41 maintenance men simply backfilled eroded shoulders. Drainage curbs, diversion ditches, downspouts, and asphalt drainage aprons were also used by the maintenance men to control shoulder erosion.

Approximately 47 per cent of the responses denoted that the operation was not a preventive measure, but rather was performed after erosion of the shoulder had occurred. The control method actually used by the maintenance men depended primarily on either the severity of the problem, the steepness of the shoulder slope, or whether or not the shoulder material would support any form of vegetation. Approximately 19 per cent of the responses concerning planting grass on shoulders reported that grass had been planted as an erosion control. The two most widely used recommendations concerning erosion control were to construct flatter shoulder slopes and to allow natural or planted vegetation to grow on the shoulders.

Reshaping Shoulders. The maintenance men reported that the shoulder reshaping operation was performed in the same manner and for the same reasons as the shoulder pulling operation. In fact, many of the actual responses recorded in the questionnaire for this operation were: "same as pulling shoulders." The maintenance men did specify, however, that the reshaping operation was usually limited to relatively short sections of shoulder, whereas the pulling operation usually was performed along the entire length of the maintenance section. Due to the shorter lengths of shoulder involved with the reshaping operation a few maintenance men actually performed the operation with hand tools.

Patching Paved or Bituminous Treated Shoulders. Fifty-five per cent of the interviewed maintenance men pointed out that their sections did not have paved or bituminous treated shoulders. The main travelway patching standards were used by 40 per cent of the maintenance men because most of them considered the shoulder surface as important as the travelway surface. The size and depth of the shoulder failure also influenced the selection of the standard used.

In all cases the same quality material used to patch the travelway was used to patch paved shoulder failures.

Approximately 63 per cent of the paved or bituminous treated shoulders were reported patched as holes appeared in the surface material. The amount of shoulder surface breakup (no specific amounts reported) was used by 25 per cent of the maintenance men to determine when to begin patching shoulders.

Surface Treating Shoulders. Surface treating of shoulders was not performed by approximately 62 per cent of the maintenance men, and 2 per cent of the maintenance men indicated they were not familiar with the surface treating operation. Twenty-five per cent of the maintenance men pointed out that their sections' shoulders were surface treated to provide a wider overall travelway width, and 7 per cent reported that the shoulders were surface treated because the maintenance of the original gravel shoulders was a continual problem. An additional 4 per cent of the maintenance men indicated that the shoulders were surface treated to provide additional stability to the edge of the travelway surface.

The surface treatment specified in 71 per cent of the responses consisted of applying one or two layers of bituminous surface treatment over a reshaped original gravel surface. Twenty-one per cent of the responses indicated that an asphalt mat was actually constructed over the original gravel surface, and in two cases a penetration treatment was used to improve the shoulder surface.

Replacing Large Failed Shoulder Areas. Occasionally, incorrect use of the shoulder, excessive moisture in the base material, or improper construction methods result in large failed areas along the shoulder. Material was replaced in such areas as soon as the failures were observed according to 27 per cent of the maintenance men. Eighteen per cent replaced the failed material before the travelway surface was affected and 9 per cent replaced the shoulder material when the dropoff at the travelway edge became hazardous to the motorist. Twenty-one maintenance men, representing approximately 17 per cent of the total, reported that at the time of the study, failed shoulder material was not replaced. Nineteen of those 21 maintenance men were from District 2, Shoshone.

Forty-six of the maintenance men removed the failed material before adding new material, and 23 men indicated that the failed material was not removed and the new material was simply added on top of the old material. Eleven men removed approximately 2 to 3 inches of the failed material and three maintenance men removed 12 to 18 inches of the failed material before adding new material. According to the interviewed maintenance men, gravel or premix was predominantly used to replace the failed material and the sections were reconstructed to original or better than original standards.

Mowing

Approximately 80 per cent of the maintenance men completely mowed their assigned sections. Only 5 per cent of the sections were not mowed and the remaining 15 per cent were partially mowed.

An unspecified general weed and grass height was one criterion used to determine when a section required mowing and was reported in 24 per cent of the responses. Twenty-two per cent of the maintenance men reported they mowed when the mower was available and 20 per cent specified they would like to mow two or three times each year.

A grass height of 8 to 12 inches indicated the section needed mowing in 19 per cent of the responses and a maximum grass height of 12 to 18 inches was noted in 4 per cent of the responses. One maintenance man used a six-inch height as the maximum allowed and two maintenance men reported a 36-inch maximum allowable grass height.

Variations from 1 to 12 inches were reported as the desirable heights for newly mowed grass. Approximately 28 per cent of the maintenance men reported their sections were mowed as close to the ground as possible. A 1- to 3-inch mowing height was used by 7 per cent of the maintenance men and 48 per cent used a 3- to 5-inch mowing height. Additional mowing heights of 6 to 8 inches (used by 14 per cent of the maintenance men) and 8 to 12 inches (used by 3 per cent of the men) were also specified.

The standard sickle bar mower was mentioned as the equipment used to perform the mowing operation in 65 per cent of the responses. The rotary mower was mentioned in 32 per cent of the responses and either a combination rotary-sickle mower or a hand scythe was reported in the other 3 per cent of the responses.

A need for more and better mowers was voiced by 33 per cent of the maintenance men. Seven per cent indicated that flatter shoulder slopes should be used to facilitate the mowing operation and 5 per cent specifically pointed out that they needed to mow their sections more frequently than they were able to at the time of this study.

Trash Gathering

Trash gathering was classified by some maintenance personnel as being a secondary maintenance operation. This operation does, however, provide an important service to the motorist and due to the demands of the traveling public the maintenance effort required to perform this service has been undergoing a rapid growth.

Only one maintenance man interviewed during the study did not gather trash on his maintenance section. Approximately 26 per cent of the maintenance men's responses reported noticeable trash was picked up daily. In 19 per cent of the responses, trash gathering was designated as a fill-in job with no set schedule being used, and

13 per cent of the responses pointed out that trash was gathered when the roadside developed a trashy appearance. The remaining responses usually mentioned some basis for scheduling the operation with 18 per cent indicating some type of major annual operation, 17 per cent indicating spring and fall operations each year and 5 per cent indicating either a monthly or weekly trash gathering operation.

The complete right-of-way was cleaned by 62 per cent of the maintenance men and 27 per cent cleaned the roadside ditches and picked up any noticeable trash in the right-of-way. Ten per cent of the maintenance men reported cleaning only the roadside ditches along their sections.

No equipment or other trash gathering aids were used by approximately 49 per cent of the maintenance men. The other maintenance men reported items such as pitchforks, buckets, gunnysacks and sharp sticks were used to assist in gathering the trash on the sections.

Forty-nine per cent of the maintenance men indicated that turnouts did not require more attention than did trash gathering on general right-of-way sections. Forty-four per cent said turnouts did require more attention than did general right-of-way sections and 6 per cent reported that there were no turnouts on their sections.

When asked if the trash gathering charge code included litter barrel pickup, 82 per cent of the maintenance men replied that it did include the barrel pickup. Nine per cent of the men said it did not include litter barrel pickup and the remaining 9 per cent reported they did not have litter barrels on their sections. District 5 was unique in that it had regular refuse collector type trucks and crews emptying litter barrels and garbage at some of the more heavily used parks and litter barrel locations.

Spraying and Weed Control

In the questionnaire the spraying operation was divided into the following five areas where weed control might be performed: guardrails, signs and right-of-way markers, delineators, headwalls and pipe appurtenances, and bridges. In actual practice, however, the majority of the maintenance men indicated that spraying was performed as one overall operation and no distinction was made concerning the different areas of application covered in the questionnaire. Because of this lack of distinction by the maintenance personnel the discussion also deals with spraying and weed control as a single overall operation. A specific breakdown of the data for each of the five areas originally covered in the questionnaire is included in the two State summaries of responses located in Appendix C, page 155, and Appendix D, page 197.

Twenty-nine per cent of the maintenance men pointed out that no spraying operation was performed on their sections and any weed control performed was accomplished by using handtools. The remaining maintenance men reported a number of criteria used in spraying their

sections once each year. Ten per cent sprayed every two years and an additional 20 per cent sprayed every three years. Spraying every four or five years was specified by 2 per cent of the maintenance men and at the time of the field interviews the other 8 per cent had sprayed their sections for the first time.

General amount of weed growth was the criterion used by 28 per cent of the maintenance men to determine when to spray their sections. Another 28 per cent sprayed in the spring and 6 per cent sprayed in the fall. An adequate amount of ground moisture was required by an additional 28 per cent of the men before they would begin spraying and another 6 per cent mentioned they performed spraying when the spray equipment and the spray were available. The majority of the maintenance men reported their entire section received the same type of treatment and that the type of treatment did not change due to the length or size of the area sprayed along the section.

Roadside and Drainage

Providing drainage for a highway system is an important part of the overall maintenance operation. Proper roadside and drainage maintenance will assure that any water falling upon a highway section will be rapidly and effectively removed through the section's drainage facilities. Since roadside and drainage maintenance covered such a wide range of maintenance assignments, eleven of the more important specific operations were included in the questionnaire and are discussed in the following analysis.

Ditches and Gutters. Ditches and gutters were cleaned only when they became full of foreign material and the entire drainage system was affected according to 35 per cent of the maintenance men. Other maintenance men specified that they performed ditch and gutter maintenance on a routinely scheduled basis. Twenty-eight per cent performed the maintenance each fall and 21 per cent each spring and fall.

In 92 per cent of the cases the maintenance operation involved removing the foreign material from the ditch. An additional 4 per cent of the maintenance men either burned weeds in the ditch or cut out brush and trees which were affecting drainage. The equipment used in the operation included the motor patrol (25 per cent of the responses), trucks (24 per cent of the responses), and various hand-tools (14 per cent of the responses). Belt loaders, power shovels, and backhoes were also mentioned in the responses but comprised a minor percentage of the total number of responses.

Culvert Cleaning. Culverts free of sand deposits and debris are necessary items for a properly functioning roadside drainage system. Approximately 21 per cent of the maintenance men reported, however, that they only cleaned culverts when the culverts became plugged. Thirty-five per cent routinely cleaned culverts both spring and fall and an additional 33 per cent cleaned culverts only in the fall.

Removing the excess material from each end of the culvert was the cleaning method specified in 72 per cent of the responses. Fifteen per cent of the responses indicated that culverts were cleaned by flushing them out with water under pressure. Some maintenance men used a long rod to rod out the culvert and re-establish proper drainage.

The cleaning operation primarily involved the use of handtools in removing the unwanted material from the culverts. Water trucks or water pumps were used by 12 per cent of the respondents, frontend loaders by 9 per cent and backhoes by 6 per cent.

Side Drains and Diversion Ditches. Side drains and diversion ditches carry the roadside drainage water away from the roadway. Approximately 50 per cent of the maintenance men reported that no side drains or diversion ditches existed on their sections. Another 11 per cent pointed out that although side drains and diversion ditches existed on their sections, no maintenance of any type had been required at the time of the field study. Twenty-one per cent of the maintenance men did this maintenance when the ditches were either partially or completely filled with foreign material. A spring and fall operation was reported by 6 per cent of the maintenance men and an additional 6 per cent reported that cleaning was always scheduled as an annual fall operation.

Various types of hand cleaning operations were used by approximately 83 per cent of the interviewed maintenance men. Thirteen per cent washed the foreign material from the ditches with water under pressure. In addition to handtools and water pumps, 10 percent of the maintenance men pointed out that they used either motor patrols, frontend loaders, or backhoes to accomplish the ditch cleaning operation.

Subdrains. In some areas where a high water table exists, subdrains are used to remove excessive ground water from under the roadway structure. Sixty-eight per cent of the maintenance men indicated that subdrains were not needed on their sections. An additional 20 per cent of the men pointed out that the subdrains always had performed correctly so that no maintenance had been required. Seven per cent reported subdrains were cleaned when they became plugged and the remaining six per cent of the maintenance men cleaned or inspected subdrains on a varied basis.

Approximately 41 per cent of the maintenance men who cleaned subdrains accomplished the operation by opening the exposed end of the subdrain pipe. Thirty-five per cent rodded out the subdrain pipe with a long rod and 24 per cent indicated that usually it was necessary to completely dig out the plugged pipe and replace it with a new pipe.

The majority of the maintenance men used handtools in performing the operation. Long rods, backhoes, frontend loaders, and motor patrols were also used in the operation.

Storm Sewers. In some locations storm sewers were used to carry drainage water from the gutters to natural drainage points. The primary operation performed by the maintenance men was to clean the grate covering the storm sewer opening in the gutter. Only 24 of the total 121 maintenance men reported storm sewers on their sections. Of these men, 13 reported no maintenance required, 7 men cleaned the grate when it was covered with trash, 3 men cleaned the storm sewer grates each fall and 1 man inspected storm sewer grates twice monthly and cleaned as needed. Three men also reported that they cleaned the bottom of the catch-basin as needed. All of these performing storm sewer maintenance either raked the trash off the grates or shoveled the foreign material out of the bottom of the catch-basin. Handtools were used in performing both operations.

Irrigation Siphons and Stock Passes. Although this section referred to two drainage items, the majority of the maintenance men's remarks were only concerned with inverted irrigation siphons. They indicated that the inverted siphons crossing under the travelway would occasionally become plugged with sand deposited by the irrigation water. The maintenance men also specified that very little overall maintenance was required on stock passes and the small amount performed was usually performed by the farmers whose stock used the pass.

Approximately 52 per cent of the maintenance men had no irrigation siphons on their sections. Another 27 per cent reported that no maintenance had been required on irrigation siphons located on their sections. Eleven per cent of the maintenance men cleaned siphons only when they became plugged with material and the remaining 10 per cent of the men cleaned siphons according to their own particular schedules and needs.

Thirty-eight per cent of the maintenance men involved in cleaning irrigation siphons simply cleaned the deposited material out of the ends of the pipe. The material was rodded out with long rods by 14 per cent of the men and 7 per cent washed the deposited material out of the pipe with water under pressure. An additional 7 per cent dragged a grappling type hook through the pipe and still another 7 per cent dragged old tires through the pipe to dislodge the deposited materials.

Erosion Control of Cuts and Fills. Erosion occurring on a fill section of a highway can rapidly create unsightly conditions which can affect the structural integrity of the roadway. Proper erosion control techniques can be employed by the maintenance man to prevent substantial losses of both cut and fill material and to minimize the overall maintenance effort required on cuts and fills.

Four per cent of the maintenance men specified that no cuts or fills existed on their sections and 15 per cent of the maintenance men reported that no cut or fill erosion control maintenance had been required. A routine dialy patrol inspection was performed by 67 per cent of the men and 6 per cent specified they inspected cuts and fills during severe storm runoff periods.

In 24 per cent of the cases the maintenance men did not use any erosion control or preventive type of maintenance for cuts and fills. Approximately 42 per cent did allow natural vegetation to grow to help reduce slope erosion. Seven per cent of the maintenance men used some type of diversion ditches to control the runoff water and 6 per cent used asphalt curbs or gravel berms to channel the highway surface runoff water along the roadway section to acceptable discharge locations.

The particular erosion control method used by the maintenance men was based on: 1) the amount of erosion occurring (26 per cent of the responses); 2) the slope of the cut or fill (19 per cent of the responses); 3) the location of the erosion (12 per cent of the responses); and 4) the frequency of the erosion occurrence (12 per cent of the responses). An additional 14 per cent of the responses indicated that the asphalt drainage curbs used as erosion control devices were installed during the construction of the roadway section.

Approximately 16 per cent of the responses pointed out that the maintenance men did nothing to stop erosion during the actual occurrence of the erosion. Some attempt to divert the water was specified in 22 per cent of the responses. Backfilling with material while the erosion was taking place was practiced in 13 per cent of the responses and an additional 44 per cent reported that the only operation they performed concerning erosion was to backfill after the erosion had occurred. In the opinion of 21 per cent of the maintenance men, erosion of cut and fill sections was considered to be a serious problem requiring a continual maintenance effort.

Wall, Cribbing, and Riprap Maintenance. Walls, cribbing or riprap provide needed stability at the toe of steep slopes. Sixty-three per cent of the maintenance men did not have walls, cribbing, or riprap on their sections. Of the remaining 45 men, 9 men reported no maintenance required, 13 inspected them after floods and during the spring runoff and 6 inspected them during daily patrol inspection. Five other men made spring and fall inspections, four men made monthly inspections and an additional four men made inspections during periods of low water.

The maintenance performed on walls, cribbing, and riprap consisted primarily of rebuilding them to original standards. Eleven men indicated they added more riprap to failed areas and four men simply called in the district's special crews.

Seeding. In areas where natural vegetation is not adequate, seeding may be necessary to establish erosion reducing ground cover over roadside slopes. Thirty-eight per cent of the interviewed maintenance men reported that some type of slope seeding had been performed on their sections. However, only 15 of the 47 men actually performed the operation themselves. In the remaining cases the seeding operation was performed either during original construction or by the U.S. Forest Service crews. Approximately 94 per cent of

those men involved in slope seeding indicated that from fair to good success was achieved from the operation.

Mulching. Mulch is usually used to protect or to hold the ground moisture on newly planted areas. Eighty per cent of the maintenance men reported that mulching had never been performed on their sections. The maintenance men involved with mulching operations indicated that mulch was used to cover newly planted slopes. Approximately 58 per cent of these men reported either fair or better results were obtained from the mulching operation.

Fertilizing. In areas of slow vegetative growth or on newly planted slopes, fertilizer may be required to produce needed vegetation. Ninety-three per cent of the maintenance men had never fertilized their roadway sections. Only three maintenance men actually used fertilizer on seeded areas and four other men reported that the contractor fertilized seeded areas during the original roadway construction.

Extraordinary Roadside and Drainage

Extraordinary roadside and drainage maintenance was basically an expanded version of that performed under routine roadside and drainage maintenance. The extraordinary operations usually required specialized equipment, trained operators, and sometimes a gang-type crew of maintenance men to perform the work.

The extraordinary roadside and drainage charge code was not used by 60 per cent of the maintenance men. Nine per cent of the maintenance men used the charge code for any major drainage project. An additional 9 per cent of the men charged to the extraordinary roadside and drainage code when specialized equipment was used in the operation and 5 per cent of the maintenance men only charged to the code when working with the special crew on a drainage project.

Approximately 57 per cent of the responses specified that extraordinary roadside and drainage was a special crew function. The area shed crew performed extraordinary maintenance according to 23 per cent of the responses and the remaining 20 per cent either did not know what criteria were used to charge to extraordinary roadside and drainage operations or simply did not respond to the question.

Traffic Sign Maintenance

Properly maintained signs are essential to providing effective control, guidance and service to the traveling motorist. A sign is effective only to the degree that the motorist is able to read and understand the message. Sign maintenance is, therefore, an important maintenance function which can directly affect overall traffic operations of a roadway section. Almost all of the interviewed maintenance men indicated they had been involved in some type of traffic sign maintenance.

Replacement of a defective traffic sign depends on a variety of criteria. Fifty-two per cent of the responses specified that either damaged or vandalized traffic signs were replaced. In another 22 per cent of the responses, poor legibility and poor reflectorization were used as sign replacement criteria. Eighteen per cent of the responses point out that a severely damaged sign post was the criterion used to determine when a sign needed maintenance.

Traffic signs were inspected during routine daily patrol by 117 of the 121 interviewed maintenance men. The remaining four maintenance men inspected traffic signs two to three times weekly, weekly, or monthly. Only four maintenance men mentioned a night patrol inspection for traffic signs. They performed the night inspection according to their own established schedules which varied from every two weeks and every month to every six months.

A number of traffic sign repairs were performed in the field by the maintenance men. The most common repair named by 37 per cent of the responses was to replace damaged sign posts. Approximately 18 per cent of the responses dealt with replacing signs and an additional 14 per cent mentioned painting sign posts. Eleven per cent of the responses specified that sign bolts were either replaced or tightened and 9 per cent reported that delineators were repaired or replaced. Washing dirty signs was mentioned in 7 per cent of the responses.

Traffic Signal and Luminaire Maintenance

Approximately 60 per cent of the maintenance men did not have traffic signals or luminaires on their maintenance sections. Only 8 of the 121 interviewed maintenance men actually performed maintenance on traffic signals and luminaires and the operation was limited to changing burned-out light bulbs. In the majority of cases traffic signals were maintained by city crews when the signals were located within the city limits and by the district sign crews or the Boise office electrician when the signals were located outside the city limits. The cities, power companies, and district sign crews performed the majority of the maintenance concerning highway lighting.

Roadside Rest and Picnic Area Maintenance

Roadside rest and picnic areas have become an increasingly important service area to the traveling public and regular maintenance is essential for both sanitation and appearance. Each year, due to the increased use of these facilities, additional maintenance effort has been required and in some locations the maintenance required for roadside rest and picnic areas has become almost a full-time operation. Even though the need for such facilities is apparent, 74 of the 121 interviewed maintenance men (61 per cent) did not have roadside rest or picnic areas on their sections. The maintenance men who did have rest or picnic areas on their sections primarily

performed only four major roadside rest and picnic areas maintenance operations. The four operations, trash and litter pickup, vandalism repair, insect and disease control, and driveway and parking area maintenance were included in the questionnaire with eight other roadside rest and picnic area maintenance operations. The eight additional operations were not performed by a significant number of maintenance men and are not included in this discussion. The responses to these operations were compiled, however, and are included in the two State summaries of responses located in Appendix C, page 155, and Appendix D, page 197.

In 92 per cent of the cases the regular section maintenance men were responsible for maintaining the roadside rest and picnic areas located along their sections. In the remaining cases the maintenance men indicated that in District 2, a part-time employee, hired during the summer season, was responsible for maintaining roadside rest and picnic areas and that in District 5, as previously mentioned, a regularly assigned garbage collector picked up all roadside rest and picnic area trash and litter.

Trash and Litter Pickup. Trash and litter pickup was found to be the predominant roadside rest and picnic area operation. Each year motorists deposit a tremendous volume of trash and litter in rest and picnic areas and a continual maintenance effort is necessary to properly dispose of the refuse. Approximately 42 per cent of the maintenance men picked up roadside park trash at the same time that section litter barrels were serviced. Nineteen per cent of the maintenance men emptied roadside park trash once each week. Approximately 10 per cent of the maintenance men picked up roadside park trash twice each week, and an additional 10 per cent found it necessary to pick up roadside park trash daily during the peak tourist season.

Vandalism Repair. Acts of vandalism cause a considerable amount of damage in roadside rest and picnic areas. In 74 per cent of the cases the section maintenance men repaired all damage caused by vandals. Approximately 18 per cent of the maintenance men indicated that the district carpenter crew repaired such damage and 4 per cent reported the summer parkman performed the needed maintenance.

Driveway and Parking Area Maintenance. Fifteen per cent of the maintenance men involved in roadside rest and picnic area maintenance pointed out that no maintenance had been performed on the driveways or parking areas in the roadside parks located in their sections. A daily patrol type of inspection was reported by 23 per cent of the maintenance men and 29 per cent performed the maintenance once each year. Approximately 17 per cent of the maintenance men performed the maintenance on an "as needed" basis and an additional 6 per cent scheduled their driveway and parking area operations when a motor patrol was working in the immediate area. The majority of maintenance men tried to provide driveways and parking areas which had a stable and smooth riding surface.

Insect and Disease Control. Insect and disease control, when properly performed, assures traveling motorists protection from annoying insects and other pests and that the facilities are sanitary and safe for public use. Approximately 50 per cent of the maintenance men reported that no maintenance of this type was performed in their roadside rest and picnic areas. An additional 38 per cent of the men indicated that they treated toilets and other possible disease sources with lime or other unspecified types of disinfectants. Only 6 per cent of the maintenance men mentioned washing picnic tables and only 4 per cent sprayed insecticides around litter barrels.

Approximately 32 per cent of the maintenance men performing insect and disease control maintenance performed the operation two to three times each week. Twenty-five per cent performed the control operation weekly, and 4 per cent performed the control operation weekly, and 4 per cent performed it twice each month. Twenty-eight per cent of the maintenance men reported that some type of control was used when the odor around toilets and garbage cans became offensive and an additonal 7 per cent specified that control measures were performed when the bugs and insects became bothersome.

Snow and Ice Removal

Snow and ice removal is one of the most important maintenance operations performed by maintenance men during the winter season. Each year the traveling public demands that more of this important service be provided by the maintenance men. Only by using modern equipment and techniques in removing snow and ice from the highway system can the service be provided in the most efficient manner.

Snow and ice removal was reported by the maintenance men as basically being two distinct operations. Snow was primarily removed from the roadway sections by plowing and ice was primarily removed through the use of salt or other chemicals. Since these operations were covered separately in the questionnaire, they are also discussed separately in the following analysis.

Snow Plowing. A truck-mounted snow plow was used by the majority of the maintenance men to remove snow from the travelway. Approximately 12 per cent of the maintenance men specified that they began to plow snow when the snow began to fall. A minimum snow depth on the highway of 1 to 2 inches was reported to be needed by 78 per cent of the maintenance men before they started to plow snow, and an additional 4 per cent specified that 2 to 3 inches of snow were needed before they started plowing snow. One noteworthy method of determining when to begin the snow plowing operation was reported by ten maintenance men. They began sanding the roadway section at the beginning of the snow storm and then when sanding was no longer effective, they began plowing.

Maintaining a snow-free pavement surface was reported by 84 per cent of the maintenance men as the end objective of their snow plowing

operation. The remaining 16 per cent of the maintenance men specified that although a snow-free surface was desired, many times it could not be achieved. Approximately 84 per cent of these men who could not always maintain a snow-free surface did always try to provide a well-sanded snow floor. The end objective for an additional 11 per cent of the maintenance men was to keep the highway passable.

When asked a question concerning plowing approaches, intersections, and crossroads, 12 per cent of the maintenance men replied that they only plowed the main travelway section. Approximately 63 per cent of the men plowed approaches, intersections and/or crossroads after completely plowing the main travelway. An additional 21 per cent of the maintenance men plowed these other items only after plowing the main travelway and if the time was available.

Snow and Ice Control with Salt or Other Chemicals. In some locations throughout the State, particularly in the suburban and urban areas when weather conditions are favorable, salt or other chemicals may be used to remove snow and ice from the travelway surface. Approximately 42 per cent of the maintenance men reported that salt or other chemicals were not used alone but were mixed with sanding material. These responses will be discussed in the next section under Sanding Icy Surfaces.

Only 8 per cent of the maintenance men used a chemical other than salt. The chemical, calcium chloride, reported by ten maintenance men, was used only in Districts 1 and 6.

A variety of salt or chemical application rates was reported by the remaining 58 per cent of the maintenance men. The majority of the men indicated that the application rates varied and were basically determined by the conditions at the time of the operation. The other maintenance men using salt or chemicals at many locations for snow and ice control used "standardized" rates of 100 to 500 pounds of material per mile of travelway lane width. The majority of these men reported using 100 to 150 pounds of material per mile of travelway lane width, but due to the relatively small number of men involved, no significant application rates could be determined.

The maintenance men used salt or chemicals at many locations along their travelway sections. Icy spots (24 per cent), slick intersections (12 per cent), snow floors over two inches thick (12 per cent), slick grades (10 per cent), and slick curves (9 per cent), comprised 67 per cent of these responses. An additional 13 per cent of the responses pointed out that salt or chemicals were used only when the temperature conditions were between 20° and 32° F.

Salt and other chemicals were also used for snow and ice control on bridges, overpasses, and interchange ramps. Some maintenance men even used salt to remove ice from storm drains and culverts.

Sanding Icy Surfaces

Many times sufficient traction for safe vehicular movement is obtained by applying sand, cinders, and other granular materials to slick travelway surfaces. Only one of the interviewed maintenance men did not sand icy travelway surfaces on his maintenance section.

Fifty-one per cent of the responses pointed out that sanding was performed immediately after plowing the travelway surface. An additional 41 per cent of the responses indicated that sanding was performed on all icy travelway surfaces.

Sand (used by 50 per cent of the maintenance men), gravel (used by 29 per cent of the maintenance men), sand rejects (used by 23 per cent of the maintenance men), and cinders (used by 8 per cent of the maintenance men) were the basic sanding materials. Approximately 83 per cent of the maintenance men added salt or calcium chloride to the sanding material. The proportion of salt to sanding material varied from 1 sack of salt per 1/2 cubic yard of sanding material to 1 sack of salt per 10 cubic yards of sanding material. The majority, representing 64 per cent of the responses, used 1 sack of salt per 1 cubic yard of sanding material.

A variety of locations along the maintenance sections was reported sanded by the maintenance men. Approximately 13 per cent of the maintenance men sanded their entire maintenance section when surface conditions warranted the operation. The remaining maintenance men "spot" sanded locations which they felt needed additional traction. These "spot" locations included grades and hills, curves, intersections, and shaded areas. A small number of maintenance men also reported sanding bridges, interchange ramps, urban sections and school bus stops.

Bridge Maintenance

A sound, up-to-date bridge maintenance program will insure that all bridges and other miscellaneous structures will function effectively throughout their design life. Since the overall bridge maintenance operation was composed of several specific operations, seven sub-sections were included in the questionnaire and are discussed in the following analysis.

Bridge Inspections. A thorough inspection of a bridge may point out areas where maintenance is required. It may also provide an indication of a prospective failure which can be avoided by employing preventive maintenance procedures. Only 13 of the 121 (11 per cent) interviewed maintenance men reported no bridges on their maintenance sections.

The maintenance men who were responsible for maintaining bridges or other structures gave a variety of responses regarding inspections. Six per cent of the men specified that bridges on their particular

maintenance sections were not inspected. Approximately 20 per cent of the responses indicated that the structures were inspected during high water and 32 per cent assigned the inspection responsibility to the district bridge crews. The inspection rate varied from daily to annually with the majority reporting a semi-annual inspection program performed during the spring and the fall.

A number of possible trouble areas are inspected. Twenty-five per cent of the maintenance men's responses dealt with undercutting of the structure. Thirteen per cent mentioned deck cracking and 13 per cent were concerned with damaged stringers. Trash collecting under the structure, damaged or plugged expansion joints, concrete surface spalling, and cracked abutments were also included in most bridge inspections.

Cleaning Expansion Joints on Structures. Approximately 25 per cent of the maintenance men reported that the bridges on their sections did not have expansion joints. An additional 30 per cent reported that they did not clean the expansion joints on their bridges. Fourteen per cent of the maintenance men cleaned expansion joints as they filled up with material. Expansion joints were cleaned each spring by 12 per cent, each spring and fall by 11 per cent, and each fall by 3 per cent of the maintenance men.

Sixty-four per cent of maintenance men cleaned the expansion joints by hand. Water under pressure was used to force foreign material out of expansion joints by 30 per cent of the maintenance men and an additional 3 per cent used compressed air.

Concrete Surface Spalling. A spalling concrete surface reduces the overall load carrying capabilities of a structure and if excessive spalling has occurred, reinforcing steel may also be exposed to the elements. Approximately 49 per cent of the maintenance men reported doing nothing to prevent the spalling of concrete surfaces on their structures. Thirty per cent of the maintenance men reported that their bridge decks were surfaced with asphalt and 14 per cent simply did not use salt on concrete bridge decks. A small 3 per cent of the men sprayed their bridge decks with linseed oil and 1 per cent periodically washed the concrete bridge deck with water.

In 59 per cent of the cases no surface spalling maintenance was required. However, in an additional 29 per cent of the cases, if the concrete had chipped off the bridge deck leaving a rough, uneven surface some type of corrective maintenance was performed. Of those maintenance men having spalled concrete surfaces, 28 per cent repaired the affected area with a thin concrete patch. Twenty per cent of the maintenance men covered the bridge surface with a bituminous surface treatment whereas premix patches and tar patches were reported by 7 per cent of the maintenance men. The remaining 43 per cent either responded that they did not know how to repair a spalled concrete surface or did not respond to the question. In

only 16 per cent of the cases was spalling considered to be a serious problem.

Bridge Joint Repair. Nineteen per cent of the maintenance men pointed out that the bridges on their sections did not have any joints and an additional 16 per cent indicated that no bridge joint maintenance had been required. Approximately 42 per cent of the maintenance men specified that bridge joint repair was primarily a function of either the district bridge crew or the special Boise bridge crew. Only 7 per cent of the maintenance men performed joint repair without assistance from special crews.

The repairs consisted of adding or replacing joint filler material, replacing steel caps and supports, and tightening and reinforcing joints with steel and concrete. Again, since this operation did not directly involve the majority of maintenance men, a number of "don't know" responses and "no direct reply" responses were recorded by the research assistants.

Bridge Hand Rail Repair. Only 14 per cent of the maintenance men performed bridge hand rail maintenance. Seventeen per cent of the maintenance men had bridges without handrails and an additional 15 per cent had required no bridge hand rail maintenance. Approximately 36 per cent of the maintenance men specified that the district bridge or carpenter crew maintained bridge hand rails, and 18 per cent of the maintenance men indicated that some bridge hand rail repair was needed, but that it had not been performed by anyone.

The usual maintenance operation consisted of repairing damaged railing to original conditions (35 per cent of the responses), replacing damaged railing (28 per cent of the responses), and repainting unsightly railings (18 per cent of the responses). Washing bridge railing, welding broken sections, and maintenance as determined by the district bridge or carpenter crews were also mentioned by the maintenance men.

Bridge Drainage Cleanouts. Drainage cleanouts allow water to drain through the deck of a bridge at selected locations along the bridge span. Proper maintenance of drainage cleanouts is necessary to insure that the bridge surface will be free of water and possible future ice and slipperiness. Approximately 14 per cent of the maintenance men reported that the small bridges located on their sections did not have drainage cleanouts. The remaining maintenance men inspected drainage cleanouts according to a variety of methods which ranged from daily patrol inspection to annual inspections. The three inspection periods most commonly practiced were a spring and fall inspection (15 per cent of the responses), a spring inspection (14 per cent of the responses), and an inspection performed approximately twice each month (11 per cent of the responses).

Thirty-five per cent of the maintenance men reported that no maintenance of bridge drainage cleanouts had been required. Thirty-three pre cent of the men rodded foreign material out of the clean-outs. An additional 21 per cent of the maintenance men hand swept

or shoveled out bridge drainage cleanouts and 11 per cent washed out cleanouts with water under pressure.

Removal of Used Sanding Material from Bridges. Sometimes after a winter season which required a great deal of travelway surface sanding, the used sanding material remains on the bridge deck. When large quantities of the surplus material are present so as to become unsightly and hazardous to traffic operation, the used material should be removed from the bridge travelway surface.

In 6 per cent of the cases, maintenance men felt that accumulated used sanding material did not create any hazard to traffic and was not cleaned off bridges. Forty-nine per cent of the maintenance men indicated they cleaned their bridge decks each spring after the winter sanding operations had been completed. Approximately 33 per cent of the men cleaned their bridge decks when the accumulated used sanding material began to affect the drainage systems of the bridge, and 8 per cent cleaned their bridge decks each spring and fall.

The majority of the maintenance men (72 per cent) used handtools and swept and shoveled the accumulated sand off their bridge decks. Fifteen per cent washed the excess sand off their bridges with water under pressure and 12 per cent swept with power brooms. One individual even reported using a motor patrol to blade off the used sanding material.

Yard and Building Maintenance

A maintenance yard with garages and storage bins serves as the operations center for two or more section maintenance crews. Equipment is stored here as well as maintenance materials and tools. A well organized, properly maintained, and neat appearing maintenance yard and maintenance shed provides not only good public relations, but also possesses better safety characteristics and contributes to the efficiency of the total maintenance operation. Although four different yard and building maintenance operations were included in the questionnaire only two, trash and litter pickup and grading and surfacing, are discussed in the following analysis. The other two operations, building painting and roofing, were in most cases performed either by special crews or awarded to private contractors. Both of the latter operations were retained in the two State summaries of responses and are located in Appendix C, page and Appendix D, page

Maintenance Yard Trash and Litter Pickup. Periodic trash and litter pickup is necessary to maintain a neat appearing maintenance yard and shed. Approximately 35 per cent of the responses indicated that trash and litter barrels were emptied as they filled up. An additional 17 per cent of the responses reported a weekly pickup of trash and litter barrels. Other responses such as "picked up when time becomes available" (15 per cent of the responses), "major cleanup each spring" (13 per cent of the responses), and "major cleanup each each spring and fall" (13 per cent of the responses), were also noted.

Maintenance Yard Grading and Surfacing. Approximately 95 per cent of the maintenance men reported that yard grading and surface maintenance were performed by particular shed crews and not by district special crews. A rough and broken surface was used in 67 per cent of the cases as the criterion to start the yard maintenance operation. Eight per cent listed available time as their starting criterion.

Pot-holes were repaired with gravel road type patches in 50 per cent of the cases. In an additional 28 per cent of the cases pot-holes found in the maintenance yards were repaired in the same manner as pot-holes found in the regular travelway section.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions concentrate on that portion of the data collected concerning the levels and standards most frequently practiced by field maintenance personnel. In the recommendations a somewhat broader discussion is presented.

Due to the great volume and variety of information computed from the questionnaires a complete analysis of the study data has not been possible within the time limits of the project. Accordingly, the conclusions treat primarily on those aspects of the data that have been analyzed in detail in previous chapters and are further limited to maintenance activities that lend themselves to being described by specific standards and levels of performance.

I. CONCLUSIONS

Generally speaking, it is concluded that the range of levels and standards of maintenance is not great in most cases. There are instances, however, where variations from common practice represent progressiveness that could be adopted as the Departmental standard. On the other hand, a certain amount of inferior work was also reported which should be expected in an organization so large as the Idaho Department of Highways. Total uniformity in working procedures in a large, widespread organization is a difficult achievement due to such practical problems of lack of individual experience, lack of complete communications, and/or lack of ambition by some individuals.

Although the preceding analysis chapter and the subsequently presented specific conclusions oftentimes describe levels and standards of maintenance for the various maintenance operations performed in vague or overly simple terms, it should be borne in mind that these statements are summarizations of what the field men report that they are doing. No concerted attempts have been made to observe field practices and no attempt will be made to draw conclusions as to the adequacy of reported practices.

It is concluded, however, the concept of describing highway maintenance operations in terms of levels and standards is feasible in many instances. Moreover, the diversity of responses suggest that specifying the manner in which maintenance will be performed in terms of both levels and standards of maintenance, where possible, is desirable. By so doing greater uniformity can be achieved and workmanship of either an inferior or unnecessarily high quality can be avoided.

A general area of variation in practices, removed from levels and standards of maintenance, exists in the manner in which costs are reported against the various cost accounting codes. The exact reason for these variations is not always clear but, for the most part, it appears that where they exist the maintenance men do not adequately understand the intent of the cost accounting system or the scope of particular cost accounting codes. In the former case it is concluded that some men suspect that cost accounting is a management tool to check on the efficiency of field performance. In the second case it may be that there is a lack of dissemination of information to all personnel. Other logical explanations probably could be made if the topic were pursued in depth.

The following specific conclusions pertain primarily to the level and standards of maintenance presently in use by the majority of the field maintenance men on their individual highway sections. Maintenance operations discussed here are in the same order as presented in the previous chapter. Some operations, such as Unusual or Disaster Maintenance, have been deleted because they can not be quantified in terms of specific levels or standards.

Roadway Patrol Inspection

The level of service most commonly associated with the roadway patrol function was to perform an inspection first thing each day for the entire assigned section and perform such minor work as required to provide an obstruction-free surface. If the work required to satisfy this objective is of any magnitude, warning devices are posted and the work is done at a later time.

No standard of maintenance can be stated that covers all possible types of minor work that might be done.

Travelway Patching

Most maintenance men try to keep a pot-hole free surface as their level of maintenance objective for asphalt-surfaced highways. Insufficient data were collected for gravel and concrete highways to permit establishing a level of maintenance for non-asphalt surfaces.

Accomplishment of the level of maintenance by use of permanent patches is achieved by a widely used standard; however, the use of temporary asphalt and loose gravel patches is also a regular necessity during adverse weather. The standard of maintenance practiced is:

1. Remove all failed material from the hole.
2. Square all edges.
3. Paint the bottom and sides of the hole with tack oil.
4. Fill the hole with bituminous mix.
5. Compact the bituminous mix with truck wheels.

Travelway Joint and Crack Filling

Joints and cracks are filled routinely in either the spring or fall when the cracks are expanded thereby permitting favorable penetration of the filler material. This level of maintenance does enjoy a doubtful majority, however, with many the other responses actually given.

A standard of maintenance reported by the majority for crack filling was:

1. Clean loose material from the crack.
2. Fill the crack with a hot asphaltic material.
3. Cover the treated crack with blotter material.

Blading and Pulling Shoulders

The level of maintenance adopted for most maintenance sections was to maintain proper shoulder drainage by keeping the shoulder material pulled up against the pavement edge.

A very large majority described the standard of maintenance saying that material was pulled out of the ditch by a motor patrol and spread across the shoulder so that the line and grade was re-established.

Replacing Shoulder Material

Replacing shoulder material in holes or low spots in the shoulder area was practiced by nearly everyone interviewed but the critera for doing the work varied too widely to permit making a representative statement for the level of maintenance for this function.

A standard of maintenance frequently stated was to fill the depression with material hauled in, usually sand rejects, and to compact the fill material without benefit of water to about the same density as the rest of the shoulder.

Erosion Control of the Shoulder

Shoulder erosion control measures were attempted by slightly over one half of the maintenance men and the level of maintenance which ruled was to exercise control measures where shoulder erosion had occurred.

The techniques employed to control shoulder erosion varied widely so that no standard of maintenance can be given based on present practices.

Patching Paved or Bituminous Treatment Shoulders

The level of maintenance reported by the majority of the maintenance men was to keep asphalt surface shoulders free of holes or failed areas.

Paved or asphalt treated shoulders enjoy the same standard of maintenance as the travelway which was:

1. Remove failed material from the hole.
2. Square the edges of the hole.
3. Paint the hole with tack oil.
4. Fill the hole with asphalt mix.
5. Compact the asphalt mix with truck wheels.

Mowing

Although maximum grass height of approximately 8 to 12 inches was the level of maintenance generally adopted by maintenance men, there is some question as to whether it exists in actual practice. If enough mowers were available when needed, the level of maintenance cited would probably be much closer to fact.

When roadside grass and weeds are mowed, over three fourths of the men try to cut at heights of 3 to 5 inches or less as their standard of maintenance criteria.

Trash Gathering

Trash gathering usually included collecting roadside trash along the entire roadside as well as emptying litter barrels at selected locations. Unsightly appearance was reported as the factor that defined the level of maintenace in most instances. For litter barrels, and particularly on weekends, field observations suggest that this level of maintenance is not being satisfied with much regularity.

It is difficult to state a meaningful standard of maintenance for this operation based on the responses since the work is so simple and all done by hand.

Spraying and Weed Control

The circumstances necessary to cause weed control measures to be initiated was never clearly answered in the responses to the questionnaire but there was almost unanimous agreement that spraying weeds was an essential operation. A level of maintenance followed by most maintenance men was to do this work annually, usually in the spring or when adequate ground moisture was present.

No information was reported as to the standard techniques employed in weed control such as spray rates or specific materials used. Accordingly, the stated standard of maintenance of spraying soil sterilants around posts and other areas not readily accessible to mowers is not very comprehensive.

Ditches and Gutters

About one half of the maintenance men defined the level of maintenance criteria for ditch and gutter maintenance in terms of an annual or semi-annual operation. Another one third stated that the work should be done whenever the ditches or gutters filled up.

Nearly all responses indicated that the standard of maintenance should be to remove all foreign material from the ditch or gutter.

Culvert Cleaning

Culvert cleaning also has a level of maintenance most often stated in terms of an annual or semi-annual event. A disturbing response received over 20 per cent of the time was that culverts should be cleaned when they become plugged. While this is certainly correct, such a criteria for the level of maintenance is clearly inadequate to afford the drainage necessary to protect a highway and its environs.

The predominant standard of maintenance for culvert cleaning was removal of foreign material from the culvert ends, with hand tools being the common equipment employed.

Side Drains and Diversion Ditches

The most common consideration for determining when side drains and diversion ditches require attention is a plugged or filling condition. The former condition would appear to render a low level of maintenance.

Hand cleaning, presumably to the originally constructed condition, was most frequently reported as the standard of maintenance performed.

Subdrains, Storm Sewers, Siphons and Stock Passes

These four maintenance operations are treated in a similar manner, but individually involve very few maintenance men. In each case the level of maintenance adopted is usually to attend to them only after they became plugged. Many responses were that no maintenance was ever required.

No conspicuous standard of maintenance can be given for the small number of diverse statements reported.

Erosion Control of Cuts and Fills

A large proportion (67%) of the maintenance men make daily inspections of cut and fill slopes. Even so, only about one third of the responses showed that preventive measures were taken. The most often reported level of maintenance was to do nothing until after erosion occurs.

Backfilling eroding or eroded locations was the standard of maintenance most often adopted.

Traffic Sign Maintenance

Over 90 per cent of maintenance men defined the level of maintenance provided for traffic signs was daily (and daytime) inspection for signs and sign posts that were damaged or provided poor legibility. Only 4 per cent reported making night inspections which indicates a serious weakness in practice.

Repair or replacement of inservicable signs and appurtenances was the common standard of maintenance reported.

Roadside Rest and Picnic Areas - Trash and Litter Pickup

Practice is not very consistent for the level of maintenance for trash and litter collection at roadside rest and picnic areas. The most common procedure was to perform this service at the same time that section litter barrels were emptied which is also done according to a diversity of schedules. Probably due to the highly varied useage of roadside facilities by areas and seasons, no predominant procedures were discernible.

When trash and litter was collected from roadside facilities the standard of maintenance reported was to simply pick up noticeable trash and empty the litter barrels.

Roadside Rest and Picnic Area - Insect and Disease Control

Of the 50 per cent of the maintenance men with roadside areas on their section who performed an insect control program, the level of maintenance most often followed was treatment of the premises once or twice a week.

A standard of maintenance most often adopted by those few who did this work was to clean with an unspecified disinfectant or treat with lime.

Snow Plowing

Over three fourths of the men reported as their level of maintenance that they started snow plowing operations when the snow depth was between 1-2 inches.

The standard of maintenance cited as the common objective was to maintain a snow-free roadway surface.

Packed Snow and Ice Control

Although most maintenance men try for a snow free highway surface, this objective is not always attainable by plowing. When packed snow or icy conditions develop, the level of maintenance most often adopted

was application of abrasives (sand, gravel, rejects) or salt or a mixture of the two in areas where greatest skid resistance was important (grades, curves, intersections).

No particular standard of maintenance was cited in terms of minimum skid resistance or application rates of skid resistant materials.

Bridge Inspections

Bridges are inspected on nearly all maintenance sections but the procedures vary widely. The largest response for the level of maintenance included only one-third of the sections, and that provided for spring and fall inspections. Another 20 per cent of the responses indicated inspections were performed during high water.

From the answers given to the questionnaire, no standard of maintenance can be stated.

Cleaning Bridge Expansion Joints

Out of 111 responses, only 48 maintenance men reported a practice for cleaning bridge expansion joints. From these 48 men, the level of maintenance most often reported (one third) was claening when the joint was filled. Another one- fourth of the responses cited semi-annual cleanings and one third reported annual cleanings.

The standard of maintenance followed by a majority of the men was to clean all material out of the joints, usually by hand methods and/or by water pressure.

Concrete Surface Spalling

Concrete Surface Spalling on bridge decks was of concern to only a few maintenance men who stated predominantly that the level of maintenance was based on conspicuous scaling.

For those making repairs, the standard of maintenance for a bare majority was use of a thin concrete patch. A substantial proportion also reported seal coating the bridge surface as the standard of maintenance.

Removal of Sanding Material from Bridges

Nearly half of the maintenance men reported that the level of maintenance followed for removing sand from bridges was to do so each spring. Another large group removed the surplus sand whenever it built up and affected drainage.

Over 70 per cent of the responses indicated that the standard of maintenance was to use hand tools for sweeping and shoveling to clean the deck.

II. RECOMMENDATIONS

Based on the preceding conclusions, direct field observations and information from previous studies, the following recommendations are offered.

Purpose Code Definitions

The Idaho Department of Highways Maintenance Manual does not include a complete list of all maintenance purpose codes together with a clear description of all types of work within the scope of each purpose code. It is recommended that such a listing with definitions be included in the Maintenance Manual and also that such a listing be distributed to each maintenance man for his personal use and reference.

The list of purpose codes presented in Appendix Table A-1 commencing on page 133 could be used as a guide for defining the purpose codes presently in use by the Department. Each purpose code might be further qualified by inclusion of a list of applicable maintenance operations such as shown on page 139 of Appendix Table A-2.

Maintenance Schools

The maintenance man must have a thorough understanding of the basic purpose codes and must understand the importance of correctly reporting maintenance charges as well as correctly performing maintenance operations. Educational programs, such as periodic maintenance schools, can help the maintenance man obtain the needed basic knowledge and keep him advised of changes and improvements in the accounting system, charge purpose codes, and modern maintenance techniques. Schools or workshops of this type can also be used to teach the maintenance man the standards and levels of maintenance to be used for each maintenance operation and the methods to correctly perform an operation under a given set of circumstances.

The author is aware of the recent progress made by the Idaho Highway Department in the area of annual maintenance personnel schools, but since the workshops are held at the State level with only maintenance supervisors and foremen attending, the direct benefit to the individual section maintenance man remains questionable. Schools for maintenance men similar to those attended by the supervisors and area foremen should be conducted at the district level or perhaps in some instances at the area level of maintenance operations. The maintenance men could then directly benefit by attending the workshops and would also have the opportunity to ask questions and discuss situations or characteristics specifically related to their assigned sections.

Other benefits can be derived from maintenance schools held at the local area level. If district and head quarters engineers participate in the schools, maintenance personnel at all levels will become better acquainted. This should result in improved rapport and help overcome restraints to communications between field and office staff. In discussion sessions, field crews will have the opportunity to describe

problems in the implementation of new or proposed policy. These local area sessions would also give staff engineers an opportunity to hear recommendations on new maintenance techniques and new or revised policy, both of which can have Department-wide application.

Physical and Climatic Data Correlation

The data in this study have provided an indication of the range of practices presently occurring throughout the State. However, no attempt was made to determine specifically why certain maintenance men deviate from the more widely used "standard" practices. The large volume of physical and climatic data collected for the maintenance sections by Parman (3) and the standard and level data presented in this study for the selected study sections should be analyzed to determine if any correlation exists between the physical and climatic characteristics of a particular maintenance section and the type of standards and levels of maintenance used in performing the various maintenance operations.

Standards and Levels of Maintenance

Even though the data indicate that maintenance practice is fairly uniform in most maintenance activities, there is still need for a critical review of present practice to determine if the present practice is indeed the best practice. It is recommended that the responses to the questionnaire be studied with the objective of developing as Departmental policy definite standards and levels of maintenance for all possible maintenance activities. Experimentation may be desirable by using different levels of maintenance for different classes of road. An attempt also should be made to determine whether adjustments to the level of maintenance have an effect on the cost of maintenance.

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APPENDIX A

TABLE A-1

IDAHO DEPARTMENT OF HIGHWAYS
MAINTENANCE CODES

Purpose Code	Explanation
1000	Unusual or Disaster Maintenance This code is used for items stated above including road closures, landslides, floods, etc.
1005	Roadway Patrol Inspection This purpose code was set aside for "Roadway Patrol Inspection." The patrol includes a man and truck to survey the roadway for needed repairs. A man making a patrol on Saturday would fall in this category. During the patrol he may be required to push rocks off the roadway, dump a trash can, or perform some other minor maintenance function. His primary purpose, though, is to patrol.
1010	Travelway - Routine Repair "Routine Travelway Repair" is defined as work performed by <u>one</u> or <u>two</u> men on the surface of the travelway. This involves repairing pot-holes, small hand seals, crack filling, and routine blade work on gravel surfaces. The repair involved under this purpose code is primarily for the assigned maintenance man on his individual section. Should he require additional help, other than himself and helper, the repair should not be charged to 1010. The help may originate within the foreman's area or come from the district. It is logical to expect that additional assistance will be required on road sections to expedite the work and better utilize equipment. The individual man could not possibly perform the quantity of work done by several; therefore, the job falls outside the definition of Routine Travelway Repair.

TABLE A-1 (continued)

Purpose Code	Explanation
1020	Travelway - Special Repair
	"Travelway Special Repair" involves more than two people with additional equipment such as a motor patrol, roller, or several trucks. The magnitude of the work is greater than done under 1010. The crew doing this work may be made up of men assigned to one or several maintenance foremen or the district "Special Crew." During certain times of the year, foremen occasionally combine forces and equipment to expedite work by gang maintenance. An example would be three men filling cracks and two flagmen. The magnitude of work would be greater than could be expected by an individual maintenance man. Therefore, it would fall under the 1020 purpose code. This code is not reserved for only the district "Special Crew," although much of the work is in this area. Any crew, regardless of origin, may charge to this purpose code providing the work is of sufficient magnitude. Purpose Codes 1040 and 1045 would fall in a similar category with 1010 and 1020 in respect to personnel and equipment.
1021	Tear up and Relay
	This work involves scarifying a roadway, remixing with the addition of asphalt and rolling, etc. The intent of Purpose Code 1021 is not to preclude the individual foreman from charging to it. The code is not reserved for only the district "Special Crew," although much of their work is in this area. Any crew, regardless of origin, may charge to this purpose code providing the work is of sufficient magnitude.
1022	Half Sole
	"Half Sole" is generally of greater magnitude than Travelway Surface Repair. The very nature of the work involves more equipment and personnel. Some judgement must be exercised when making charges to this code. The intent of Purpose Code 1022 is not to preclude the individual foreman from charging to

TABLE A-1 (continued)

Purpose Code	Explanation
1022 continued	it. The code is not reserved for only the district "Special Crew," although much of their work is in this area. Any crew, regardless of origin, may charge to this purpose code providing the work is of sufficient magnitude.
1023	Seal Coat This work consists of special highway forces or contract seal coat projects. The first seal coat on any project is charged to Construction and thereafter charged to Maintenance.
1030	Shoulders and Side Approaches Repairs by one or two men on the shoulders and side slopes of the roadway.
1032	Mowing Mowing the shoulders and side slopes of the roadway. Mowing on high type roadways, Interstate, etc., is necessarily much more frequent than on much less frequently traveled highways such as secondary roads, etc.
1033	Trash Gathering This work consists of roadside pickup, emptying litter barrels, etc.
1034	Spraying and Weed Control This work consists of spraying herbicides at guardrails, signs, etc. This item does not include weed control by contract with the Counties.
1040	Roadside and Drainage This item involves the heavy work of improving roadside drainage by special crews, cleaning of pipe, etc. Purpose Codes 1040 and 1045 would fall in a similar category with 1010 and 1020 in respect to personnel and equipment.

TABLE A-1 (continued)

Purpose Code	Explanation
1045	Roadside and Drainage - Extraordinary This work involves the odd work with power shovels as the Michigan loader in cleaning of ditches, etc., or crews larger than two maintenance men.
1050	Traffic Signs - Replacement and Normal Repair This work involves replacing vandalized signs, exchanging signs to new standards, etc. Sign work is distributed annually on a pro rata basis to each maintenance section including salaries, wages, materials, equipment rental, etc.
1054	Highway Signals and Lights This code includes replacement of units, globes, power and the power bill for signals and lights. The item for power is the largest item.
1055	Roadside Rest and Picnic Areas "Roadside Parks and Picnic Areas" represent a purpose code to be used only when the work done in these areas cannot be covered by another code. Trash gathering may be done in a rest area and charged to 1033. The charge should be made against the assigned rest area number (Ref. Accounting Manual 19-027.6). Supplies, Utility Service, or any other charge which will not readily fall into one of the other purpose codes would then be charged to 1055.
1060	Snow and Ice Removal Work involves removal of snow and ice from roadway pavement. Does not include patrol as described in Section 1005.
1065	Sanding Icy Surfaces This item is similar to snow and ice removal, but includes cost of material used in sanding the roadway. Does not include sanding of oil rich surfaces during summer months.

TABLE A-1 (continued)

Purpose Code	Explanation
1070	Bridge Maintenance
	Work performed by the special bridge crews normally. It could include some charges by a single maintenance man cleaning bridges seats, drainage cleanouts, etc.
1071	Bridge Painting
	Generally involves contract painting of bridge structures.
1080	Damage Repair
	This involves emergency type repair by special crews.
1095	Yards and Building
	"Maintenance and Operating Costs of Yards and Buildings.: Should the maintenance man spend several hours per week cleaning buildings or cutting weeds in the yard, this charge should be used.
	To keep yards and buildings in neat appearance, it is necessary to perform regular maintenance. Many foremen perform this work at the end of a short shift or when regular roadway maintenance is completed sooner than expected. Maintenance personnel should be instructed to use the charge accordingly.

TABLE A-2

LIST OF MAINTENANCE OPERATIONS COVERED IN THE QUESTIONNAIRE

Idaho Purpose Code	Type of Operation
1000	Unusual or Disaster Maintenance
1005	Roadway Patrol Inspection
1010	Travelway - Routine Repair a) Patching b) Joint and Crack Filling
1020	Travelway - Special Repair
1021	Tear up and Relay
1022	Half Sole
1023	Seal Coat
1030	Shoulders and Side Approaches a) Blading or Pulling Shoulders b) Replacing Materials c) Erosion Control d) Reshaping - Shoulders e) Patching - Paved or Bituminous Treated Shoulders f) Surface Treating - Shoulders g) Replacing Large Failed Areas
1032	Mowing
1033	Trash Gathering a) Right of Way - Turnouts
1034	Spraying and Weed Control a) Guard Rails b) Signs - Right of Way Markers c) Delineators d) Headwalls, Pipes, etc. e) Bridges
1040	Roadside and Drainage a) Ditches and Gutters

TABLE A-2 (continued)

Idaho Purpose Code	Type of Operation
1040 continued	b) Culverts c) Side Drains and Diversion Ditches d) Subdrains e) Storm Sewers f) Irrigation Siphon and Stock Passes g) Erosion - Cuts and Fills h) Walls, Cribbing and Riprap i) Seeding j) Mulching k) Fertilizing
1045	Roadside and Drainage - Extraordinary
1050	Traffic Signs - Placement and Normal Repair
1051	Paint Striping - Handled by Boise
1054	Highway Signals and Lights a) Signals b) Lights
1055	Roadside Rest and Picnic Areas a) Trash and Litter b) Vandalism Repairs c) Driveways and Parking Areas d) Footpaths and Sidewalks e) Mowing and Irrigation f) Curbs g) Fences h) Building and Tables i) Structures j) Water Supply k) Fireplaces, Pit, and Barbeque Facilities l) Insect and Disease Control
1060	Snow and Ice Removal a) Plowing b) Salt or Chemicals
1065	Sanding Icy Surfaces
1070	Bridge Maintenance a) Inspections b) Cleaning Expansion Joints c) Concrete Surface Spalling d) Joint Repair e) Hand Rail Repair f) Drainage Cleanouts g) Removal of Used Sanding Material

TABLE A-2 (continued)

Idaho Purpose Code	Type of Operation
1071	Bridge Painting - Handled by Special Crew or by Contract
1080	Damage Repair - Depends on Conditions
1090	General Expense
1095	Yards and Building a) Trash and Litter Pickup b) Painting Buildings, etc. c) Roofing d) Grading and Surfacing
1099	Distribution of Indirect Charges

APPENDIX B

TABLE B

MAINTENANCE SECTIONS SELECTED FOR STUDY

District I:

1.	020-305	6.	730-419	11.	037-022	16.	191-101
2.	730-300	7.	034-030	12.	037-068	17.	515-013
3.	730-351	8.	034-053	13.	039-056	18.	515-044
4.	730-367	9.	034-116	14.	089-026	19.	515-091
5.	730-397	10.	036-034	15.	091-030		

District II:

1.	023-211	7.	030-222	13.	093-105	19.	993-079
2.	024-037	8.	830-297	14.	093-130	20.	615-016
3.	025-177	9.	068-189	15.	093-164	21.	080-232
4.	025-226	10.	075-042	16.	093-190		
5.	026-218	11.	093-042	17.	093-228		
6.	030-181	12.	093-074	18.	993-028		

District III:

1.	015-034	7.	021-039	13.	069-010	19.	095-085
2.	015-053	8.	021-079	14.	069-016	20.	095-113
3.	015-112	9.	044-057	15.	069-018	21.	095-187
4.	019-005	10.	051-093	16.	072-043	22.	080-026
5.	019-021	11.	052-030	17.	095-047	23.	080-100
6.	020-057	12.	052-054	18.	095-063		

District IV:

1.	007-270	8.	012-044	15.	043-010	22.	095-331
2.	007-344	9.	012-115	16.	043-057	23.	095-363
3.	007-364	10.	012-146	17.	064-014	24.	095-389
4.	008-002	11.	012-176	18.	095-213	25.	995-400
5.	008-014	12.	013-090	19.	095-238		
6.	008-037	13.	013-100	20.	095-252		
7.	011-070	14.	042-029	21.	095-286		

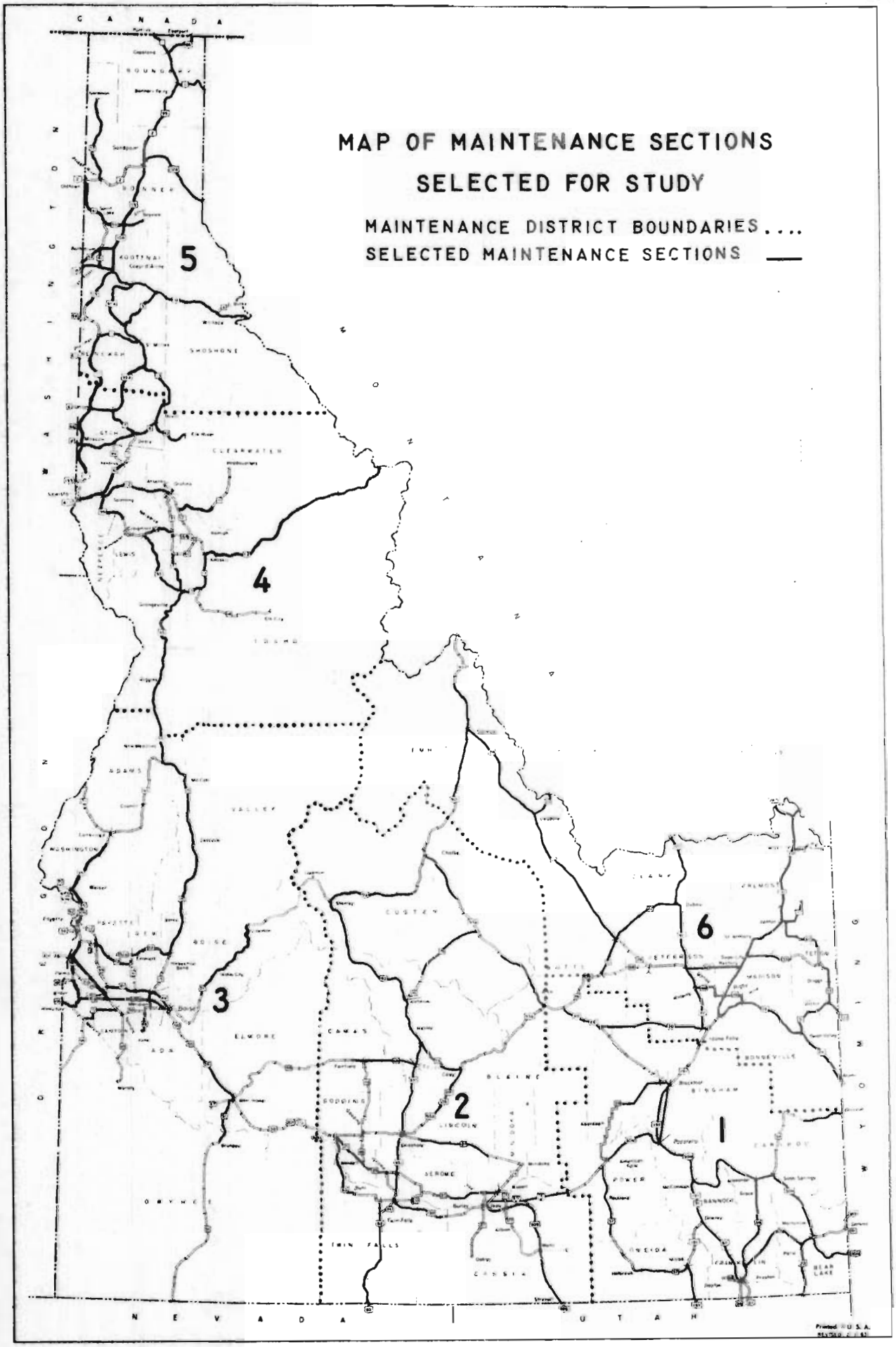
TABLE B (continued)

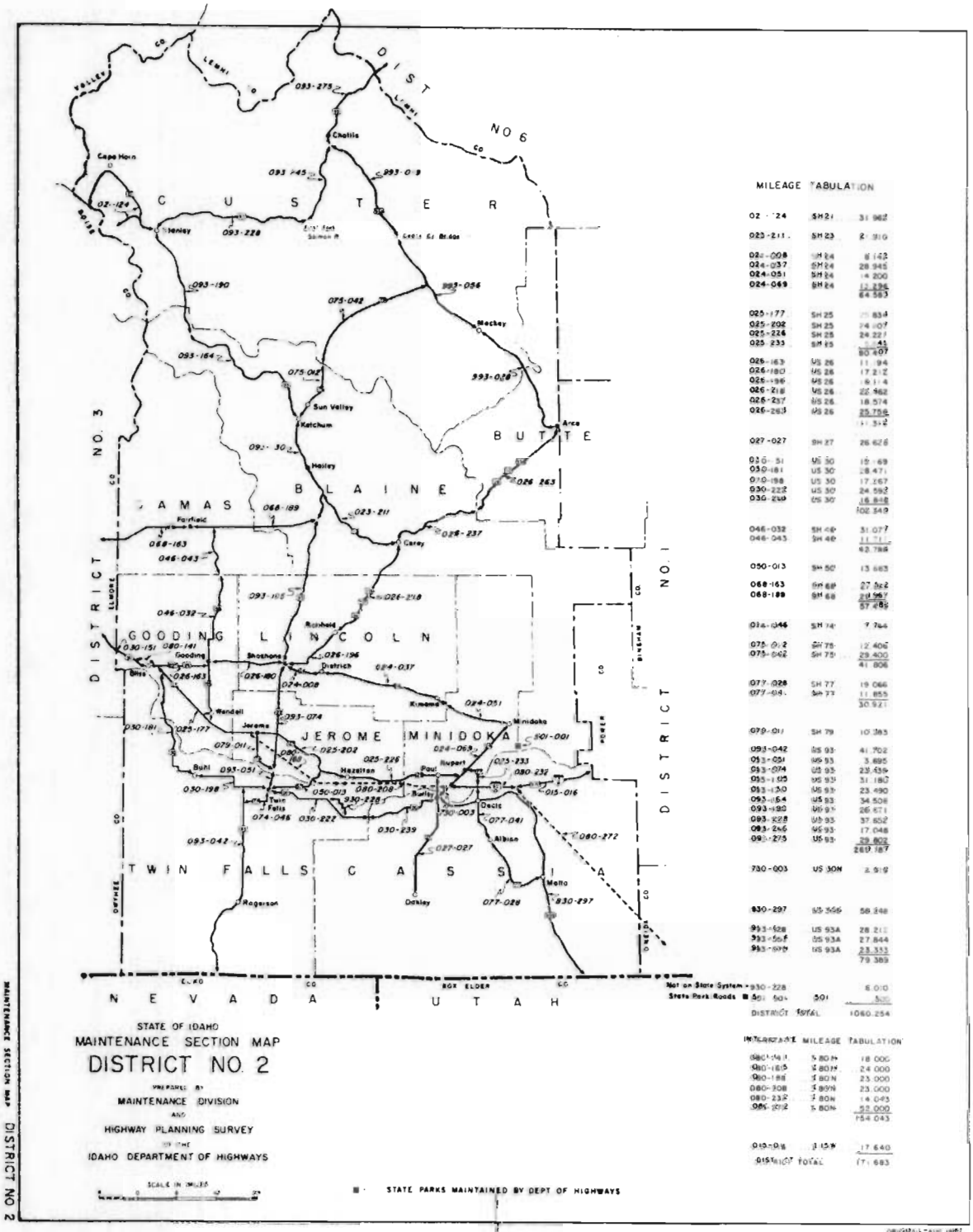
District V:

1.	001-555	9.	041-039	17.	095-470	25.	995-440
2.	002-549	10.	043-032	18.	095-493	26.	995-476
3.	003-462	11.	053-009	19.	095-511	27.	090-012
4.	005-019	12.	053-014	20.	095-528	28.	090-033
5.	010-035	13.	054-016	21.	095-544	29.	090-049
6.	010-076	14.	057-037	22.	095-559	30.	090-062
7.	910-063	15.	095-414	23.	995-415		
8.	041-008	16.	095-448	24.	995-429		

District VI:

1.	020-328	8.	028-291	15.	088-340	22.	191-210
2.	022-308	9.	029-258	16.	088-340	23.	191-236
3.	022-338	10.	031-021	17.	091-154	24.	287-240
4.	026-347	11.	033-178	18.	093-306	25.	515-142
5.	026-376	12.	033-215	19.	092-327	26.	515-166
6.	026-401	13.	047-012	20.	191-160	27.	515-197
7.	028-245	14.	048-024	21.	191-182		


MAP OF MAINTENANCE SECTIONS
SELECTED FOR STUDY
MAINTENANCE DISTRICT BOUNDARIES....
SELECTED MAINTENANCE SECTIONS
CANADA
NEVADA
UTAH
1
2
3
4
5
6

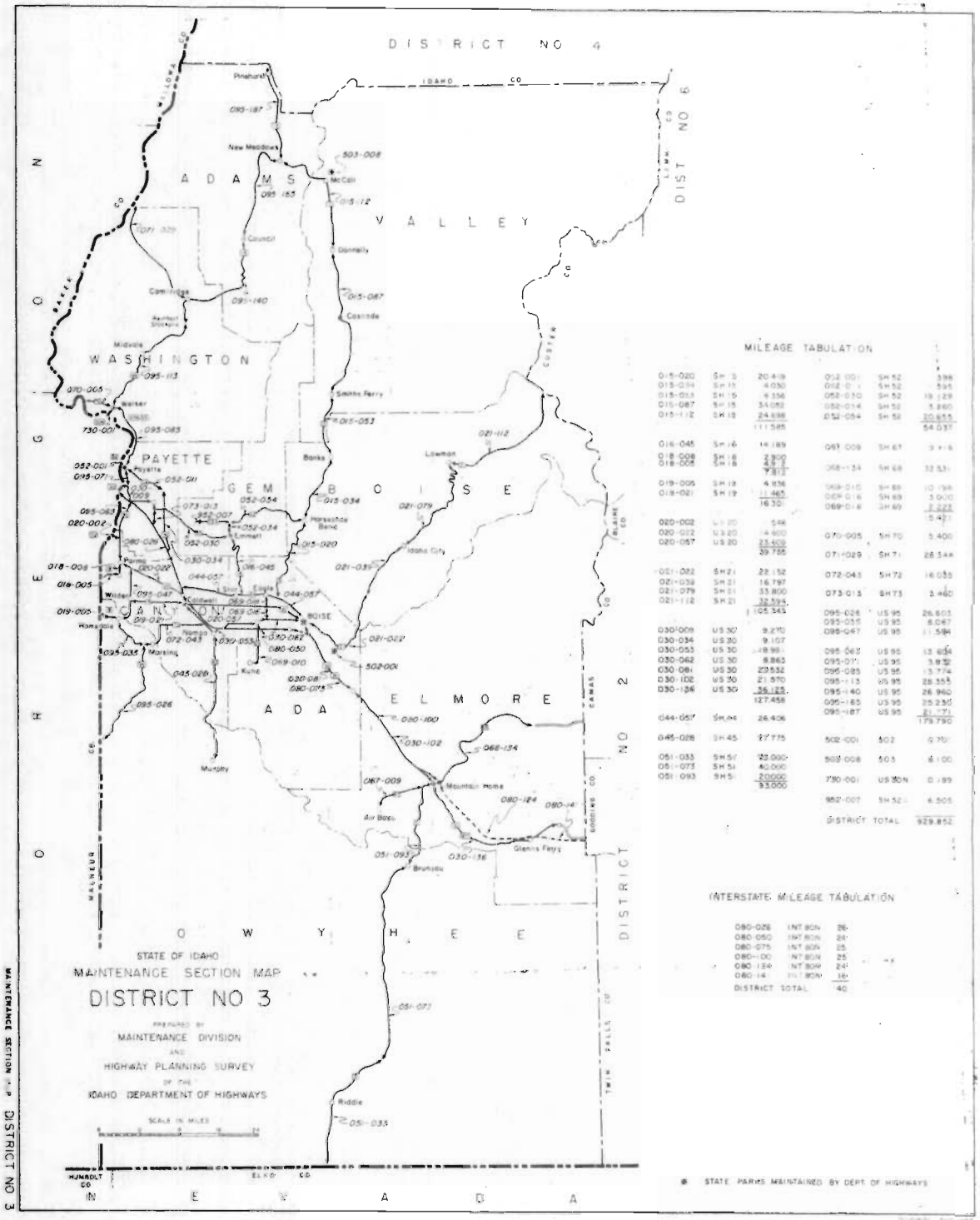


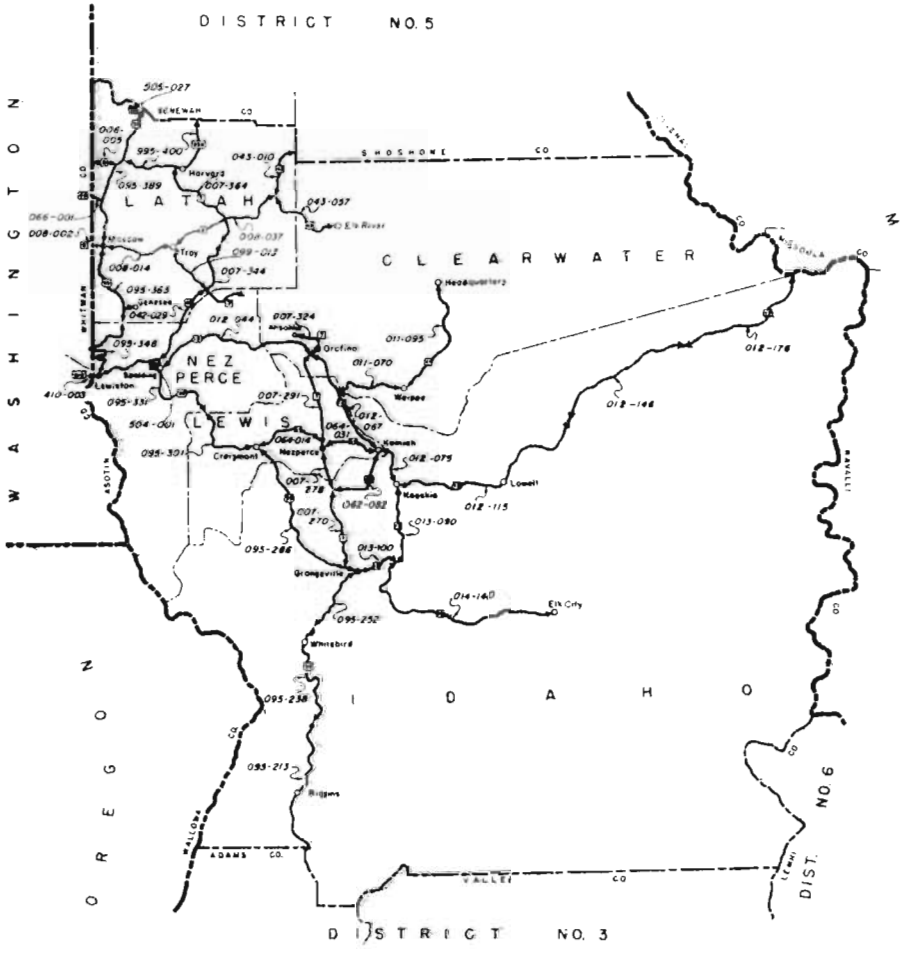
MILEAGE TABULATION

02-124	SH 21	31.962
023-211	SH 23	2.910
024-008	SH 24	6.143
024-037	SH 24	28.945
024-051	SH 24	14.200
024-069	SH 24	12.336
		64.583
025-177	SH 25	11.834
025-202	SH 25	14.107
025-226	SH 25	24.227
025-233	SH 25	[illegible]
		80.407
026-163	US 26	11.194
026-180	US 26	17.212
026-196	US 26	16.114
026-218	US 26	22.462
026-237	US 26	18.574
026-263	US 26	25.756
		111.312
027-027	SH 27	26.626
030-151	US 30	15.169
030-181	US 30	28.471
030-198	US 30	17.267
030-222	US 30	24.592
030-239	US 30	16.848
		102.349
046-032	SH 46	31.077
046-043	SH 46	11.711
		42.788
050-013	SH 50	13.663
068-163	SH 68	27.862
068-189	SH 68	29.567
		57.429
074-046	SH 74	7.744
075-012	SH 75	12.406
075-042	SH 75	29.400
		41.806
077-028	SH 77	19.066
077-041	SH 77	11.855
		30.921
079-011	SH 79	10.383
093-042	US 93	41.702
093-051	US 93	3.695
093-074	US 93	23.439
093-100	US 93	31.180
093-130	US 93	23.490
093-164	US 93	34.508
093-190	US 93	26.671
093-228	US 93	37.652
093-246	US 93	17.048
093-275	US 93	29.802
		269.187
730-003	US 30N	2.919
830-297	US 36S	58.348
933-628	US 93A	28.211
933-656	US 93A	27.844
933-679	US 93A	23.333
		79.389
Not on State System - 930-228		6.010
State Park Roads ■ 501-501	501	.500
DISTRICT TOTAL		1060.254

INTERSTATE MILEAGE TABULATION

080-141	I 80N	18.000
080-185	I 80N	24.000
080-188	I 80N	23.000
080-308	I 80N	23.000
080-232	I 80N	14.043
080-272	I 80N	52.000
		154.043
015-016	I 15N	17.640
DISTRICT TOTAL		171.683


DISTRICT NO 4
DISTRICT NO 6
DISTRICT NO 2
DISTRICT NO 3
IDAHO CO
ADAMS
VALLEY
WASHINGTON
PAYETTE
GEM
BOISE
ADA
ELMORE
OWYHEE
OREGON
NEVADA
Pinehurst
New Meadows
McCall
Council
Donnelly
Cascade
Cambridge
Midvale
Weiser
Smiths Ferry
Banks
Lowman
Horseshoe Bend
Emmett
Idaho City
Payette
Fruitland
Parma
Wilder
Caldwell
Nampa
Marsing
Kuna
Eagle
BOISE
Mountain Home
Air Base
Glenns Ferry
Bruneau
Murphy
Riddle
HUMBOLDT CO
ELKO CO
TWIN FALLS CO
BLAINE CO
CAMAS
GOODING CO
CUSTER
LEMHI CO
WALLOWA
BAKER
WALLOWA
STATE OF IDAHO
MAINTENANCE SECTION MAP
DISTRICT NO 3
PREPARED BY
MAINTENANCE DIVISION
AND
HIGHWAY PLANNING SURVEY
OF THE
IDAHO DEPARTMENT OF HIGHWAYS
SCALE IN MILES
MAINTENANCE SECTION MAP DISTRICT NO 3
MILEAGE TABULATION
INTERSTATE MILEAGE TABULATION
DISTRICT TOTAL 929.852
STATE PARKS MAINTAINED BY DEPT OF HIGHWAYS



STATE OF IDAHO

MAINTENANCE SECTION MAP

DISTRICT NO. 4

PREPARED BY

MAINTENANCE DIVISION

AND

HIGHWAY PLANNING SURVEY

OF THE

IDAHO DEPARTMENT OF HIGHWAYS

SCALE IN MILES

0 8 16 24

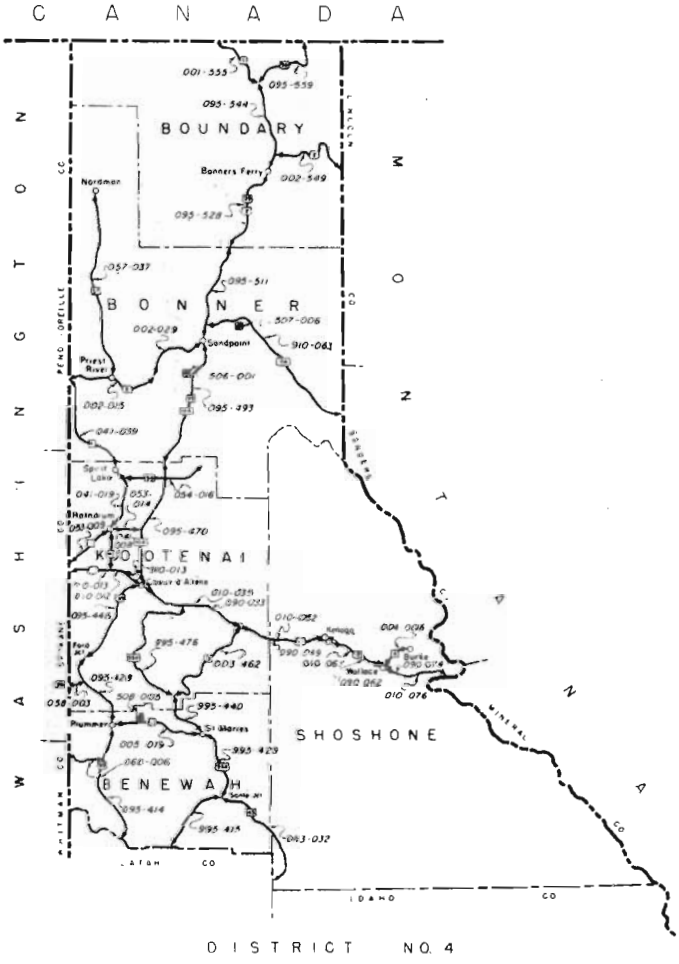
■ STATE PARKS MAINTAINED BY DEPT OF HIGHWAYS

MILEAGE TABULATION

006-005	SH 6	4.546	014-140	SH14	50.088
007-275	SH7	15.793	042-029	SH42	16.823
007-278	SH7	6.400			
007-291	SH7	23.565	043-010	SH43	3.219
007-324	SH7	18.639	043-057	SH43	1.635
007-344	SH7	18.574			28.854
007-364	SH7	20.293			
		108.284	062-082	SH62	15.072
			066-001	SH66	0.989
008-002	SH8	1.854	095-213	US 95	25.966
008-014	SH8	11.574	095-238	US 95	25.129
008-037	SH8	252.24	095-252	US 95	1.677
		264.68	095-286	US 95	32.602
			095-301	US 95	18.725
012-044	SH12	31.981	095-331	US 95	27.545
012-067	SH12	22.357	095-348	US 95	16.688
012-075	SH12	7.844	095-363	US 95	15.489
012-116	SH12	40.725	095-389	US 95	26.384
012-146	SH12	29.757			
012-176	SH12	29.604			200.405
		162.348	095-400	SH 95	12.416
011-070	SH11	17.950	095-405	US 95A	20.310
011-095	SH11	24.749			
		42.699	410-003	US 410	3.835
064-014	SH 64	13.736	504-001	504	0.400
064-551	SH 64	17.765	505-027	505	27.209
		31.503			
013-090	SH13	15.169	DISTRICT TOTAL		785.273
013-150	SH13	11.000			
		26.169			

MAINTENANCE SECTION MAP DISTRICT NO. 4

REV-ST MAR. 1963



MILEAGE TABULATION

001-559	SH 1	11 210
002 013	US 2	14 532
002 029	US 2	14 176
002 549	US 2	1 177
		45 895
003-462	SH 3	27 049
004-006	SH 4	6 465
006-019	SH 5	19 386
010 013	US 10	12 168
010 035	US 10	22 096
010-052	US 10	18 595
010-063	US 10	11 91
010 076	US 10	2 831
		76 845
910-013	U A	0 250
910-063	US A	3 269
		3 519
041-008	SH 41	8 269
041-019	SH 41	10 501
041-039	SH 41	19 935
		38 704
043-032	SH 43	22 250
052-009	SH 52	9 650
053 014	SH 53	4 640
		14 290
056 016	SH 54	16 006
057 037	SH 57	37 229
058-003	SH 58	2 910
060-006	SH 60	5 508
0[illegible]-[illegible]	US 95	24 276
095 [illegible]28	US 95	14 623
095 488	US 95	19 718
095 4[illegible]	US 95	22 095
095 4[illegible]	US 95	23 591
095-[illegible]	US 95	17 064
09[illegible] 5 8	US 95	17 30
095 544	US 95	15 5 8
095 559	US 95	5 647
		169 656
995-4 5	US 95 A	14 496
995-425	US 95 A	14 484
995-440	US 95 A	11 184
995-4 6	US 95 A	35 990
		76 154
506 001	506	150
5 -006	507	5 500
508-003	508	500
DISTRICT TOTAL		509 268

INTERSTATE MILEAGE TABULATION

090-0 2	INT 90	12
090 033	INT 90	21
090 049	INT 90	16
090 062	INT 90	13
090 074	INT 90	12
		74

STATE OF IDAHO
MAINTENANCE SECTION MAP
DISTRICT NO. 5

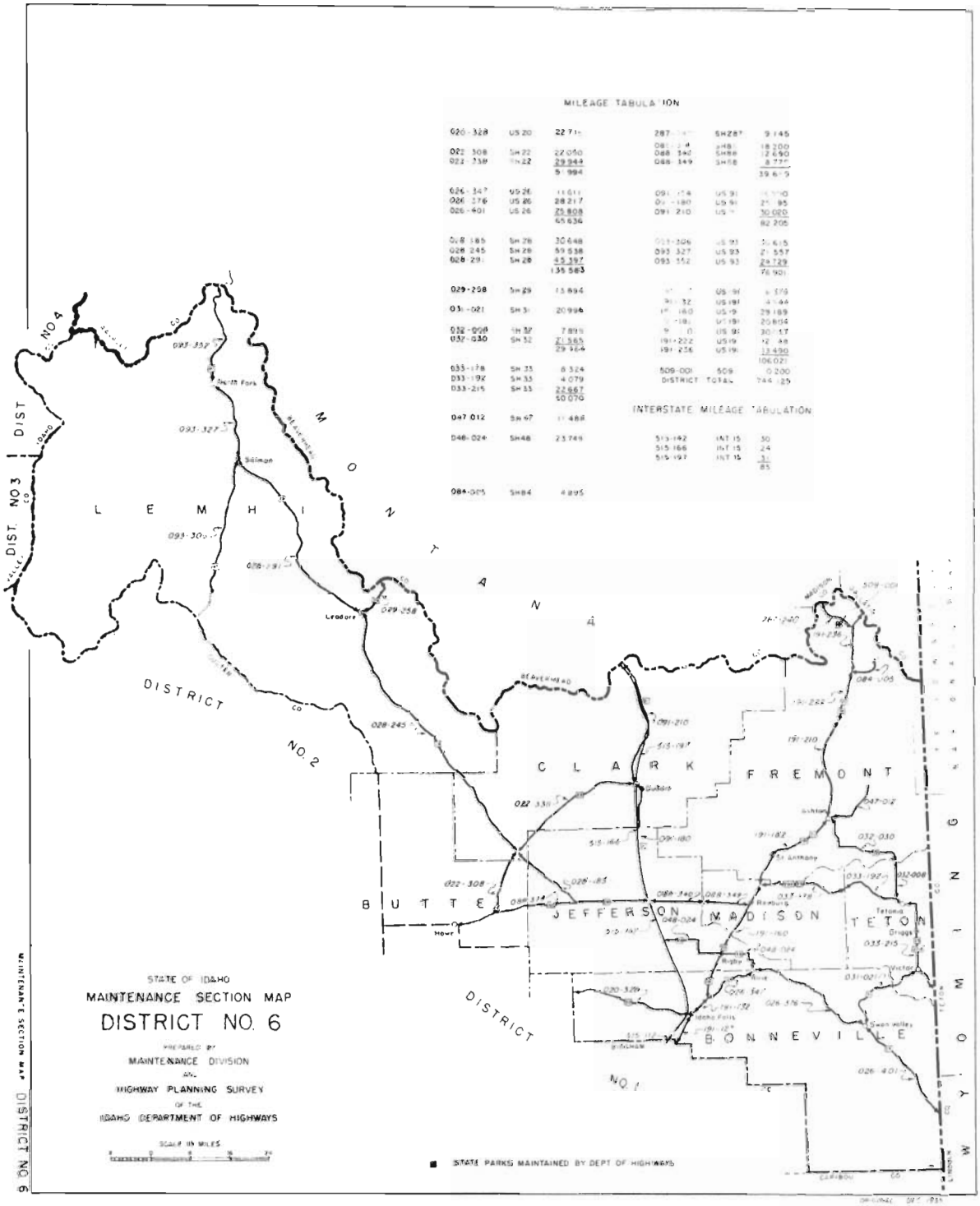
PREPARED BY
MAINTENANCE DIVISION
AND
HIGHWAY PLANNING SURVEY
OF THE
IDAHO DEPARTMENT OF HIGHWAYS

SCALE IN MILES
0 8 16 24

■ STATE PARKS MAINTAINED BY DEPT OF HIGHWAYS

ORIGINAL DEC 1955
REVISED MAR 1963

MAINTENANCE SECTION MAP DISTRICT NO 5



MILEAGE TABULATION

026-328	US 20	22 715	287-[illegible]	SH287	9 145
			081-[illegible]	SH81	18 200
022-308	SH 22	22 050	088-340	SH88	12 690
022-338	SH 22	29 944	088-349	SH88	8 777
		51 994			39 615
026-347	US 26	11 611	091-[illegible]	US 91	[illegible]
026-376	US 26	28 217	091-180	US 91	21 195
026-401	US 26	25 808	091-210	US 91	30 020
		65 636			82 205
028-185	SH 28	30 648	093-306	US 93	21 615
028-245	SH 28	59 538	093-327	US 93	21 557
028-291	SH 28	45 397	093-352	US 93	24 729
		135 583			78 901
029-258	SH 29	15 894	[illegible]	US 191	[illegible]
			[illegible]-32	US 191	[illegible]
031-021	SH 31	20 996	[illegible]-180	US 19	29 189
			[illegible]-181	US 191	20 804
032-008	SH 32	7 895	[illegible]-[illegible]	US 93	30 157
032-030	SH 32	21 565	191-222	US 19	[illegible]
		29 460	191-236	US 191	13 430
					106 021
033-178	SH 33	8 324	509-001	509	0 200
033-192	SH 33	4 079	DISTRICT TOTAL		744 [illegible]25
033-215	SH 33	22 667			
		30 070			
047-012	SH 47	[illegible] 488			
048-024	SH 48	23 749			
084-005	SH 84	4 895			

INTERSTATE MILEAGE TABULATION

513-192	INT 15	30
515-166	INT 15	24
515-197	INT 15	31
		85

APPENDIX C

TABLE C

MAINTENANCE OPERATIONS QUESTIONNAIRE

DISTRICT AND STATE SUMMARY OF AREA FOREMEN RESPONSES

I. PURPOSE CODE 1000 - UNUSUAL OR DISASTER MAINTENANCE

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to decide whether to charge to Code 1000?								
1. Code 1000 has never been used by area foreman	-	2	-	3	1	3	9	17%
2. Criteria determined by district office	2	-	1	2	-	-	5	10%
3. Major floods	4	4	7	4	4	3	26	50%
4. Major slides	-	-	4	1	1	1	7	13%
5. Disrupted travelway	2	-	-	2	1	-	5	10%
District Totals	8	6	12	12	7	7	52	

II. PURPOSE CODE 1005 - ROADWAY PATROL INSPECTION

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. Does this include driving time only?								
1. Yes	1	6	6	-	-	-	13	32%
2. No	7	-	2	7	6	6	28	68%
District Totals	8	6	8	7	6	6	41	
Question 2. If not, then is there any time limit on small jobs which are done under Code 1005?								
1. No time limit	2	-	2	1	-	5	10	36%
2. 1 to 2 hour time limit	4	-	-	4	5	1	14	50%
3. Varies as to section length	-	-	-	2	-	-	2	7%
4. No direct reply	1	-	-	-	1	-	2	7%
District Totals	7	-	2	7	6	6	28	
Question 3. What small jobs are done under Code 1005?								
1. Clear travelway of obstacles	4	-	3	7	6	6	26	45%
2. Saturday patrol	3	-	1	-	5	2	11	19%
3. Emergency sign maintenance	-	-	3	-	1	1	5	9%
4. Empty litter barrels	-	-	-	-	-	1	1	2%
5. Truck maintenance	1	-	-	-	-	-	1	2%
6. Any small job one man can handle	3	-	-	-	-	-	3	5%
7. Small patches	1	-	-	-	-	-	1	2%
8. Remove small slides	-	-	4	3	-	-	7	12%
9. Night patrol	-	-	-	-	-	2	2	3%
10. No direct reply	-	-	1	-	-	-	1	2%
District Totals	12	-	12	10	12	12	58	
Question 4. What are your personal recommendations?								
1. No recommendations	4	1	-	4	2	5	16	40%
2. Code 1005 is a good charge code	1	3	5	1	-	-	10	25%
3. Keep roadway cleaner on weekends	-	-	-	-	1	-	1	2%
4. Confusion exists on Code 1005	-	1	1	-	1	-	3	7%
5. Use judgement when charging to Code 1005	-	-	1	-	-	1	2	5%

*% of total number of responses per question.

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

II. PURPOSE CODE 1005 - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. Maintenance man should be allowed to inspect section daily.	1	1	-	1	1	-	4	10%
7. Charge driving time only to Code 1005	1	-	-	-	-	-	1	2%
8. Charge to Code 1005 sparingly and with caution	1	-	-	-	-	-	1	2%
9. Use Code 1005 only on jobs not requiring work signs . .	-	-	-	1	-	-	1	2%
10. Concentrate on removing roadway obstacles only	-	-	-	-	1	-	1	2%
11. Area foreman should use Code 1005 more than his crew . .	-	-	1	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	

III. PURPOSE CODE 1010 - TRAVELWAY - ROUTINE REPAIR

1010 a) Patching

Question 1. What is routine repair?								
1. Any patching on travelway by 1 or 2 men	-	-	2	-	1	3	6	14%
2. Any patching on travelway by section man and/or crew . .	-	-	1	5	5	4	15	36%
3. Any patching on the travelway.	8	6	5	2	-	-	21	50%
District Totals	8	6	8	7	6	7	42	
Question 2. What methods are used to patch a pot-hole?								
1. Remove old material, square up edges, paint with tack oil, fill with mix, and compact with truck wheels . . .	8	-	7	3	6	6	30	39%
2. Remove old material, paint with tack oil, fill with mix and compact with truck wheels.	8	5	3	5	2	4	27	35%
3. Fill with mix and compact with truck wheels	-	-	-	3	-	-	3	4%
4. Lay material with patrol and compact with truck wheels .	-	-	-	1	-	5	6	8%
5. Fill with gravel and compact with truck wheels	4	-	-	1	-	3	8	10%
6. Fill with chips, spray with oil, cover over with additional chips, and compact with truck wheels. . . .	-	1	-	-	1	-	2	3%
District Totals	20	6	10	13	9	18	76	
Question 3. What criteria are used to determine which method shall be used?								
1. Weather conditions	7	1	1	5	5	6	25	39%
2. Size or type of hole.	4	-	-	2	2	4	12	19%
3. Type of surface	1	-	-	-	-	1	2	3%
4. Only method used	-	1	5	-	-	-	6	9%
5. Condition of surface.	2	-	-	3	-	1	6	9%
6. Amount of traffic.	-	-	-	-	-	1	1	2%
7. Amount of moisture in the base material	-	-	-	-	-	5	5	8%
8. No reply.	1	4	2	-	-	-	7	11%
District Totals	15	6	8	10	7	18	64	
Question 4. What materials are used?								
1. Cold mix.	7	5	8	7	6	6	39	39%
2. Hot mix	6	-	2	-	-	6	14	14%
3. Road oil.	6	5	-	6	4	6	27	27%
4. Emulsion.	-	-	6	-	3	-	9	9%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

III. PURPOSE CODE 1010 a) - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. Gravel or rejects	-	4	-	3	1	3	11	11%
District Totals	19	14	16	16	14	21	100	
Question 5. Do you attempt to keep a pot-hole free surface?								
1. Yes	8	6	8	7	6	6	41	100%
Question 6. In question 5, how do you determine when it is necessary to start maintaining pot-holes?								
1. Maintain when pot-hole is first observed	8	3	7	7	6	5	36	88%
2. Maintain when pot-hole becomes a hazard	-	1	-	-	-	1	2	5%
3. Maintain as soon as weather permits	-	-	1	-	-	-	1	2%
4. No reply	-	2	-	-	-	-	2	5%
District Totals	8	6	8	7	6	6	41	
Question 7. What recommendations do you have concerning patching?								
1. No recommendations	2	1	1	1	1	3	9	21%
2. Patch pot-holes as they occur	1	-	3	1	1	-	6	14%
3. Seal all pot-hole patches	-	-	-	-	1	2	3	7%
4. Need better quality patching materials	1	-	-	1	-	-	2	5%
5. Always heat mix before patching pot-holes	3	-	-	-	1	-	4	9%
6. Squaring the hole is not necessary	-	-	1	-	-	-	1	2%
7. Need more compaction for pot-hole patches	1	-	-	-	2	1	4	9%
8. Use a minimum amount of tack oil in patching pot-holes	-	-	-	1	-	-	1	2%
9. Need faster pot-hole patching methods	-	1	-	-	-	-	1	2%
10. Need more men and equipment	1	-	3	1	-	-	5	11%
11. Condition of travelway determines the type of patch	-	-	-	1	-	1	2	5%
12. Chip penetration and seal works best on BST roads	-	1	-	-	-	-	1	2%
13. Patch sealing unnecessary	-	1	-	-	-	-	1	2%
14. Tacking the hole is unnecessary in hot weather	-	1	-	1	-	-	2	5%
15. Emulsion better tacking agent in cold weather	-	1	-	-	-	-	1	2%
16. Leave major repair to special crew	-	-	-	-	1	-	1	2%
District Totals	9	6	8	7	7	7	44	
1010 b) Joint and Crack Filling								
Question 1. What method is used in joint and crack filling?								
1. Clean crack, pour full of hot material, and add cover material	5	6	8	6	5	5	35	78%
2. Clean crack, tack, and fill with premix	-	-	-	-	1	-	1	2%
3. Fill crack with a slurry mix	1	-	3	1	-	1	6	13%
4. Rake material into crack and roll with truck wheels	2	-	-	-	-	1	3	7%
District Totals	8	6	11	7	6	7	45	
Question 2. What material is used?								
1. Hot road oil	-	2	-	7	4	5	18	27%
2. Hot tar	4	6	8	-	2	-	20	30%
3. Slurry mix	1	1	3	1	-	-	6	9%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

III PURPOSE CODE 1010 b) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Premix	2	-	-	-	2	1	5	7%
5. Gravel or rejects	-	-	-	7	5	5	17	25%
6. Doesn't know	1	-	-	-	-	-	1	2%
District Totals	8	9	11	15	13	11	67	
Question 3. What determines when you should start filling joints and cracks?								
1. Cracks are filled in fall	4	3	6	3	4	4	24	52%
2. Cracks are filled in the spring after pavement dries out.	-	-	-	4	2	2	8	18%
3. Fill cracks as they occur	-	-	1	-	-	-	1	2%
4. Fill cracks during hot weather	1	-	1	-	-	-	2	4%
5. Accumulate enough cracks for one complete days operation.	1	-	-	-	-	-	1	2%
6. Fill cracks when time becomes available	-	3	1	-	4	-	8	18%
7. No direct reply	2	-	-	-	-	-	2	4%
District Totals	8	6	9	7	10	6	46	
Question 4. What is your recommendation on joint and crack filling?								
1. No recommendations	1	1	2	1	2	4	11	24%
2. Present methods are not very effective.	-	3	5	-	-	-	8	18%
3. Cracking is good indication that major repair is needed	-	-	1	-	-	-	1	2%
4. Need a more flexible filler material	3	-	-	-	1	-	4	9%
5. Fill crack in cool weather when crack is widest.	-	-	-	-	-	1	1	2%
6. Use tar filler instead of roadoil	1	1	-	1	-	-	3	7%
7. Filling cracks in fall seals out winter moisture	-	1	-	1	1	-	3	7%
8. Use a slurry mix for crack filling	-	-	1	2	-	1	4	9%
9. Fill cracks only when they have dried out.	-	-	-	1	1	1	3	7%
10. Need portable blower for cleaning cracks	2	-	-	-	2	-	4	9%
11. Need storage for heavier crack filling oil	-	-	-	1	-	-	1	2%
12. Treat wide cracks as pot-holes	1	-	-	-	-	-	1	2%
13. Use crackfiller material developed for State of Utah	1	-	-	-	-	-	1	2%
District Totals	9	6	9	7	7	7	45	

IV. PURPOSE CODE 1020 - TRAVELWAY - SPECIAL REPAIR

Question 1. What determines the difference between Code 1010 and Code 1020?								
1. Code 1020 not used by area foreman	3	2	4	2	-	1	12	28%
2. Code 1020 used when working with special crew	5	4	4	5	4	5	27	63%
3. Code 1020 used when working with shed gang crew.	-	-	-	2	2	-	4	9%
District Totals	8	6	8	9	6	6	43	
Question 2. Are these criteria always used?								
1. Yes	8	4	4	7	6	6	35	85%
2. No reply.	-	2	4	-	-	-	6	15%
District Totals	8	6	8	7	6	6	41	
Question 3. What repair standards concerning aggregate, asphalt, and rolling are used?								
1. Better equipment than that maintenance man uses.	3	-	-	7	3	5	18	32%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

IV. PURPOSE CODE 1020 - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Same material as maintenance man uses	3	-	-	4	4	5	16	29%
3. Same material and equipment as maintenance man uses	4	-	-	-	3	1	8	14%
4. No direct reply	-	6	8	-	-	-	14	25%
District Totals	10	6	8	11	10	11	56	

Question 4. What condition must a small section be in before it is torn up and the section patched?

1. Section larger than shed crew can handle	2	-	2	2	-	2	8	17%
2. When roadbase is soft	4	1	3	2	3	4	17	37%
3. When surface is entirely worn out	-	1	3	2	2	-	8	17%
4. Repair beycnd 1-2 man capabilities	1	-	-	1	1	-	3	7%
5. No experience to date with this operation.	1	-	-	-	-	-	1	2%
6. No direct reply	-	5	4	-	-	-	9	20%
District Totals	8	7	12	7	6	6	46	

Question 5. What is your opinion on patching small sections?

1. Special crew does a good job	4	-	-	-	-	6	10	24%
2. Should use special crew more often	-	-	1	1	1	1	4	9%
3. Not pleased with special crew work	2	-	-	-	-	-	2	5%
4. Tear up section only when soft spots are present	-	-	-	1	2	-	3	7%
5. Half-sole better than tear-up and relay	2	-	1	3	1	-	7	17%
6. Hold job size to a minimum so shed crew can handle.	-	-	-	1	1	-	2	5%
7. No opinion	-	6	6	1	1	-	14	33%
District Totals	8	6	8	7	6	7	42	

V. PURPOSE CODE 1021 - TEAR UP AND RELAY

Question 1. What criteria are used to determine when it is necessary to tear up a section and relay it?

1. Code 1021 not used by area foreman	-	3	3	-	-	1	7	13%
2. When surface is entirely worn out	2	1	2	4	2	2	13	24%
3. When roadbase is soft	-	-	2	5	3	3	13	24%
4. Tear up only as a last resort.	-	-	-	-	1	-	1	2%
5. When section is larger than shed crew can handle	2	1	-	-	-	-	3	6%
6. Badly cracked surface mat	3	1	1	2	4	-	11	20%
7. Travelway oilmat is too rich with oil	-	-	-	1	1	-	2	4%
8. To aerate and remove moisture from oilmat.	-	-	-	-	2	-	2	4%
9. No direct reply	2	-	-	-	-	-	2	4%
District Totals	9	6	8	12	13	6	54	

Question 2. Who determines these criteria?

1. District office	7	2	3	7	6	5	30	83%
2. Area foreman	-	1	3	-	-	-	4	11%
3. No direct reply	1	-	-	-	-	1	2	6%
District Totals	8	3	6	7	6	6	36	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VI. PURPOSE CODE 1022 - HALF SOLE

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to determine when it is necessary to half sole a section?								
1. Code 1022 not used by area foreman	-	1	2	-	-	-	3	5%
2. When section has solid base but poor surface	4	1	1	7	3	5	21	36%
3. When surface is rough and expensive to maintain	5	4	2	3	5	2	21	36%
4. When wider travelway is desired	-	-	-	-	-	1	1	2%
5. Criteria determined by district office	-	-	2	-	-	-	2	3%
6. When road surface is wavy and irregular	-	-	-	3	3	1	7	12%
7. Doesn't know	-	-	2	-	-	-	2	3%
8. No direct reply	1	-	-	-	-	-	1	2%
District Totals	10	6	9	13	11	9	58	
Question 2. Who determines these criteria?								
1. District office	7	4	6	6	6	6	35	92%
2. Area foreman	1	1	-	1	-	-	3	8%
District Totals	8	5	6	7	6	6	38	

VII. PURPOSE CODE 1023 - SEAL COAT

Question 1. What criteria are used to determine when it is necessary to seal coat a section?								
1. Code 1023 not used by area foreman	-	5	-	-	-	-	5	7%
2. Surface dried out and cracked	5	-	1	5	2	5	18	26%
3. Wearing surface is worn off	1	-	-	-	5	2	8	11%
4. Seal coat all new roadmats	3	-	-	5	5	2	15	22%
5. Seal coat all patches	-	-	-	4	6	-	10	15%
6. Done on a regularly scheduled basis	-	-	-	-	-	3	3	4%
7. Seal coat over rich oil spots	-	-	-	3	-	-	3	4%
8. Criteria determined by district office	-	1	7	-	-	-	8	11%
District Totals	9	6	8	17	18	12	70	
Question 2. Who determines these criteria?								
1. District office	8	6	8	7	6	6	41	100%

VIII. PURPOSE CODE 1030 - SHOULDERS AND SIDE APPROACHES

1030 a) Blading and Pulling Shoulders

Question 1. What criteria are used to determine when a shoulder should be pulled?								
1. Shoulders are not pulled	1	1	1	1	1	1	6	11%
2. When shoulder material pulls away from oil mat	4	5	6	6	3	5	29	54%
3. Pull shoulders each spring or fall	2	-	1	3	3	1	10	19%
4. Shoulder pulled to control weeds	-	1	-	-	-	2	3	5%
5. When sod builds up above oil mat	1	-	-	1	3	-	5	9%
6. When hazard is present	-	-	-	-	1	-	1	2%
District Totals	8	7	8	11	11	9	54	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 a) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. Who determines these criteria?								
1. District office	2	-	-	-	-	-	2	5%
2. Area foreman	6	5	7	6	6	5	35	85%
3. Maintenance man	-	1	-	1	-	-	2	5%
4. No direct reply	-	-	1	-	-	1	2	5%
District Totals	8	6	8	7	6	6	41	
Question 3. How is the operation performed?								
1. Pull material from ditch with patrol and blade back over shoulder with patrol or snowplow.	7	5	6	7	5	5	35	89%
2. Haul in new material.	1	-	1	-	1	-	3	8%
3. Pull material from ditch and haul off	-	-	-	-	1	-	1	3%
District Totals	8	5	7	7	7	5	39	
1030 b) Replacing Material								
Question 1. How big does a hole or low spot in the shoulder have to be before new material is used to fill it?								
1. Filled when hole becomes a hazard	-	2	2	4	3	4	15	33%
2. No particular size of hole.	-	-	4	-	-	-	4	9%
3. Keep holes filled as they occur	-	-	3	1	2	-	6	13%
4. Filled when 1-3 inches deep	-	4	1	2	-	-	7	16%
5. When material not available to pull.	5	-	-	-	-	2	7	16%
6. Depends on hole location not size	1	-	-	-	-	-	1	2%
7. Fill shoulder holes as time becomes available	-	-	-	2	1	-	3	7%
8. No direct reply	2	-	-	-	-	-	2	4%
District Totals	8	6	10	9	6	6	45	
Question 2. What type of material is used?								
1. Gravel or rejects.	8	2	4	7	5	4	30	51%
2. Premix	-	-	-	1	7	1	9	16%
3. Any available material	-	1	1	-	-	1	3	5%
4. Large boulders covered with gravel	2	3	5	3	-	2	15	26%
5. No reply.	-	-	1	-	-	-	1	2%
District Totals	10	6	11	11	12	8	58	
Question 3. Is the material compacted about the same as the original shoulder material?								
1. Yes	6	2	3	7	6	4	28	68%
2. No.	2	4	5	-	-	2	13	32%
District Totals	8	6	8	7	6	6	41	
Question 4. Is water used to help compaction?								
1. Yes	1	-	1	1	1	1	5	12%
2. No.	7	6	7	6	5	5	36	88%
District Totals	8	6	8	7	6	6	41	
Question 5. Is material replaced as holes appear or are holes allowed to accumulate and are all filled at the same time?								
1. Holes in shoulder are allowed to accumulate	6	4	2	4	3	6	25	57%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 b) - QUESTION 5 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Holes are filled as they occur	2	2	3	3	3	-	13	30%
3. Holes are filled only when ditches are pulled	-	-	3	2	-	-	5	11%
4. Holes are filled every spring.	-	-	-	1	-	-	1	2%
District Totals	8	6	8	10	6	6	44	

1030 c) Erosion Control

Question 1. What methods are used to control erosion of the shoulder?

1. Allow natural vegetation to grow.	6	-	-	6	5	6	23	30%
2. Backfill eroded areas	4	-	-	6	3	2	15	20%
3. No control used	-	5	6	-	-	-	11	15%
4. Shoulder erosion is not a problem	-	1	-	-	-	-	1	1%
5. Uses drainage curbs	5	-	2	1	-	2	10	13%
6. Uses diversion ditches	1	-	-	-	-	1	2	3%
7. Plant grass seed	1	-	-	-	-	-	1	1%
8. Construct retaining walls	-	-	-	-	1	-	1	1%
9. Ripraps eroded areas.	-	-	-	-	-	1	1	1%
10. Reshape shoulder slopes.	1	-	1	-	1	-	3	4%
11. Spray shoulder with road oil	-	-	-	2	3	-	5	7%
12. Construct asphalt aprons and side drains	-	-	1	1	1	-	3	4%
District Totals	18	6	10	16	14	12	76	

Question 2. What criteria are used to determine when to use erosion control methods?

1. Used after erosion occurs	5	-	-	5	3	3	16	46%
2. Done during construction	6	-	-	-	-	-	6	17%
3. Severe washing problem	1	-	1	2	2	1	7	20%
4. Steepness of eroded shoulder slope	-	-	-	-	1	1	2	6%
5. When vegetation will not grow.	-	-	1	-	1	-	2	6%
6. No direct reply	-	-	-	1	-	1	2	6%
District Totals	12	-	2	8	7	6	35	

Question 3. How often is control used?

1. Permanent type control	5	-	-	-	1	-	6	32%
2. Seldom used.	-	-	-	-	-	2	2	10%
3. Used only as needed after erosion occurs	-	-	2	3	2	1	8	42%
4. Used each spring and/or fall	-	-	-	-	1	1	2	10%
5. Used frequently	1	-	-	-	-	-	1	5%
District Totals	6	-	2	3	4	4	19	

Question 4. How do you determine which method to use?

1. Frequency of occurence	-	-	-	-	-	2	2	10%
2. Slope of eroded shoulder	1	-	-	-	-	1	2	10%
3. Location of eroded area.	-	-	-	1	1	1	3	15%
4. Cause of erosion	1	-	-	-	-	-	1	5%
5. Severity of erosion	2	-	-	-	1	2	5	25%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 c) - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. Type of soil in area.	-	-	-	-	3	-	3	15%
7. No direct reply	-	-	2	2	-	-	4	20%
District Totals	4	-	2	3	5	6	20	
Question 5. Is grass planting ever used on shoulders to control erosion?								
1. Yes	4	-	1	6	2	2	15	37%
2. No.	4	5	7	1	4	4	25	61%
3. No direct reply	-	1	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 6. Does the use of weed sprays and sterilants cause erosion problems around guardrails, bridge abutments, culvert headwalls, etc.?								
1. Yes	6	-	-	-	-	1	7	17%
2. No.	2	3	4	7	6	5	27	66%
3. Doesn't spray weeds	-	1	3	-	-	-	4	10%
4. No direct reply	-	2	1	-	-	-	3	7%
District Totals	8	6	8	7	6	6	41	
Question 7. What are your personal recommendations concerning erosion control?								
1. No recommendations	1	5	2	2	2	3	15	36%
2. Construct flatter shoulder slopes	1	-	-	1	1	1	4	10%
3. Allow natural vegetation to grow.	-	-	2	1	2	1	6	14%
4. Use coarse material on shoulder to prevent erosion.	-	-	-	-	1	-	1	2%
5. Spray oil seal on shoulder.	-	1	-	-	-	1	2	5%
6. Should use more drainage curb.	4	-	1	-	-	-	5	12%
7. Always backfill eroded area with gravel	1	-	-	1	-	1	3	7%
8. Erosion of shoulder has not been a problem	-	-	3	-	-	-	3	7%
9. Plant shrubs and bushes on shoulder slopes	-	-	-	1	-	-	1	2%
10. Construct shoulders of the proper material	-	-	-	1	-	-	1	2%
11. Need better equipment	1	-	-	-	-	-	1	2%
District Totals	8	6	8	7	6	7	42	

1030 d) Reshaping - Shoulders

Question 1. What determines when shoulders should be reshaped?								
1. Shoulders not reshaped	-	1	-	-	1	1	3	7%
2. When edge of oil mat is exposed	5	5	5	3	3	2	23	50%
3. When the shoulder is rough and torn up.	-	-	2	3	1	-	6	13%
4. When shoulder sod is higher than edge of oil mat	-	-	-	-	3	-	3	7%
5. When shoulder doesn't drain properly	3	-	1	1	-	2	7	15%
6. Excessive weed growth	-	1	-	-	-	-	1	2%
7. Done annually in spring or fall	-	-	1	-	-	1	2	4%
8. When a wider shoulder is desired.	-	-	-	1	-	-	1	2%
District Totals	8	7	9	8	8	6	46	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 d) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. How is reshaping accomplished?								
1. Pull material from ditch with patrol and blade back over shoulder with patrol or snowplow.	7	5	5	7	2	5	31	72%
2. Haul in new material.	-	-	2	3	2	-	7	16%
3. Cut shoulder sod off with patrol.	-	-	-	-	3	-	3	7%
4. No direct reply	1	-	1	-	-	-	2	5%
District Totals	8	5	8	10	7	5	43	
Question 3. Is any standard slope used?								
1. Use any slope that will drain water.	1	5	8	2	2	3	21	54%
2. Try to maintain original slope	7	-	-	5	4	1	17	44%
3. Slope that is best for mowing.	-	-	-	-	-	1	1	2%
District Totals	8	5	8	7	6	5	39	
Question 4. What is the purpose of the reshaping?								
1. To establish good drainage.	2	3	6	-	1	2	14	31%
2. To provide stability to travelway surface.	3	-	-	1	-	1	5	11%
3. To maintain original shape.	2	-	-	6	4	1	13	28%
4. To present a pleasing shoulder appearance.	5	1	-	-	-	-	6	13%
5. To provide wider shoulder width	-	-	-	-	-	1	1	2%
6. To control weeds	-	1	-	-	-	-	1	2%
7. No direct reply	1	2	2	-	-	1	6	13%
District Totals	13	7	8	7	5	6	46	
Question 5. After reshaping has been completed, is the shoulder rolled to compact it?								
1. Yes	5	-	2	7	1	4	19	50%
2. No.	2	5	5	-	4	1	17	45%
3. No direct reply	1	-	1	-	-	-	2	5%
District Totals	8	5	8	7	5	5	38	

1030 e) Patching - Paved or Bituminous Treated Shoulders

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. What standard is used for shoulder patching?								
1. No BST's or paved shoulders	-	1	3	5	1	1	11	27%
2. Uses main travelway patching standards.	8	3	5	1	5	5	27	66%
3. Blade chips into depressions, spray with oil, and cover with sand or chips	-	1	-	1	-	-	2	5%
4. No maintenance required to date	-	1	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 2. What criteria are used to determine this standard?								
1. Shoulder considered part of travelway	-	-	-	1	2	1	4	13%
2. Size and depth of pot-hole or failed area.	-	-	2	-	-	-	2	7%
3. Type of shoulder	8	1	1	-	-	4	14	45%
4. The weight and ADT of vehicles traveling on road	-	-	-	-	-	1	1	3%
5. Determined by district office.	-	-	1	-	-	-	1	3%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 e) QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. No direct reply	-	3	1	1	3	1	9	29%
District Totals	8	4	5	2	5	7	31	
Question 3. What criteria are used to determine when shoulder patching is necessary?								
1. Shoulder patched as holes appear.	6	-	-	-	2	5	13	43%
2. Determined by amount of breakup	-	4	5	1	-	-	10	34%
3. Patched after travelway is patched	-	-	-	1	-	-	1	3%
4. Patched when hole is deep enough to hold mix.	1	-	1	-	-	-	2	7%
5. No direct reply	1	-	-	-	3	-	4	13%
District Totals	8	4	6	2	5	5	30	
Question 4. What guide is used to determine when a patch is no longer practical and an entire section is replaced?								
1. Rough, broken up section of shoulder	3	2	5	3	3	-	16	53%
2. Number and size of holes	2	2	-	-	-	4	8	27%
3. Only has had pot-hole type of failures to date	1	-	-	-	-	1	2	7%
4. When base moisture is the cause of failure	1	-	-	-	-	-	1	3%
5. No direct reply	1	-	-	-	2	-	3	10%
District Totals	8	4	5	3	5	5	30	
Question 5. Is the material used for the patch the same quality as that used for a pot-hole in the main travel way?								
1. Yes	8	4	5	2	5	5	29	100%
1030 f) Surface Treating - Shoulders								
Question 1. What criteria are used to determine that a shoulder surface treatment is necessary?								
1. Not done by area foreman	1	6	5	5	3	1	21	46%
2. When wider travelway is desired	2	-	-	-	-	3	5	11%
3. When gravel shoulder is a continual problem	2	-	1	2	2	-	7	15%
4. When travelway mat edge needs additional stability.	1	-	-	1	1	4	7	15%
5. Used for weed control on shoulder	1	-	-	-	-	-	1	2%
6. District office determines.	-	-	1	-	-	-	1	2%
7. Not familiar with operation	-	-	1	-	-	1	2	4%
8. No direct reply	2	-	-	-	-	-	2	4%
District Totals	9	6	8	8	6	9	46	
Question 2. In what ways does the cross-section of the shoulder differ between a gravel shoulder and a surface treated shoulder?								
1. No difference between cross-section.	-	-	-	2	3	-	5	25%
2. BST shoulder is wider than gravel shoulder	1	-	1	-	-	-	2	10%
3. Gravel shoulder is thicker.	1	-	-	-	-	-	1	5%
4. BST shoulder is more uniform in width than gravel shoulder	-	-	-	-	-	1	1	5%
5. BST shoulder is narrower than gravel shoulder	1	-	-	-	-	-	1	5%
6. Doesn't know	1	-	-	-	-	-	1	5%
7. No direct reply	3	-	2	-	-	4	9	45%
District Totals	7	-	3	2	3	5	20	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 f) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 3. What types of treatments are used?								
1. Apply seal coat in one or two layers	5	-	2	1	1	5	14	63
2. Construct asphalt mat	-	-	1	-	-	2	3	14%
3. Apply penetration seal	2	-	-	1	2	-	5	23%
District Totals	7	-	3	2	3	7	22	
Question 4. What determines the type of treatment to be used?								
1. Only uses one method.	1	-	1	2	-	-	4	19%
2. District office determines.	2	-	1	-	-	-	3	14%
3. Type of available base material	1	-	-	-	1	-	2	10%
4. Type and amount of shoulder use	1	-	1	-	1	1	4	19%
5. Bureau of Public Roads specifications	-	-	-	-	-	1	1	5%
6. Doesn't know	1	-	-	-	-	3	4	19%
7. No direct reply	1	-	-	-	2	-	3	14%
District Totals	7	-	3	2	4	5	21	
1030 g) Replacing Large Failed Areas								
Question 1. What determines when a large failed area should be replaced?								
1. Replace as they occur	-	-	-	3	5	1	8	17%
2. Replace material before oil mat breaks off	-	-	-	3	1	-	4	9%
3. Replace when shoulder is worn away from oil mat and dropoff becomes hazardous	1	-	-	-	1	3	5	11%
4. Replace material as time becomes available	-	-	1	-	-	2	3	6%
5. Presently material not replaced	-	-	4	-	-	-	4	9%
6. District office determines.	-	-	2	-	-	-	2	4%
7. When shoulder material is broken up or washed away.	2	-	1	2	-	2	7	15%
8. No maintenance required.	1	6	-	1	1	-	9	20%
9. Replace when shoulder cannot be economically maintained	4	-	-	-	-	-	4	9%
District Totals	8	6	8	8	8	8	46	
Question 2. What type of materials are used?								
1. Gravel	4	-	-	6	3	4	17	36%
2. Premix	3	-	2	2	4	2	13	28%
3. Pit-run material	3	-	1	1	5	3	13	28%
4. Original material.	-	-	1	-	-	-	1	2%
5. Chips.	-	-	-	-	2	-	2	4%
6. Perforated piping.	-	-	-	-	1	-	1	2%
District Totals	10	-	4	9	15	9	47	
Question 3. To what depth is the failed material removed?								
1. Removed to solid material	3	-	1	5	5	2	16	54%
2. Not removed, add additional material	3	-	-	-	-	4	7	23%
3. Removed approximately 2-3 inches deep	2	-	2	-	-	-	4	13%
4. Not removed below ditchline	-	-	-	2	-	-	2	7%

TABLE C (continued

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 g) - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. No direct reply	-	-	1	-	-	-	1	3%
District Totals	8	-	4	7	5	6	30	
Question 4. What standards are used in reconstructing the section?								
1. Try to maintain original or better standards.	7	-	1	-	1	6	15	52%
2. Rebuild section with gravel and surface with premix	-	-	-	2	3	-	5	18%
3. Rebuild section with gravel	-	-	1	4	-	-	5	18%
4. Place ½ sole over original shoulder mat	-	-	1	-	-	-	1	3%
5. Rebuild section with premix	-	-	1	-	-	-	1	3%
6. Reconstruct with a French drain to remove water.	-	-	-	-	1	-	1	3%
7. Depends on available equipment	1	-	-	-	-	-	1	3%
District Totals	8	-	4	6	5	6	29	

IX. PURPOSE CODE 1032 - MOWING

Question 1. What areas along your section require mowing?								
1. Completely mowed section	8	5	5	6	5	6	35	86%
2. Mow approximately 50% of section.	-	-	1	1	-	-	2	5%
3. Mow approximately 25% of section.	-	-	2	-	1	-	3	7%
4. Only mows seeded areas	-	1	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 2. What determines when you should mow them?								
1. General weed and grass height.	1	5	4	1	1	-	12	21%
2. When mower is available.	2	3	4	-	-	1	10	18%
3. When grass is 8-12 inches high	-	-	1	4	3	1	9	16%
4. When grass is 12-18 inches high	1	-	-	-	-	1	2	4%
5. Mowed 2 or 3 times each year	3	-	-	3	5	2	13	23%
6. Mowed annually.	1	-	-	1	1	1	4	7%
7. Mowed as time becomes available	-	2	1	1	-	1	5	9%
8. No direct reply	-	-	-	-	-	1	1	2%
District Totals	8	10	10	10	10	8	56	
Question 3. To what height do you mow?								
1. Mow as low as possible	-	3	3	4	2	1	13	28%
2. Mow to 1-3 inches high	-	-	-	1	1	2	4	9%
3. Mow to 3-5 inches high	4	-	2	6	4	3	19	42%
4. Mow to 6-8 inches high	4	2	1	-	-	-	7	15%
5. Mow to 8-12 inches high.	-	-	1	-	-	-	1	2%
6. Determined by area foreman.	-	-	1	-	-	-	1	2%
7. No direct reply	-	-	-	-	1	-	1	2%
District Totals	8	5	8	11	8	6	46	
Question 4. Does the height vary with the type of area being mowed?								
1. Yes	7	5	6	5	5	6	34	83%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

IX. PURPOSE CODE 1032 - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. No.	1	1	2	2	-	-	6	15%
3. No reply.	-	-	-	-	1	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 5. What equipment is used to do the mowing?								
1. Sickle mower is used.	8	5	7	6	5	5	36	61%
2. Rotary mower is used.	6	3	4	4	3	2	22	37%
3. Combination rotary-sickle mower is used	-	-	-	-	-	1	1	2%
District Totals	14	8	11	10	8	8	59	
Question 6. What recommendations do you have concerning the mowing operation?								
1. No recommendation.	-	2	4	-	2	4	12	25%
2. Need more and better mowers	5	-	3	7	-	1	16	33%
3. Design flatter slopes for mowing.	-	-	-	1	4	-	5	10%
4. Use weed spray to facilitate mowing operations	1	2	-	-	-	1	4	8%
5. Cut grass before it blooms and goes to seed	1	-	-	-	-	-	1	2%
6. Mowing late in the season helps to prevent snow-drifting.	1	-	-	-	-	-	1	2%
7. Assign one man to mow each maintenance area	2	-	-	-	-	-	2	4%
8. Need puncture-proof tires on mowers.	2	-	-	-	-	-	2	4%
9. Rotary mowers are best for shoulders	-	2	1	-	-	-	3	6%
10. Need bigger bars on the sickle mowers	-	-	-	2	-	-	2	4%
11. Don't make mowers be dual purpose for other summer work	-	-	-	-	1	-	1	2%
District Totals	12	6	8	10	7	6	49	

X. PURPOSE CODE 1033 - TRASH GATHERING

Question 1. What do you use to determine when to gather trash along the right-of-way?								
1. Noticeable trash picked up daily.	-	-	3	-	-	-	3	5%
2. Trash gathering is a fill-in job.	2	2	2	1	1	2	10	16%
3. Gathers trash each spring and fall	-	4	-	2	3	-	9	14%
4. When roadside has trashy appearance	6	1	2	3	5	2	19	30%
5. Yearly project.	-	-	-	1	-	-	1	2%
6. Spring project.	3	-	1	3	1	3	11	18%
7. Trash gathered on a weekly basis.	1	-	1	-	2	4	8	13%
8. Trash gathered before mowing	-	-	-	-	-	1	1	2%
District Totals	12	7	9	10	12	12	62	
Question 2. Do you clean the complete right-of-way or just the barrow pit?								
1. Complete right-of-way is cleaned.	8	5	4	4	6	6	33	81%
2. Barrow pit is cleaned and any trash picked up	-	1	2	2	-	-	5	12%
3. Clean only the barrow pit	-	-	1	1	-	-	2	5%
4. No direct reply	-	-	1	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 3. Is any type of equipment used to assist in trash gathering?								
1. No equipment or other aids are used.	8	5	7	1	1	3	25	60%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

X. PURPOSE CODE 1033 - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Uses a pitchfork	-	1	-	-	-	-	1	2%
3. Uses a bucket	-	-	-	2	1	1	4	10%
4. Uses a gunnysack	-	-	-	2	1	2	5	12%
5. Uses a spud basket	-	-	-	-	-	1	1	2%
6. Uses a sharp stick	-	-	1	-	-	-	1	2%
7. Boom on truck lifts litter barrel	-	-	-	2	-	-	-	5
8. Uses a shovel	-	-	-	-	1	-	1	2%
9. Uses enclosed garbage trucks	-	-	-	-	2	-	2	5%
District Totals	8	6	8	7	6	7	42	
Question 4. Do turnouts require more attention than general right-of-way section?								
1. Yes	7	-	2	7	4	4	24	58%
2. No.	1	6	6	-	2	2	17	42%
District Totals	8	6	8	7	6	6	41	
Question 5. Does Code 1033 include litter barrels?								
1. Yes	5	6	8	7	6	5	37	90%
2. No.	3	-	-	-	-	1	4	10%
District Totals	8	6	8	7	6	6	41	

XI. PURPOSE CODE 1034 - SPRAYING AND WEED CONTROL

1. No spraying done in area	-	1	-	-	1	1	3	100%
1034 a) Guardrails								
Question 1. How often is spraying and weed control performed?								
1. Guardrails sprayed annually	8	-	-	5	3	1	17	43%
2. Guardrails sprayed every 2 years.	-	-	1	1	2	-	4	10%
3. Guardrails sprayed every 3 years.	-	1	5	-	-	3	9	23%
4. Guardrails sprayed every 5 years.	-	1	-	-	-	-	1	3%
5. Guardrails sprayed this year for the first time.	-	1	-	-	-	1	2	5%
6. Guardrails not sprayed	-	2	2	-	-	-	4	10%
7. Salt is used to control weeds around guardrails.	-	-	-	1	-	-	1	3%
8. Weeds around guardrails are cut by hand	-	-	-	1	-	-	1	3%
District Totals	8	5	8	8	5	5	39	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	2	2	6	4	2	-	16	39%
2. Spray in the spring	2	-	-	-	3	3	8	20%
3. Spray when adequate ground moisture is present	1	-	-	5	3	-	9	22%
4. Spray when equipment and/or spray are available.	4	-	-	-	1	-	5	12%
5. Spray in the fall.	-	-	-	-	-	2	2	5%
6. No reply.	-	1	-	-	-	-	1	2%
District Totals	9	3	6	9	9	5	41	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 3. Do all sections receive the same treatment?								
1. Yes	7	3	5	5	4	2	26	76%
2. No.	1	-	1	2	1	3	8	24%
District Totals	8	3	6	7	5	5	34	
Question 4. Does length or size have anything to do with the type of treatment performed?								
1. No.	8	3	6	6	5	5	33	100%
1034 b) Signs - Right-of-Way Markers								
Question 1. How often is spraying and weed control performed?								
1. Signs, etc., sprayed annually.	8	-	1	3	3	1	16	41%
2. Signs, etc., sprayed every 2 years	-	-	-	1	2	-	3	8%
3. Signs, etc., sprayed every 3 years	-	1	3	-	-	3	7	18%
4. Signs, etc., sprayed every 5 years	-	1	-	-	-	-	1	3%
5. Signs, etc., sprayed this year for the first time	-	-	-	-	-	1	1	3%
6. Salt is used to control weeds around signs, etc.	-	-	-	1	-	-	1	3%
7. Signs, etc., not sprayed	-	3	3	1	-	-	7	18%
8. Weeds around signs, etc., are cut down by hand	-	-	-	2	-	-	2	5%
9. No direct reply	-	-	1	-	-	-	1	3%
District Totals	8	5	8	8	5	5	39	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	2	2	3	4	2	-	13	34%
2. Spray in the spring	2	-	-	-	3	3	8	21%
3. Spray when adequate ground moisture is present	1	-	-	4	3	-	8	21%
4. Spray when equipment and/or spray are available.	2	-	-	-	1	-	3	8%
5. Spray in the fall.	1	-	-	-	-	2	3	8%
6. Cut weeds when help is available.	-	-	-	1	-	-	1	3%
7. Doesn't know	-	-	1	-	-	-	1	3%
8. No direct reply	-	-	1	-	-	-	1	3%
District Totals	8	2	5	9	9	5	38	
Question 3. Do all sections receive the same treatment?								
1. Yes	8	2	4	4	4	2	24	78%
2. No.	-	-	-	2	1	3	6	19%
3. Doesn't know	-	-	1	-	-	-	1	3%
District Totals	8	2	5	6	5	5	31	
1034 c) Delineators								
Question 1. How often is spraying and weed control performed?								
1. No delineators in area	-	-	-	-	-	1	1	3%
2. Delineators sprayed annually	7	-	1	3	3	1	15	38%
3. Delineators sprayed every 2 years	-	-	-	1	2	-	3	8%
4. Delineators sprayed every 3 years	-	1	4	-	-	1	6	15%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. Delineators sprayed this year for the first time	-	-	-	-	-	1	1	3%
6. Salt is used to control weeds around delineators	-	-	-	1	-	-	1	3%
7. Delineators not sprayed.	1	4	2	1	-	1	9	23%
8. Weeds around delineators are cut down by hand	-	-	-	2	-	-	2	5%
9. No direct reply	-	-	1	-	-	-	1	3%
District Totals	8	5	8	8	5	5	39	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	2	1	5	4	2	-	14	40%
2. Spray in the spring	2	-	-	-	3	1	6	17%
3. Spray when adequate ground moisture is present	-	-	-	4	3	-	7	20%
4. Spray when equipment and/or spray are available.	3	-	-	-	1	-	4	11%
5. Spray in the fall.	-	-	-	-	-	2	2	6%
6. Cut weeds when help is available.	-	-	-	1	-	-	1	3%
7. No direct reply	-	-	1	-	-	-	1	3%
District Totals	7	1	6	9	9	3	35	
Question 3. Do all sections receive the same treatment?								
1. Yes	6	1	6	4	5	2	24	83%
2. No.	1	-	-	2	1	1	5	17%
District Totals	7	1	6	6	6	3	29	
1034 d) Headwalls, Pipes, etc.								
Question 1. How often is spraying and weed control performed?								
1. Headwalls, pipes, etc., sprayed annually	8	-	1	3	3	1	16	41%
2. Headwalls, pipes, etc., sprayed every 2 years	-	-	-	1	2	1	4	10%
3. Headwalls, pipes, etc., sprayed every 3 years	-	-	2	-	-	-	2	5%
4. Salt is used to control weeds around headwalls, etc	-	-	-	1	-	-	1	3%
5. Weeds around headwalls, pipes, etc., are cut by hand	-	-	-	1	-	-	1	3%
6. Headwalls, pipes, etc., not sprayed.	-	5	5	2	-	3	15	38%
District Totals	8	5	8	8	5	5	39	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	-	-	2	2	3	-	7	23%
2. Spray in the spring	2	-	-	-	3	1	6	19%
3. Spray when adequate ground moisture is present	1	-	-	3	3	-	7	23%
4. Spray when equipment and/or spray are available.	2	-	-	-	1	-	3	10%
5. Spray in the fall.	3	-	-	-	-	1	4	13%
6. Determined by the area foreman	-	-	-	1	-	-	1	3%
7. Cleaned when working in area on culverts	-	-	-	2	-	-	2	6%
8. No direct reply	-	-	1	-	-	-	1	3%
District Totals	8	-	3	8	10	2	31	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 d) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 3. Do all sections receive the same treatment?								
1. Yes	7	-	3	4	4	1	19	83%
2. No.	1	-	-	1	1	1	4	17%
District Totals	8	-	3	5	5	2	23	

1034 e) Bridges

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. How often is spraying and weed control performed?								
1. Bridges sprayed annually	6	-	-	3	3	2	14	37%
2. Bridges sprayed every 2 years.	-	-	-	-	2	1	3	8%
3. Bridges sprayed every 3 years.	-	1	4	-	-	1	6	16%
4. Bridges sprayed every 5 years.	-	1	-	-	-	-	1	3%
5. Bridges sprayed this year for the first time.	-	2	-	-	-	1	3	8%
6. Weeds around bridges are cut by hand	-	-	-	1	-	-	1	3%
7. Bridges not sprayed	2	1	4	3	-	-	10	26%
District Totals	8	5	8	7	5	5	38	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	-	3	3	1	3	-	10	28%
2. Spray in the spring	1	-	-	2	3	3	9	26%
3. Spray when adequate ground moisture is present	-	-	-	2	3	-	5	14%
4. Spray when equipment and/or spray are available.	2	-	-	-	1	-	3	9%
5. Spray in the fall.	3	-	-	-	-	2	5	14%
6. Area foreman determines when to spray	-	-	-	1	-	-	1	3%
7. Doesn't know	-	1	-	-	-	-	1	3%
8. No direct reply	-	-	1	-	-	-	1	3%
District Totals	6	4	4	6	10	5	35	
Question 3. Do all sections receive the same treatment?								
1. Yes	6	4	4	3	4	3	24	86%
2. No.	-	-	-	1	1	2	4	14%
District Totals	6	4	4	4	5	5	28	

XII. PURPOSE CODE 1040 - ROADSIDE AND DRAINAGE

1040 a) Ditches and Gutters

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to determine when cleaning is required?								
1. Clean as they fill up	4	4	3	7	3	2	23	50%
2. Clean each spring and fall.	1	1	4	1	2	2	11	24%
3. Clean each fall	2	1	-	2	1	2	8	18%
4. Clean each spring.	1	-	-	-	-	1	2	4%
5. Clean ditches as time becomes available	-	-	-	-	1	-	1	2%
6. No direct reply	-	-	1	-	-	-	1	2%
District Totals	8	6	8	10	7	7	46	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 a) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. What methods are used in the cleaning operation?								
1. Remove material from ditch	8	6	8	7	6	4	39	93%
2. Burn weeds in ditch	-	-	1	-	-	-	1	2%
3. No direct reply	-	-	-	-	-	2	2	5%
District Totals	8	6	9	7	6	6	42	
Question 3. What equipment is used for this cleaning?								
1. Motor patrol	7	-	8	5	5	4	29	28%
2. Trucks	5	-	-	6	6	4	21	21%
3. Frontend loader	3	1	5	3	5	5	22	22%
4. Handtools	1	6	2	3	-	-	12	12%
5. Belt loader	-	-	-	5	3	-	8	8%
6. Power shovel	4	-	-	-	3	-	7	7%
7. Back hoe	1	-	1	-	-	-	2	2%
8. None	-	1	-	-	-	-	1	1%
District Totals	21	8	16	22	22	13	102	

1040 b) Culverts

Question 1. What criteria are used to determine when cleaning is required?								
1. Clean each spring and fall	4	2	2	4	3	1	16	33%
2. Clean each fall	3	-	1	3	3	4	14	30%
3. Clean each spring	-	-	3	-	-	1	4	8%
4. Clean when plugged	1	3	2	5	1	-	12	25%
5. Clean each summer	-	-	1	-	-	-	1	2%
6. No maintenance required	-	1	-	-	-	-	1	2%
District Totals	8	6	9	12	7	6	48	
Question 2. What methods are used in the cleaning operation?								
1. Clean material out of culvert ends	8	5	6	7	6	6	38	72%
2. Flush culvert out with water	6	-	-	2	3	-	11	20%
3. Rod out with long rod	-	-	2	-	-	-	2	4%
4. Burn weeds at culvert ends	-	-	1	-	-	-	1	2%
5. During winter melt ice out with hot water	-	1	-	-	-	-	1	2%
District Totals	14	6	9	9	9	6	53	
Question 3. What equipment is used for this cleaning?								
1. Handtools	6	6	5	6	6	6	35	54%
2. Water truck or water pump	5	-	-	2	3	-	10	15%
3. Frontend loader	-	-	2	1	2	2	7	11%
4. Back hoe	1	-	3	1	1	-	6	9%
5. Long rod with steel hooks on the end	-	-	2	-	-	-	2	3%
6. Weed burner	1	-	1	-	-	1	3	5%
7. Dump truck	-	-	-	-	-	1	1	2%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 b) - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
8. Wheel barrow	-	-	-	1	-	-	1	2%
District Totals	13	6	13	11	12	10	65	

1040 c) Side Drains and Diversion Ditches

Question 1. What criteria are used to determine when cleaning is required?	1	2	3	4	5	6	Totals	%
1. No side drains or diversion ditches in areas.	-	5	1	2	1	2	11	26%
2. No maintenance required.	2	-	-	-	3	1	6	14%
3. Cleaned when ditch is filling up or completely plugged	4	1	4	2	1	-	12	29%
4. Cleaned each spring and fall	1	-	3	-	-	-	4	10%
5. Cleaned each fall.	1	-	-	-	1	3	5	12%
6. Cleaned once each year	-	-	-	2	-	-	2	5%
7. Clean when diversion curbs crack and washout.	1	-	-	-	-	-	1	2%
8. Clean every two years	-	-	-	1	-	-	1	2%
District Totals	9	6	8	7	6	6	42	

Question 2. What methods are used in the cleaning operation?	1	2	3	4	5	6	Totals	%
1. Hand clean drains and ditches.	5	1	5	4	2	3	20	67%
2. Wash material out of drains and ditches	-	-	-	-	1	1	2	7%
3. Sweep material out of drains and ditches	-	-	-	-	-	1	1	3%
4. Rod out plugged material	-	-	-	1	-	-	1	3%
5. Clean ditch with patrol.	1	-	4	-	-	-	5	17%
6. Patch cracks in curb.	1	-	-	-	-	-	1	3%
District Totals	7	1	9	5	3	5	30	

Question 3. What equipment is used for this cleaning?	1	2	3	4	5	6	Totals	%
1. Hand tools	6	1	5	4	2	4	22	69%
2. Water truck or water pump	-	-	-	-	1	1	2	6%
3. Long rod.	-	-	-	1	-	-	1	3%
4. Motor patrol	1	-	3	-	-	-	4	13%
5. Front end loader	1	-	1	-	-	-	2	6%
6. Trucks	1	-	-	-	-	-	1	3%
District Totals	9	1	9	5	3	5	32	

1040 d) Subdrains

Question 1. What criteria are used to determine when cleaning is required?	1	2	3	4	5	6	Totals	%
1. No subdrains in area.	5	6	1	5	5	3	25	61%
2. No maintenance required.	-	-	7	1	-	2	10	25%
3. Cleaned when plugged.	2	-	-	1	1	1	5	12%
4. Determined by the district office	1	-	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	

Question 2. What methods are used in the cleaning operation?	1	2	3	4	5	6	Totals	%
1. Open ends of subdrain pipe.	1	-	-	-	-	1	2	29%
2. Roc out subdrain pipe	-	-	-	-	1	-	1	14%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 d) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Dig out subdrain and replace pipe	-	-	-	-	-	1	1	14%
4. Wash out ends of subdrain pipe	-	-	-	1	-	-	1	14%
5. Done by the special crew	1	-	-	-	-	-	1	14%
6. No reply.	1	-	-	-	-	-	1	14%
District Totals	3	-	-	1	1	2	7	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	2	-	-	-	-	1	3	43%
2. Long rod.	-	-	-	-	1	-	1	14%
3. Back hoe.	1	-	-	-	-	-	1	14%
4. Front end loader	-	-	-	-	-	1	1	14%
5. Water tank or water pump	-	-	-	1	-	-	1	14%
District Totals	3	-	-	1	1	2	7	
1040 e) Storm Sewers								
Question 1. What criteria are used to determine when cleaning is required?								
1. No storm sewers in area.	5	2	4	2	4	2	19	46%
2. No maintenance required.	-	3	-	2	1	2	8	20%
3. Cleaned when grate is covered with trash	2	1	1	2	-	1	7	17%
4. Cleaned each fall.	1	-	-	1	1	-	3	7%
5. Cleaned each spring and fall	-	-	1	-	-	1	2	5%
6. Cleaned once a year	-	-	2	-	-	-	2	5%
District Totals	8	6	8	7	6	6	41	
Question 2. What methods are used in the cleaning operation?								
1. Rake trash off grate.	2	-	-	-	-	1	3	20%
2. Shovel out bottom of catch-basin.	1	1	4	2	1	1	10	67%
3. Wash material out of storm sewers	-	-	-	1	1	-	2	13%
District Totals	3	1	4	3	2	2	15	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	3	1	4	2	1	2	13	87%
2. Water truck or water pump	-	-	-	1	1	-	2	13%
District Totals	3	1	4	3	2	2	15	
1040 f) Irrigation Siphons and Stock Passes								
Question 1. What criteria are used to determine when cleaning is required?								
1. None in area	1	2	3	-	2	1	9	22%
2. No maintenance required.	-	2	-	4	3	3	12	29%
3. Cleaned when siphon plugged	3	2	4	-	-	2	11	26%
4. Cleaned each spring and fall	1	-	-	-	-	-	1	2%
5. Cleaned each fall.	-	-	1	-	-	-	1	2%
6. Cleaned each spring	-	-	-	-	-	1	1	2%
7. Inspected daily during irrigation season	1	-	-	-	-	-	1	2%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 f) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
8. Inspected each spring	2	-	-	-	-	-	2	5%
9. Cleaned when stock passes become plugged	-	-	-	3	1	-	4	10%
District Totals	8	6	8	7	6	7	42	
Question 2. What methods are used in the cleaning operation?								
1. Clean ends of siphon pipe	4	-	2	-	-	2	8	34%
2. Rod out pipe with long rod.	2	-	1	-	-	-	3	12%
3. Wash material out of pipe	1	1	2	-	-	-	4	17%
4. Drag hook through pipe	-	1	-	-	-	2	3	12%
5. Clean material out of stock passes	-	-	-	4	1	1	6	25%
District Totals	7	2	5	4	1	5	24	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	4	-	2	3	1	-	10	34%
2. Long rod.	2	-	-	-	-	-	2	7%
3. Water truck or water pump	1	1	1	-	-	-	3	10%
4. Back hoe.	-	-	-	-	-	1	1	3%
5. Winch and long cable.	-	1	1	-	-	2	4	13%
6. Front end loader	-	-	1	1	-	-	2	7%
7. Snow plow	-	-	-	-	-	1	1	3%
8. Old tires	-	-	-	-	-	1	1	3%
9. Wheel barrows	-	-	-	3	1	-	4	13%
10. No reply.	-	-	2	-	-	-	2	7%
District Totals	7	2	7	7	2	5	30	
1040 g) Erosion - Cuts and Fills								
Question 1. How often are cuts and fills inspected?								
1. No maintenance required.	-	5	3	1	-	-	9	21%
2. Inspected during daily patrol.	5	1	4	5	5	3	23	52%
3. Inspected during storms.	5	-	-	-	-	4	9	21%
4. Inspected weekly	-	-	-	1	-	-	1	2%
5. Inspected each spring	-	-	1	-	1	-	2	4%
District Totals	10	6	8	7	6	7	44	
Question 2. What methods are used to prevent erosion of cut and fill sections?								
1. Nothing is done to prevent erosion	-	1	3	-	2	-	6	11%
2. Allow natural vegetation to grow.	8	-	-	-	1	6	15	28%
3. Use diversion ditches to control runoff	1	-	1	-	1	1	4	7%
4. Use asphalt curbs and drains to control runoff	6	-	1	-	-	3	10	19%
5. Seed bare slopes	-	-	-	6	2	-	8	15%
6. Spray slopes with road oil.	-	-	-		-	-	1	2%
7. Place large rock in eroded areas.	-	-	-	-	-	1	1	2%
8. Install downspouts to prevent washing slope	-	-	1	-	-	-	1	2%
9. Place riprap in possible erosion areas.	-	-	-	3	-	-	3	6%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 g) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
10. Reduce slopes of cuts and fills	-	-	-	1	1	-	2	4%
11. Terrace long steep slopes	-	-	-	-	1	-	1	2%
12. Drive pilings at base of slope	-	-	-	1	-	-	1	2%
District Totals	15	1	6	12	8	11	53	
Question 3. How is a particular method selected?								
1. Amount of erosion determines method used	2	-	1	-	-	-	3	11%
2. Slope of cut or fill determines method used	-	-	-	2	2	1	5	19%
3. Location of erosion determines method used	1	-	-	3	-	-	4	15%
4. Curbs were selected during original construction	2	-	-	-	-	3	5	19%
5. The type material in the cut or fill	1	-	-	1	3	1	6	22%
6. No direct reply	1	-	1	1	-	1	4	15%
District Totals	7	-	2	7	5	6	27	
Question 4. If erosion is taking place, what is done to stop it and when is the action performed?								
1. Nothing is done to stop erosion	-	1	-	-	2	2	5	12%
2. Try to divert the water	2	-	1	3	3	-	9	23%
3. Backfill while erosion is taking place.	4	-	-	1	-	-	5	12%
4. Backfill after erosion occurs.	3	-	5	5	4	4	21	53%
District Totals	9	1	6	9	9	6	40	
Question 5. Is erosion of cut and fill slopes a serious problem on your section?								
1. Yes	4	1	3	3	-	1	12	29%
2. No.	4	5	5	4	6	5	29	71%
District Totals	8	6	8	7	6	6	41	

1040 h) Walls, Cribbings, and Riprap

Question 1. What determines when these items are inspected?								
1. None in area	3	6	2	2	4	2	19	47%
2. No maintenance required.	1	-	1	2	1	-	5	12%
3. Inspected after floods and during spring runoff.	1	-	2	1	-	3	7	17%
4. Inspected spring and fall	-	-	2	-	-	-	2	5%
5. Inspected during daily patrol.	2	-	1	1	1	-	5	12%
6. Inspected during low water.	-	-	-	-	-	1	1	2%
7. Inspected each year	-	-	-	1	-	-	1	2%
8. No direct reply	1	-	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 2. If failures are present, what methods of repair are used?								
1. No maintenance required.	-	-	-	-	-	1	1	5%
2. Rebuild to original standards.	-	-	-	2	-	-	2	10%
3. Add more riprap to failed area	4	-	5	2	-	3	14	70%
4. Call in special crew.	-	-	-	-	1	-	1	5%
5. Rebuild walls and cribbing with braces and reinforcement.	-	-	1	1	-	-	2	10%
District Totals	4	-	6	5	1	4	20	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 i) Seeding

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What determines when it is necessary?								
1. No seeding performed in area	-	4	7	2	2	3	18	40%
2. Seed all bare slopes.	3	1	1	1	2	-	8	18%
3. Seed when slopes begin to erode	-	-	-	3	1	-	4	9%
4. Seeded by contractor during original construction	3	1	-	2	3	-	9	20%
5. Slope seeded under special Forest Service project	-	-	-	1	-	1	2	4%
6. Seeding done spring and fall	1	-	-	-	-	-	1	2%
7. Seeding determined by the district office.	-	-	-	-	-	1	1	2%
8. No reply.	1	-	-	-	-	1	2	4%
District Totals	8	6	8	9	8	6	45	
Question 2. How is it performed?								
1. Seed spread by hand	3	1	1	2	3	1	11	65%
2. Blown on slopes with hay chopper.	-	-	-	1	1	-	2	12%
3. Seed drilled into slope.	-	-	-	-	-	1	1	6%
4. No direct reply	1	-	-	1	-	1	3	17%
District Totals	4	1	1	4	4	3	17	
Question 3. How successfully have past operations been used?								
1. Have had good success with seeding	3	-	1	3	4	2	13	77%
2. Have had fair success with seeding	-	1	-	-	-	-	1	6%
3. Have had poor success with seeding	1	-	-	1	-	1	3	17%
District Totals	4	1	1	4	4	3	17	

1040 j) Mulching

Question 1. What determines when it is necessary?								
1. No mulching operation performed in area	3	6	8	5	4	5	31	74%
2. Mulch spread when grass planted	2	-	-	2	2	-	6	14%
3. Mulch spread by contractor during original construction	1	-	-	1	-	-	2	5%
4. Slopes too steep for vegetation growth.	1	-	-	-	-	1	2	5%
5. No direct reply	1	-	-	-	-	-	1	2%
District Totals	8	6	8	8	6	6	42	
Question 2. How is it performed?								
1. Mulch is blown on slope.	2	-	-	-	2	1	5	56%
2. No direct reply	2	-	-	2	-	-	4	44%
District Totals	4	-	-	2	2	1	9	
Question 3. How successfully have past operations been used?								
1. Have had good success with mulching.	4	-	-	-	2	-	6	67%
2. No direct reply	-	-	-	2	-	1	3	33%
District Totals	4	-	-	2	2	1	9	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 k) Fertilizing

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What determines when it is necessary?								
1. Never has used fertilizer in area	5	6	8	4	5	6	34	83%
2. Fertilizer used when seeded area doesn't grow	-	-	-	1	1	-	2	5%
3. Fertilizer used by contractor during original contract	1	-	-	2	-	-	3	7%
4. Fertilizer used with grass seeding	2	-	-	-	-	-	2	5%
District Totals	8	6	8	7	6	6	41	
Question 2. How is it performed?								
1. Spread on by hand.	-	-	-	1	-	-	1	25%
2. Drilled into slope by machine.	2	-	-	-	1	-	3	75%
District Totals	2	-	-	1	1	-	4	
Question 3. How successfully have past operations been used?								
1. Have had good success with fertilizing.	1	-	-	-	1	-	2	50%
2. Have had fair success with fertilizing.	1	-	-	-	-	-	1	25%
3. No direct reply	-	-	-	1	-	-	1	25%
District Totals	2	-	-	1	1	-	4	

XIII. PURPOSE CODE 1045 - ROADSIDE AND DRAINAGE - EXTRAORDINARY

Question 1. What determines where the dividing point is between Code 1040 and Code 1045?								
1. Code 1045 not used by area foreman	6	1	6	7	6	3	29	66%
2. Code 1045 used for any major drainage project	1	4	-	-	-	1	6	14%
3. Code 1045 used when working with special crew	1	1	-	-	-	1	3	7%
4. Code 1045 used during floods	1	1	-	-	-	1	3	7%
5. Code 1045 used when cutting brush	-	-	1	-	-	-	1	2%
6. Doesn't know	-	-	-	-	-	1	1	2%
7. No direct reply	-	-	1	-	-	-	1	2%
District Totals	9	7	8	7	6	7	44	
Question 2. Who does this type of work?								
1. Special crew handles 1045 operations	6	1	3	7	6	4	27	63%
2. Shed crew gang handles 1045 operations.	2	5	1	-	-	2	10	23%
3. Doesn't know	1	-	-	-	-	1	2	5%
4. No direct reply	-	-	4	-	-	-	4	9%
District Totals	9	8	8	7	6	7	43	

XIV. PURPOSE CODE 1050 - TRAFFIC SIGNS (PLACEMENT AND NORMAL REPAIR)

Question 1. What determines when a sign should be replaced?								
1. Replace if sign is damaged.	1	6	4	3	5	1	20	22%
2. Replace if sign is vandalized.	2	-	5	4	5	1	17	19%
3. Replace if sign has poor legibility.	6	-	-	6	4	4	20	22%
4. Replace if sign post is damaged	-	-	2	4	2	-	8	9%
5. Replace if sign has poor reflectorization.	3	1	-	2	3	5	14	15%
6. Replace badly weathered signs.	1	1	-	1	2	-	5	5%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIV. PURPOSE CODE 1050 - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
7. Replace signs that have been removed	-	2	4	-	-	-	6	7%
8. No direct reply	1	-	-	-	-	-	1	1%
District Totals	14	10	15	20	21	11	91	
Question 2. How often are signs inspected for possible repairs?								
1. Inspected during daily patrol.	7	5	7	7	6	3	35	73%
2. Inspected 2-3 times weekly.	-	1	1	-	-	2	4	8%
3. Sign crew inspects	-	1	-	-	-	-	1	2%
4. Night patrol inspection each month	1	-	-	-	-	2	3	6%
5. Night patrol inspection every 6 months.	-	-	-	1	-	2	3	6%
6. Night patrol inspection every 2 months.	-	-	-	1	-	1	2	4%
District Totals	8	7	8	9	6	10	48	
Question 3. What repairs are performed in the field?								
1. Replace damaged posts	6	6	7	5	6	3	33	33%
2. Replace signs	1	-	3	6	4	2	16	16%
3. Paint sign posts	2	2	1	1	3	6	15	15%
4. Replace or tighten sign bolts.	2	-	-	-	-	4	6	6%
5. Replace and repair delineators	-	-	1	2	5	-	8	8%
6. Wash dirty signs	-	-	-	2	2	2	6	6%
7. Notify sign crew of damaged signs	-	-	-	-	-	2	2	2%
8. Straighten signs and posts.	-	4	3	2	-	5	14	14%
District Totals	11	12	15	18	20	24	100	

XV. PURPOSE CODE 1054 - HIGHWAY SIGNALS AND LIGHTS

1054 a) Signals

Question 1. Who replaces lamps and repairs signal heads?								
1. No signals in area	4	1	4	2	2	4	17	42%
2. City maintains.	1	2	-	3	2	1	9	22%
3. District sign crew maintains	-	-	-	2	2	-	4	10%
4. Boise electrician maintains	2	3	4	-	-	-	9	22%
5. Maintenance man maintains if signal accessible	-	-	-	-	-	1	1	2%
6. Doesn't know	1	-	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	

1054 b) Lights

Question 1. Who replaces needed lamps?								
1. No lights in area.	3	1	3	1	2	4	14	33%
2. City maintains.	2	4	1	3	1	-	11	26%
3. Power company maintains.	1	-	-	-	2	-	3	7%
4. District sign crew maintains	-	1	-	3	1	-	5	12%
5. Maintenance man maintains	-	1	2	-	-	-	3	7%
6. Boise electrician maintains	2	-	2	-	-	-	4	10%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XV. PURPOSE CODE 1054 b) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
7. Doesn't know	-	-	-	-	-	2	2	5%
District Totals	8	7	8	7	6	6	42	
Question 2. Are lights inspected at regular intervals?								
1. Yes	3	4	5	4	2	1	19	86%
2. No.	-	-	-	-	1	-	1	5%
3. Doesn't know	-	-	-	-	-	1	1	5%
4. No direct reply	-	1	-	-	-	-	1	5%
District Totals	3	5	5	4	3	2	22	
Question 3. If something other than the lamp needs repair who does the repair?								
1. Boise electrician maintains	3	3	5	2	-	1	14	64%
2. District sign crew maintains	-	-	-	1	1	1	3	13%
3. City maintains.	-	1	-	-	-	-	1	5%
4. Determined by the district office	-	-	-	1	-	-	1	5%
5. No direct reply	-	1	-	-	2	-	3	13%
District Totals	3	5	5	4	3	2	22	

XVI. PURPOSE CODE 1055 - ROADSIDE REST AND PICNIC AREAS

1. None in area	5	4	3	-	-	3	13	100%
1055 a) Trash and Litter								
Question 1. What criteria determine when trash and litterare picked up?								
1. Roadside park trash picked up with section litter barrels	-	-	-	4	2	-	6	18%
2. Roadside park trash picked up weekly	2	-	1	2	-	-	5	15%
3. Roadside park trash picked up twice weekly	-	2	1	-	2	-	5	15%
4. Roadside park trash picked up daily.	1	-	3	-	3	-	7	20%
5. Trash picked up when area begins to look bad.	-	-	-	4	2	-	6	18%
6. Roadside park trash picked up three times weekly	1	-	-	-	-	3	4	11%
7. No direct reply	1	-	-	-	-	-	1	3%
District Totals	5	2	5	10	9	3	34	
Question 2. Is this assigned to any special person or crew?								
1. No, done by section maintenance man.	5	2	5	7	6	3	28	97%
2. Yes, done by garbage collector	-	-	-	-	1	-	1	3%
District Totals	5	2	5	7	7	3	29	
1055 b) Vandalism Repairs								
Question 1. Who performs this type of work?								
1. Maintenance man repairs damage	2	2	5	7	6	1	23	70%
2. District Carpenter crew repairs damage.	3	-	-	-	-	3	6	18%
3. Special crew repairs damage	-	-	-	3	-	-	3	9%
4. No repair required to date.	1	-	-	-	-	-	1	3%
District Totals	6	2	5	10	6	4	33	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 c) Driveways and Parking Areas

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. How often is an inspection made and if necessary when is the required maintenance performed?								
1. No maintenance required.	-	-	2	-	-	-	2	5%
2. Inspected during daily patrol.	5	1	3	-	-	3	12	33%
3. Maintained annually	-	-	-	2	4	1	7	19%
4. Maintained as needed.	-	1	-	1	1	-	3	8%
5. Maintained when motor patrol is working in area.	-	-	-	2	3	-	5	13%
6. Maintained as time becomes available	3	-	-	2	-	2	7	19%
7. Maintained spring and fall.	-	-	-	1	-	-	1	3%
District Totals	8	2	5	8	8	6	37	
Question 2. What standards are used for the required maintenance?								
1. Maintain surface smooth and in good condition	4	-	-	5	3	2	14	66%
2. Maintain same as travelway.	1	-	-	-	1	-	2	10%
3. Keep approaches smooth	-	-	-	-	2	-	2	10%
4. No direct reply	-	1	-	2	-	-	3	14%
District Totals	5	1	-	7	6	2	21	

1055 d) Footpaths and Sidewalks

Question 1. How often is an inspection made and if necessary when is the required maintenance performed?								
1. None in parks	3	1	4	3	4	2	17	59%
2. No maintenance required.	-	-	-	4	-	-	4	14%
3. Inspected during daily patrol.	2	1	1	-	-	1	5	17%
4. Sidewalks washed off every spring	-	-	-	-	1	-	1	3%
5. Snow shoveled off during the winter.	-	-	-	-	2	-	2	7%
District Totals	5	2	5	7	7	3	29	
Question 2. What standards are used for the required maintenance?								
1. Sweep dirt and gravel off sidewalk	-	-	1	-	-	-	1	17%
2. Level gravel footpaths	-	-	-	-	-	1	1	17%
3. No set standard used.	1	1	-	-	2	-	4	66%
District Totals	1	1	1	-	2	1	6	

1055 e) Mowing and Irrigation

Question 1. What criteria are used for mowing grass within rest and picnic areas?								
1. No mowing done in parks.	2	1	-	3	4	1	11	40%
2. Mow park when mowing section shoulders.	3	-	-	1	1	2	7	25%
3. Mow park each week	-	-	4	-	-	-	4	14%
4. Mow park twice each week	-	1	-	1	-	-	2	7%
5. Mow as required to keep uniform shape	-	-	1	1	-	-	2	7%
6. Mows 2-3 times each summer.	-	-	-	1	1	-	2	7%
District Totals	5	2	5	7	6	3	28	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 e) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. Is any hand-work performed for trimming and clipping of the edges, etc.?								
1. Yes	3	-	1	2	-	-	6	35%
2. No.	-	1	4	2	2	2	11	65%
District Totals	3	1	5	4	2	2	17	
Question 3. What criteria are used in irrigating the grass?								
1. Grass not irrigated	2	-	1	3	2	2	10	59%
2. Grass irrigated weekly	1	-	3	-	-	-	4	23%
3. Grass irrigated twice weekly	-	1	1	-	-	-	2	12%
4. Grass irrigated daily	-	-	-	1	-	-	1	6%
District Totals	3	1	5	4	2	2	17	

1055 f) Curbs

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No curbs in parks.	4	2	4	6	3	3	22	78%
2. No maintenance required.	-	-	1	-	2	-	3	11%
3. Repaired when damaged	1	-	-	1	1	-	3	11%
District Totals	5	2	5	7	6	3	28	
Question 2. What standards are used for the required maintenance?								
1. Keep curbing functional and in good repair	1	-	-	1	1	-	3	100%

1055 g) Fences

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No fences in parks	1	-	3	5	2	2	13	46%
2. No maintenance required.	-	2	2	1	2	-	7	25%
3. Daily patrol inspection.	3	-	-	-	1	-	4	14%
4. Inspected three times weekly	-	-	-	-	-	1	1	4%
5. Repaired when damage is noticed	-	-	-	1	1	-	2	7%
6. Fences maintained by farmers	1	-	-	-	-	-	1	4%
District Totals	5	2	5	7	6	3	28	
Question 2. What standards are used for the required maintanance?								
1. Maintain original standards	1	-	2	1	1	1	6	60%
2. No direct reply	3	-	-	-	1	-	4	40%
District Totals	4	-	2	1	2	1	10	

1055 h) Buildings and Tables

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No tables or buildings in parks	-	-	1	-	-	-	1	3%
2. No maintenance required.	1	-	-	-	1	-	2	6%
3. Daily patrol inspection.	4	1	1	2	3	2	13	41%
4. Inspected three times weekly	-	-	1	-	-	1	2	6%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 h) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. Inspected twice weekly	-	1	-	3	2	-	6	19%
6. Inspected weekly	-	-	1	2	-	-	3	9%
7. Tables cleaned as needed	-	-	1	1	1	-	3	9%
8. Tables cleaned every two weeks	-	-	-	2	-	-	2	6%
District Totals	5	2	5	10	7	3	32	
Question 2. What standards are used for the required maintenance?								
1. Keep clean and sanitary.	-	1	3	3	6	-	13	48%
2. Keep in original condition.	4	1	-	4	-	2	11	41%
3. Paint annually.	1	-	1	-	-	-	2	7%
4. No direct reply	-	-	-	-	-	1	1	4%
District Totals	5	2	4	7	6	3	27	

1055 i) Structures

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No structures in parks	3	2	5	5	5	2	22	76%
2. Daily patrol inspection.	2	-	-	-	-	-	2	7%
3. Inspected three times weekly	-	-	-	-	-	1	1	3%
4. Inspected monthly.	-	-	-	-	1	-	1	3%
5. Inspected every two months.	-	-	-	2	-	-	2	7%
6. No direct reply	-	-	-	-	-	1	1	3%
District Totals	5	2	5	7	6	4	29	
Question 2. What standards are used for the required maintenance?								
1. Keep in good repair	1	-	-	2	1	1	5	83%
2. No direct reply	1	-	-	-	-	-	1	17%
District Totals	2	-	-	2	1	1	6	

1055 j) Water Supply

Question 1. How often is water supply checked for possible contamination?								
1. No water in parks.	4	-	2	5	3	2	16	55%
2. Never has been checked	-	-	1	-	-	-	1	4%
3. City checks water periodically	1	-	-	-	-	-	1	4%
4. Checked twice a year.	-	1	1	-	-	-	2	7%
5. Chlorine purifier checked weekly.	-	1	1	-	1	-	3	10%
6. Checked once a year	-	1	-	-	-	-	1	4%
7. Doesn't know	-	-	-	2	2	1	5	17%
District Totals	5	3	5	7	6	3	29	

1055 k) Fireplaces, Pits, and Barbecue Facilities

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. None in parks	5	2	5	3	5	3	23	82%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 k) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Clean as needed	-	-	-	1	-	-	1	4%
3. Clean each spring.	-	-	-	2	-	-	2	7%
4. Inspected twice a week	-	-	-	-	1	-	1	4%
5. No maintenance required.	-	-	-	1	-	-	1	4%
District Totals	5	2	5	7	6	3	28	
Question 2. What standards are used for the required maintenance?								
1. Maintain in a useable condition	-	-	-	1	1	-	2	50%
2. No direct reply	-	-	-	2	-	-	2	50%
District Totals	-	-	-	3	1	-	4	
Question 3. What criteria are used to determine when to clean grease, ashes, etc., from the facilities?								
1. Clean each spring.	-	-	-	2	-	-	2	50%
2. Clean out ashes every week.	-	-	-	-	1	-	1	25%
3. Doesn't know	-	-	-	1	-	-	1	25%
District Totals	-	-	-	3	1	-	4	

1055 l) Insect and Disease Control

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. What methods are used to perform this work?								
1. No control used	-	2	5	2	2	-	11	31%
2. Clean with disinfectant.	5	-	-	5	3	3	16	46%
3. Treat with lime	-	-	-	-	-	1	1	3%
4. Wash picnic tables and interiors of outhouses	-	-	-	-	1	-	1	3%
5. Spray insecticide around litter barrels	-	-	-	3	2	-	5	14%
6. Toilets pumped out every year.	-	-	-	-	-	1	1	3%
District Totals	5	2	5	10	8	5	35	
Question 2. What criteria are used to determine when it should be done?								
1. Control used each day during summer season	1	-	-	-	-	-	1	5%
2. Control used 2-3 times each week.	2	-	-	-	-	2	4	21%
3. Control used weekly	1	-	-	-	-	-	1	5%
4. Control used twice monthly.	-	-	-	2	-	-	2	11%
5. Control used when smell is bad	-	-	-	-	3	1	4	21%
6. Control used when bugs get thick.	-	-	-	-	2	-	2	11%
7. Control used to keep conditions sanitary	-	-	-	3	1	-	4	21%
8. Control used twice each year	1	-	-	-	-	-	1	5%
District Totals	5	-	-	5	6	3	19	

XVIII. PURPOSE CODE 1060 - SNOW AND ICE REMOVAL

1060 a) Plowing

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. What determines when the snow plowing operation should begin?								
1. Plow when storm begins	7	-	1	2	1	3	14	34%
2. Plow when snow is 1-2 inches deep	1	2	2	3	3	3	14	34%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVII. PURPOSE CODE 1060 a) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Plow when snow is 2-3 inches deep	-	4	2	2	2	-	10	25%
4. Plow when travelway becomes slick	-	-	3	-	-	-	3	7%
District Totals	8	6	8	7	6	6	41	
Question 2. Is maintaining a snow-free surface the end objective of the plowing?								
1. Yes	7	3	3	7	6	4	30	73%
2. No.	1	3	5	-	-	2	11	27%
District Totals	8	6	8	7	6	6	41	
Question 3. If not, what is the end objective?								
1. Try to maintain a sanded snow floor.	1	3	3	-	-	1	8	73%
2. Keep highway passable	-	-	2	-	-	1	3	27%
District Totals	1	3	5	-	-	2	11	
Question 4. Are the same criteria used when plowing approaches, intersections or crossroads?								
1. Only plows main travelway	-	-	-	1	-	-	1	2%
2. Plowed after main travelway	6	6	7	4	1	-	24	59%
3. Plowed after main travelway if time available	-	-	-	2	5	6	13	32%
4. Plowed along with main travelway.	2	-	-	-	-	-	2	5%
5. No direct reply	-	-	1	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	

1060 b) Salt or Chemicals

Question 1. How is the rate of application determined								
1. Salt or other chemicals not used without sanding material	6	1	5	1	2	2	17	37%
2. Rate determined by amount of ice and slickness	1	3	2	1	1	-	8	18%
3. No set rate, all salt spread by hand as needed	-	-	-	-	-	1	1	2%
4. Rate determined by temperature conditions.	1	1	-	1	3	2	8	18%
5. Only one rate is used	-	1	1	-	-	1	3	7%
6. Applies 100-150 pounds per mile	-	-	-	2	1	-	3	7%
7. Applies 250-300 pounds per mile	-	-	-	1	2	-	3	7%
8. Applied by salt spreader traveling at 25 mph rate	-	-	-	1	-	-	1	2%
9. Application rate determined from maintenance manual chart	-	-	-	-	-	1	1	2%
District Totals	8	6	8	7	9	7	45	
Question 2. Is salt used only for certain areas or conditions?								
1. Salt used on icy spots	1	-	-	-	3	-	4	8%
2. Salt used on slick intersections	2	-	1	1	-	2	6	11%
3. Salt used on slick grades and hills.	1	-	1	4	2	1	9	17%
4. Salt used on slick curves	1	-	1	3	1	1	7	13%
5. Salt used only during temperature conditions of 25-35°F	-	-	-	2	4	-	6	11%
6. Salt used on black ice sections	-	3	-	5	-	-	8	15%
7. Salt used on slick bridges and overpasses.	-	-	-	2	-	1	3	6%
8. Salt used on interchange lanes	-	-	-	-	-	1	1	2%
9. Salt used on shaded areas	-	-	-	3	-	-	3	6%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVII. PURPOSE CODE 1060 b) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
10. Salt used at the beginning of a snowstorm.	-	-	-	-	1	-	1	2%
11. Salt not used on concrete surfaces	-	-	-	-	1	-	1	2%
12. No direct reply	-	2	2	-	-	-	4	8%
District Totals	5	5	5	20	12	6	53	
Question 3. Are other chemicals used to remove snow and ice?								
1. No other chemical is used	6	6	8	7	6	2	35	86
2. Also uses calcium chloride.	1	-	-	-	-	2	3	7
3. No direct reply	1	-	-	-	-	2	3	7
District Totals	8	6	8	7	6	6	41	

XVIII. PURPOSE CODE 1065 - SANDING ICY SURFACES

Question 1. What criteria are used to determine when sanding is necessary?								
1. Sand after plowing	6	-	4	5	5	5	25	44
2. Sand when travelway is slick	2	6	6	3	3	-	20	35
3. Sand when snow not deep enough to plow.	-	-	-	2	-	1	3	5
4. Sand as soon as snow begins to fall.	-	-	-	-	3	-	3	5
5. Sand as soon as snow stops falling	-	-	-	3	-	-	3	5
6. Sand whenever there is a snowfloor	-	-	-	2	-	-	2	4
7. Sand during warming trends on snowfloors	-	-	-	1	-	-	1	2
District Totals	8	6	10	16	11	6	57	
Question 2. What materials are used?								
1. Sand	5	5	8	-	1	3	22	29%
2. Gravel	-	-	-	7	4	3	14	18%
3. Rejects	-	1	-	3	1	1	6	8%
4. Cinders	3	1	-	-	-	-	4	5%
5. Salt	8	4	7	4	5	3	31	40%
District Totals	16	11	15	14	11	10	77	
Question 3. How much salt is used with the sanding material?								
1. No salt used with sanding material	-	1	1	3	1	3	9	22%
2. Uses 1 sack of salt per ½ cubic yard of sanding material.	3	1	-	-	-	1	5	12%
3. Uses 1 sack of salt per 1 cubic yard of sanding material.	5	3	6	4	3	1	22	54%
4. Uses 1 sack of salt per 2 cubic yards of sanding material	-	-	-	-	2	-	2	5%
5. Uses 1 sack of salt per 5 cubic yards of sanding material	-	-	1	-	-	1	2	5%
6. Uses 1 sack of salt per 1/3 cubic yard of material.	-	1	-	-	-	-	1	2%
District Totals	8	6	8	7	6	6	41	
Question 4. At what locations is sanding performed?								
1. Entire area.	2	2	1	-	-	-	5	4%
2. Grades and hills	7	5	6	6	5	5	34	29%
3. Curves	3	5	6	6	5	3	28	24%
4. Intersections	3	4	3	3	2	2	17	14%
5. Shaded areas or dangerous spots	-	-	2	7	4	2	15	13%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVIII. PURPOSE CODE 1065 - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. Bridges	-	1	-	3	-	1	5	4%
7. Railroad crossings	-	-	2	-	-	-	2	2%
8. Interchange ramps	4	-	-	-	1	1	6	5%
9. City streets	-	-	2	-	-	-	2	2%
10. Entire freeway	1	-	-	-	1	-	2	2%
11. Locations demanded by the public	-	-	-	-	1	-	1	1%
District Totals	20	17	22	25	19	14	117	

XIX. PURPOSE CODE 1070 - BRIDGE MAINTENANCE

1070 a) Inspections

Question 1. What determines when an inspection is necessary?

	1	2	3	4	5	6	Totals	%
1. Bridges not inspected	1	1	-	-	-	-	2	4%
2. Inspected during high water	1	1	3	3	1	-	9	20%
3. Bridge crew determines	-	1	-	-	1	1	3	6%
4. Inspected annually, in the spring	-	-	2	3	2	1	8	17%
5. Inspected each fall	-	-	-	-	-	1	1	2%
6. Inspected spring and fall	2	3	4	3	1	2	15	33%
7. Inspected 3-4 times yearly	1	-	-	1	1	-	3	6%
8. Inspected monthly	-	-	-	-	-	1	1	2%
9. Inspected daily	3	-	-	1	-	-	4	9%
District Totals	8	6	9	11	6	6	46	

Question 2. What is looked for in an inspection?

	1	2	3	4	5	6	Totals	%
1. Undercutting of the structure	1	6	6	6	3	3	25	24%
2. Cracks in deck	-	1	-	4	-	4	9	9%
3. Damaged stringers	2	-	7	4	1	-	14	13%
4. Trash and debris collecting under bridge	2	-	1	-	1	1	5	5%
5. Damaged or plugged expansion joints and rollers	4	-	-	4	3	6	17	16%
6. Spalling of concrete surface	2	-	1	-	-	5	8	8%
7. Broken or cracked abutments	-	-	2	-	-	-	2	2%
8. Plugged drainage holes	2	-	-	-	2	1	5	5%
9. Broken or damaged railings	-	-	1	1	1	2	5	5%
10. Loose bolts	-	-	2	-	-	-	2	2%
11. Rough approaches	-	-	-	-	-	2	2	2%
12. Brush growing up close to bridge	-	-	1	-	2	-	3	3%
13. Any variations in the stream channel	1	-	1	-	-	1	3	3%
14. Paint appearance	-	-	-	2	-	1	3	3%
District Totals	14	7	22	21	13	26	103	

1070 b) Cleaning Expansion Joints

Question 1. What determines when cleaning is necessary?

	1	2	3	4	5	6	Totals	%
1. No expansion joints on bridges	-	2	1	2	1	-	6	14%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 b) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Cleaned by bridge crew	-	-	-	-	-	1	1	2%
3. Cleaned when joint fills up with material	3	3	3	2	2	2	15	34%
4. Cleaned spring and fall	1	-	-	4	3	3	11	25%
5. Cleaned each spring	2	1	-	-	1	-	4	9%
6. Cleaned each fall	-	-	-	1	-	-	1	2%
7. Cleaned annually	-	-	1	-	-	-	1	2%
8. Cleaning has not been necessary	1	-	3	-	-	-	4	9%
9. No direct reply	1	-	-	-	-	-	1	2%
District Totals	8	6	8	9	7	6	44	
Question 2. What method is used for cleaning joints?								
1. Joints are cleaned by hand	5	2	-	7	3	6	23	52%
2. Wash out with water under pressure	4	-	4	3	3	-	14	32%
3. Blow out with compressed air	1	1	-	-	2	1	5	11%
4. No direct reply	1	1	-	-	-	-	2	5%
District Totals	11	4	4	10	8	7	44	
1070 c) Concrete Surface Spalling								
Question 1. What measures are taken to prevent spalling?								
1. Nothing done to prevent spalling	5	3	7	4	1	3	23	55%
2. Bridges surfaced with asphalt	-	3	-	3	2	-	8	19%
3. Salt not used on bridges	1	-	1	-	2	1	5	12%
4. Bridge deck sprayed with linseed oil	1	-	-	-	1	3	5	12%
5. Bridge deck washed off periodically with water	1	-	-	-	-	-	1	2%
District Totals	8	6	8	7	6	7	42	
Question 2. What determines when a repair is necessary?								
1. No maintenance required	5	6	3	4	3	-	21	51%
2. Concrete scaled off bridge deck	2	-	-	3	3	4	12	30%
3. Rough surface on bridge deck	-	-	5	-	-	-	5	12%
4. Determined by bridge crew	1	-	-	-	-	1	2	5%
5. Doesn't know	-	-	-	-	-	1	1	2%
District Totals	8	6	8	7	6	6	41	
Question 3. What method is used in this repair?								
1. Repair with a thin concrete patch	-	-	1	-	-	-	1	5
2. Seal coat bridge surface	-	-	-	3	2	-	5	24%
3. Patch with premix	1	-	1	-	-	2	4	19%
4. Pour melted tar into raveled area	-	-	1	-	-	-	1	5%
5. Boise bridge crew decides	-	-	-	-	-	1	1	5%
6. District office determines	1	-	-	1	-	-	2	9%
7. Doesn't know	-	-	-	-	-	3	3	14%
8. No direct reply	1	-	2	-	1	-	4	19%
District Totals	3	-	5	4	3	6	21	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 c) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 4. Is spalling a problem on your structures?								
1. Yes	1	-	1	1	1	4	8	20%
2. No.	5	6	7	6	5	2	31	75%
3. No direct reply	2	-	-	-	-	-	2	5%
District Totals	8	6	8	7	6	6	41	
1070 d) Joint Repair								
Question 1. Is this performed by a special crew?								
1. No joints on bridges.	-	-	-	2	-	-	2	5%
2. No maintenance required.	3	2	3	-	-	-	8	20%
3. Yes, bridge crew maintains.	1	-	3	5	4	3	16	39%
4. No, maintenance man maintains.	4	4	2	-	2	2	14	34%
5. Doesn't know	-	-	-	-	-	1	1	2%
District Totals	8	6	8	7	6	6	41	
Question 2. What methods are used in repairing joints?								
1. Methods determined by bridge crew	-	-	-	1	1	-	2	6%
2. Add or replace filler material	3	3	2	1	1	1	11	32%
3. Replace steel caps and supports	-	1	-	1	-	-	2	6%
4. Weld joint plates back	-	-	-	1	-	-	1	3%
5. Patch with premix.	-	-	-	-	1	-	1	3%
6. Tighten joints.	1	-	-	-	-	-	1	3%
7. Reinforce joints with steel and concrete	-	-	-	-	-	2	2	6%
8. Doesn't know	-	-	-	4	3	3	10	29%
9. No direct reply	1	-	3	-	-	-	4	12%
District Totals	5	4	5	8	6	6	34	
Question 3. What criteria determine when a joint repair is necessary?								
1. Joint cracked or broken.	-	-	-	3	1	-	4	13%
2. Joint unsealed or loose.	-	5	3	-	-	1	9	28%
3. Joint rough and hazardous	-	1	1	-	1	-	3	9%
4. Joint bent out of shape.	-	-	-	-	1	-	1	3%
5. Joint filler material cracking	2	-	-	-	-	-	2	6%
6. Foreign material in joint	2	-	-	-	-	-	2	6%
7. Bridge crew determines	-	-	-	1	2	-	3	9%
8. Doesn't know	-	-	-	-	-	4	4	13%
9. No direct reply	1	-	1	1	-	1	4	13%
District Totals	5	6	5	5	5	6	32	
1070 e) Hand Rail Repair								
Question 1. Is this type of maintenance performed by a special crew?								
1. No handrail on bridges	6	-	-	1	-	1	8	17%
2. No maintenance required.	-	4	1	-	-	-	5	10%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 e) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Yes, bridge or carpenter crew maintains	1	2	3	6	4	2	18	38%
4. No, maintenance man maintains.	1	-	4	3	6	3	17	35%
District Totals	8	6	8	10	10	6	48	
Question 2. What type of maintenance is used?								
1. Repair to original conditions.	1	2	7	2	3	-	15	48%
2. Replace damaged members.	-	-	-	2	2	-	4	13%
3. Repaint worn railings	-	-	-	-	3	3	6	20%
4. Wash railings	-	-	-	-	-	1	1	3%
5. Straighten bent or leaning members	-	-	-	-	1	-	1	3%
6. No direct reply	1	-	-	2	-	1	4	13%
District Totals	2	2	7	6	9	5	31	
Question 3. What determines when a hand rail needs repair?								
1. When handrail is damaged or broken	-	2	6	3	4	-	15	42%
2. When paint is worn off handrail	1	-	1	-	3	3	8	22%
3. When handrail falls off bridge	-	-	-	-	3	-	3	8%
4. When handrail becomes a hazard	-	-	-	2	2	-	4	11%
5. When support posts become rotten.	-	-	-	2	-	-	2	6%
6. Bridge crew determines	-	-	-	-	1	1	2	6%
7. No direct reply	1	-	-	-	-	1	2	6%
District Totals	2	2	7	7	13	5	36	
1070 f) Drainage Cleanouts								
Question 1. How often are cleanouts inspected?								
1. No drainage cleanouts on bridges.	-	-	-	1	-	-	1	2%
2. Daily patrol inspection.	5	-	1	-	-	1	7	17%
3. Inspected every month	1	-	-	-	3	-	4	10%
4. Inspected 1-2 times each year.	1	2	2	-	-	-	5	12%
5. Inspected 3-4 times each year.	-	-	-	1	1	1	3	7%
6. Inspected each spring and fall	-	-	-	3	-	2	5	12%
7. Inspected each spring	1	-	-	3	-	2	6	14%
8. Inspected while cleaning bridge deck	-	1	-	-	2	-	3	7%
9. Inspected periodically through the winter.	-	-	2	-	-	-	2	5%
10. No direct reply	-	3	3	-	-	-	6	14%
District Totals	8	6	8	8	6	6	42	
Question 2. What methods are used to clean them?								
1. No maintenance is required.	1	4	3	-	1	2	11	23%
2. Rod out with long rod	1	1	-	6	4	5	17	35%
3. Hand sweep or shovel out	2	1	3	-	-	1	7	15%
4. Wash out with water under pressure	3	-	1	2	2	-	8	17%
5. Use torch to melt ice	-	-	2	-	-	1	3	6%

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 f) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. No direct reply	2	-	-	-	-	-	2	4%
District Totals	9	6	9	8	7	9	48	

1070 g) Removal of Used Sanding Material

Question 1. When is cleaning considered to be necessary?	1	2	3	4	5	6	Totals	%
1. Sand not cleaned off bridges	-	-	2	-	-	-	2	5%
2. Bridges cleaned each spring	6	-	1	6	3	5	21	50%
3. Cleaned when material builds up and drainage affected.	2	6	5	2	-	-	15	36%
4. Cleaned each spring and fall	-	-	-	-	2	-	2	5%
5. Cleaned 3 times each year	-	-	-	-	1	-	1	2%
District Totals	8	6	8	8	6	6	42	

Question 2. How is the cleaning performed?	1	2	3	4	5	6	Totals	%
1. Swept and shoveled off by hand	8	6	4	4	6	6	34	59%
2. Washed off with water under pressure	2	-	1	2	6	-	11	19%
3. Swept off with power broom.	1	1	4	1	-	-	7	12%
4. Bladed off with motor patrol	1	-	-	-	-	1	2	3%
5. Scooped up with a frontend loader	3	-	1	-	-	-	4	7%
District Totals	15	7	10	7	12	7	58	

XX. PURPOSE CODE 1095 - YARDS AND BUILDINGS

	1	2	3	4	5	6	Totals	%
1. Charge Code 1095 is not used by area foremen.	-	1	2	-	-	1	4	100%

1095 a) Trash and Litter Pickup

Question 1. How is scheduling of pickup determined?	1	2	3	4	5	6	Totals	%
1. Picked up as barrels fill up	4	4	6	5	1	3	23	46%
2. Picked up weekly	4	-	-	4	-	-	8	16%
3. Picked up when time available.	-	1	-	-	2	1	4	8%
4. Major cleanup each spring	-	-	-	2	1	-	3	6%
5. Major cleanup each spring and fall	-	-	-	2	2	-	4	8%
6. Picked up monthly.	-	-	-	-	-	1	1	2%
7. Picked up with section barrels	-	-	-	-	4	1	5	10%
8. Picked up 3-4 times each year.	-	-	-	1	1	-	2	4%
District Totals	8	5	6	14	11	6	50	

1095 b) Painting Buildings, etc.

Question 1. What criteria are used in deciding when to paint a building?	1	2	3	4	5	6	Totals	%
1. Determined by paint crew	8	2	6	7	5	4	32	82%
2. Amount of available "slack" time determines	-	4	-	-	-	-	4	10%
3. Determined by district office.	-	-	-	-	1	-	1	3%
4. Determined by appearance of building	-	1	-	-	-	-	1	3%
5. No painting required to date	-	-	-	-	-	1	1	3%
District Totals	8	7	6	7	6	5	39	

TABLE C (continued)

AREA FOREMEN QUESTIONNAIRE RESPONSES (CONTINUED)

XX. PURPOSE CODE 1095 b) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. Is this work performed during a "slack" period?								
1. Yes	-	4	-	-	-	-	4	100%
1095 c) Roofing								
Question 1. Is roofing inspected periodically?								
1. Yes	6	2	1	3	1	4	17	46%
2. No.	-	-	3	3	3	1	10	27%
3. Inspected annually	1	-	-	-	-	-	1	3%
4. Inspected 2 times each year	-	-	-	-	2	-	2	5%
5. Doesn't know	-	3	-	1	-	-	4	11%
6. No direct reply	1	-	2	-	-	-	3	8%
District Totals	8	5	6	7	6	5	37	
Question 2. When a roof is in need of repair, is any special crew used to perform the work?								
1. Carpenter crew does the repair work.	2	4	5	7	2	4	24	65%
2. Shed crew does the repair work	-	1	1	-	4	1	7	19%
3. Repair work is contracted out.	6	-	-	-	-	-	6	16%
District Totals	8	5	6	7	6	5	37	
1095 d) Grading and Surfacing								
Question 1. Does any special crew do this type of work?								
1. No, done by shed crew	8	5	6	7	4	5	35	92%
2. Yes, done by special crew	-	-	-	-	2	-	2	5%
3. No grading or surface repair done	-	-	-	-	1	-	1	3%
District Totals	8	5	6	7	7	5	38	
Question 2. What are the criteria used to determine when a yard needs to have some grading work?								
1. When surface is rough and broken up.	4	5	6	4	3	5	27	61%
2. When time is available	-	-	-	4	1	-	5	11%
3. Graded each spring and fall	-	-	-	3	-	-	3	7%
4. Graded during spring cleanup	1	-	-	2	2	1	6	14%
5. No grading done in yard.	1	-	-	-	-	-	1	2%
6. Graded each fall	1	-	-	-	-	-	1	2%
7. No direct reply	1	-	-	-	-	-	1	2%
District Totals	8	5	6	13	6	6	44	
Question 3. Are pot-holes, etc., handled in the same manner in yards as they are on the highways?								
1. Yes	3	3	5	-	3	-	14	38%
2. No.	2	1	1	3	-	5	12	32%
3. Repair yard with gravel road type patches.	3	2	-	4	2	-	11	30%
District Totals	8	6	6	7	5	5	37	

APPENDIX D

TABLE D

MAINTENANCE OPERATIONS QUESTIONNAIRE

DISTRICT AND STATE SUMMARY OF MAINTENANCE MEN RESPONSES

I. PURPOSE CODE 1000 - UNUSUAL OR DISASTER MAINTENANCE

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%*
Question 1. What criteria are used to decide whether to charge to Code 1000?								
1. Code 1000 has never been used by maintenance man	7	15	8	11	14	11	66	48%
2. Criteria determined by district office.	3	-	-	3	1	1	8	6%
3. Major floods	11	6	8	7	9	7	48	35%
4. Major slides	-	-	2	4	5	1	12	8%
5. Disrupted travelway	-	-	4	-	-	-	4	3%
District Totals	21	21	22	25	29	20	138	

II. PURPOSE CODE 1005 - ROADWAY PATROL INSPECTION

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. Does this include driving time only?								
1. Code 1005 not used by maintenance man	3	-	-	-	5	-	8	7%
2. Yes	1	21	4	1	-	1	28	23%
3. No.	15	-	15	18	19	18	85	70%
District Totals	19	21	19	19	24	19	121	
Question 2. If not, then is there any time limit on small jobs which are done under Code 1005?								
1. No time limit	11	-	6	3	1	14	35	41%
2. 15 minute time limit.	2	-	-	1	-	-	3	4%
3. 30 minute time limit.	-	-	-	1	-	1	2	2%
4. 1 to 2 hour time limit	1	-	-	5	14	1	21	25%
5. 2 to 4 hour time limit	-	-	-	6	-	1	7	8%
6. No direct reply	1	-	9	2	4	1	17	20%
District Totals	15	-	15	18	19	18	85	
Question 3. What small jobs are done under Code 1005?								
1. Clear travelway of obstacles	9	-	10	17	19	18	73	55%
2. Saturday patrol	5	1	8	1	4	8	27	20%
3. Emergency sign maintenance.	1	-	2	-	4	4	11	8%
4. Empty litter barrels.	5	-	-	-	-	3	8	6%
5. Small patches	-	-	-	1	-	3	4	3%
6. Any small job one man can handle.	2	-	-	1	-	-	3	2%
7. Read traffic counters	1	-	-	-	-	-	1	1%
8. Truck maintenance.	1	-	-	-	-	-	1	1%
9. Remove small slides	-	-	-	2	-	-	2	1%
10. Assisting motorists	-	-	-	1	-	-	1	1%
11. Checking roadside parks.	-	-	-	-	2	-	2	1%
12. Night patrol	-	-	-	-	-	1	1	1%
District Totals	24	1	20	23	29	37	134	
Question 4. What are your personal recommendations?								
1. No recommendations	13	11	10	12	15	14	75	61%

*% of total number of responses per question.

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

II. PURPOSE CODE 1005 - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Inspect entire section, then return doing small jobs	3	-	1	1	-	-	5	4%
3. Code 1005 is a good charge code	1	1	6	-	4	-	12	10%
4. Confusion exists on Code 1005.	-	8	-	4	-	-	12	10%
5. Maintenance man should inspect section daily.	-	-	-	1	1	3	5	4%
6. Roadway patrol is a waste of time	1	-	1	-	1	1	4	3%
7. Keep roadway cleaner on weekends.	1	-	-	-	-	-	1	1%
8. Use judgement when charging to Code 1005	-	1	-	-	-	-	1	1%
9. Always carry extra delineators	-	-	1	-	-	-	1	1%
10. Charge driving time only to Code 1005	-	-	-	1	-	-	1	1%
11. Charge to Code 1005 sparingly and with caution	-	-	-	-	4	-	4	3%
12. Need better cooperation between maintenance men.	-	-	-	-	-	1	1	1%
District Totals	19	21	19	19	25	19	122	

III. PURPOSE CODE 1010 - TRAVELWAY - ROUTINE REPAIR

1010 a) Patching

Question 1. What is routine repair?

	1	2	3	4	5	6	Totals	%
1. Routine repair not required to date (New facility).	-	1	1	-	-	-	2	1%
2. Any patching on travelway by 1 or 2 men	19	19	18	15	15	12	98	74%
3. Any patching on travelway by section man and/or crew	-	-	-	4	8	7	19	14%
4. Any patching on travelway and shoulders	-	1	-	-	-	-	1	1%
5. Roadway patrol inspection	3	-	-	-	-	-	3	2%
6. Clear travelway of obstacles	2	-	-	-	-	-	2	1%
7. Emergency sign maintenance.	-	-	3	-	-	-	3	2%
8. Litter pickup	-	-	3	-	-	-	3	2%
9. All general highway maintenance	-	-	-	-	1	-	1	1%
District Totals	24	21	25	19	24	19	132	

Question 2. What methods are used to patch a pot-hole?

	1	2	3	4	5	6	Totals	%
1. Remove old material, square up edges, paint with tack oil, fill with mix and compact with truck wheels	15	14	16	14	21	19	99	50%
2. Remove old material, paint with tack oil, fill with mix and compact with truck wheels.	3	2	2	3	5	-	15	8%
3. Fill with mix and compact with truck wheels	3	2	-	-	16	10	31	16%
4. Lay material with patrol and compact with truck wheels	4	-	-	-	8	14	26	13%
5. Fill with gravel and compact with truck wheels	3	-	-	7	3	8	21	11%
6. Fill with chips, spray with oil, cover with additional chips and compact with truck wheels.	-	4	-	-	-	-	4	2%
District Totals	28	22	18	24	53	51	196	

Question 3. What criteria are used to determine which method shall be used?

	1	2	3	4	5	6	Totals	%
1. Weather conditions	12	2	8	15	19	15	71	37%
2. Size or type of hole.	7	1	2	6	9	16	41	21%
3. Type of surface	2	4	-	7	2	1	16	8%
4. Only method used	2	2	5	-	-	-	9	5%

TABLE D (continued

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

III. PURPOSE CODE 1010 a) - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. Condition of surface	5	-	1	-	-	-	6	3%
6. Available time	1	-	-	1	2	1	5	3%
7. Available material	1	-	-	-	3	-	4	2%
8. Amount of traffic	1	-	-	-	-	-	1	1%
9. Number of available men	1	-	-	-	-	-	1	1%
10. Type of facility	-	-	-	-	-	3	3	2%
11. Amount of moisture in the base material	-	-	-	-	-	16	16	8%
12. Doesn't know	-	-	1	-	-	-	1	1%
13. No reply	-	11	4	-	-	-	15	8%
District Totals	32	20	21	29	35	52	189	
Question 4. What materials are used?								
1. Cold mix	19	17	18	19	24	17	114	40%
2. Hot mix	15	-	4	-	-	19	38	13%
3. Road oil	13	17	1	18	13	18	80	28%
4. Emulsion	-	1	12	-	14	-	27	10%
5. Gravel or rejects	3	1	-	8	7	4	23	8%
6. Chips	-	4	-	-	-	-	4	1%
District Totals	50	40	35	45	58	58	286	
Question 5. Do you attempt to keep a pot-hole free surface?								
1. Yes	18	21	19	18	24	19	119	98%
2. No	1	-	-	1	-	-	2	2%
District Totals	19	21	19	19	24	19	121	
Question 6. If a pot-hole free surface isn't the desired level of service, what is desired?								
1. Maintain pot-holes as they become hazardous	1	-	-	-	-	-	1	50%
2. During winter months maintain temporary gravel patches	-	-	-	1	-	-	1	50%
District Totals	1	-	-	1	-	-	2	
Question 7. In question 5, how do you determine when it is necessary to start maintaining pot-holes?								
1. Maintain when pot-hole is first observed	14	18	13	18	17	14	94	77%
2. Maintain when pot-hole becomes a hazard	1	1	4	1	5	3	15	12%
3. No maintenance required to date	-	1	1	-	-	-	2	2%
4. Maintain as time becomes available	-	1	-	-	2	-	3	2%
5. Maintain pot-holes twice weekly	1	-	-	-	-	-	1	1%
6. Maintain 2-3 days after pot-hole occurs	1	-	-	-	-	-	1	1%
7. Maintain when pot-hole large enough to hold moisture	1	-	-	-	-	-	1	1%
8. Area foreman determines	1	-	-	-	-	-	1	1%
9. Uses pot-hole preventive maintenance	-	-	-	-	-	1	1	1%
10. No direct reply	-	1	1	-	-	1	3	2%
District Totals	19	22	19	19	24	19	122	
Question 8. What recommendations do you have concerning patching?								
1. No recommendations	6	9	6	3	6	5	35	28%
2. Patch pot-holes as they occur	-	3	1	2	1	3	10	8%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

III. PURPOSE CODE 1010 a) - QUESTION 8 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Seal all pot-hole patches	-	3	-	3	2	1	9	7%
4. Always use permanent type patches	3	-	-	1	-	2	6	5
5. Need more routine daily patrol type patching.	2	-	-	-	3	-	5	4%
6. Need better quality patching materials.	2	-	1	1	-	1	5	4%
7. Patch pot-holes using two layers of mix	1	1	1	-	1	-	4	3%
8. Always heat mix before patching pot-holes.	1	-	-	2	1	-	4	3%
9. Square hole before patching a pot-hole.	-	-	-	1	2	1	4	3%
10. Square hole only in direction of traffic	-	-	-	1	-	-	1	1%
11. Squaring the hole is not necessary	-	-	-	-	2	1	3	2%
12. Need more compaction for pot-hole patches.	3	-	-	-	-	-	3	2%
13. Use a minimum amount of tack oil in patching pot-holes	1	-	-	-	2	1	4	3%
14. Use round patches.	-	1	-	-	-	-	1	1%
15. Use diamond shaped patches.	-	1	-	-	-	-	1	1%
16. A BST type patch does a good job.	-	3	-	-	-	-	3	2%
17. Use old material for base of new patch.	-	1	-	-	-	-	1	1%
18. Present method of patching does a good job	-	-	1	-	1	-	2	2
19. Best pot-hole patches are made in hot weather	-	-	2	-	-	-	2	2
20. Need faster pot-hole patching methods	-	-	1	-	-	-	1	1%
21. Need more men and/or equipment	-	-	2	2	1	-	5	4%
22. Always feather edges of patches	-	-	1	-	-	-	1	1%
23. Do not rake patches smooth.	-	-	1	-	-	-	1	1%
24. Tack pot-holes before patching	-	-	1	-	-	1	2	2%
25. Clean all failed material out of hole before patching.	-	-	1	1	-	1	3	2%
26. Seal coat travelway more often	-	-	-	1	-	-	1	1%
27. Keep stockdrives-off-highway and roadway	-	-	-	1	-	-	1	1%
28. Do not overheat patching materials	-	-	-	1	-	-	1	1%
29. Construct better gravel roads.	-	-	-	1	-	-	1	1%
30. Always correct cause of pot-hole.	-	-	-	-	2	-	2	2%
31. Enforce truck overloading laws	-	-	-	-	1	-	1	1%
32. Use flagmen, signing, and safety cones when patching	-	-	-	-	-	3	3	2%
District Totals	19	22	19	21	25	20	126	

1010 b) Joint and Crack Filling

Question 1. What method is used in joint and crack filling?

1. Joints and cracks are not filled.	4	8	4	1	2	1	17	14%
2. Clean crack, pour full of hot material and add cover material.	12	10	11	18	22	15	88	70%
3. Clean crack, tack and fill with premix.	7	-	-	-	-	-	7	6%
4. Fill crack with a slurry mix	-	3	3	-	-	-	6	5%
5. Spread a slurry mix over entire area	-	-	1	-	-	-	1	1%
6. Widen cracks to 3 inches and fill with premix	-	-	1	-	-	-	1	1%
7. Fill with oil and force rejects into crack	-	-	-	-	-	3	3	2%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

III. PURPOSE CODE 1010 b) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
8. No direct reply	1	-	-	-	-	-	1	1%
District Totals	21	21	20	19	24	19	124	
Question 2. What material is used?								
1. Hot road oil	4	2	2	18	19	17	62	34%
2. Hot tar	12	8	6	-	2	1	29	16%
3. Emulsion	2	-	-	-	2	-	4	2%
4. Slurry mix	-	3	7	-	-	-	10	5%
5. Crack sealer	-	2	3	-	-	-	5	3%
6. Premix	5	-	-	4	5	2	16	9%
7. Gravel or rejects	1	-	-	17	5	13	36	19%
8. Sand	-	-	-	1	10	2	13	7%
9. Chips	-	-	-	3	7	-	10	5%
District Totals	24	15	18	43	50	35	185	
Question 3. What determines when you should start filling joints and cracks?								
1. Cracks are filled in fall	8	6	9	3	-	9	35	31%
2. Cracks are filled in spring after pavement dries out	-	-	-	3	7	4	14	12%
3. Fill cracks as they occur	-	-	2	7	-	-	9	8%
4. Fill cracks during hot weather	-	-	-	6	3	2	11	10%
5. Fill cracks after pot-hole patching is completed	-	-	-	2	9	-	11	10%
6. Fill cracks when adjacent roadway surface begins to fail.	2	-	1	-	-	-	3	3%
7. Fill cracks while patching pot-holes	2	-	-	-	-	1	3	3%
8. Fill when crack is $\frac{1}{4}$ to $\frac{1}{2}$ inch wide.	2	-	1	-	-	3	6	5%
9. Area foreman determines when to maintain cracks.	2	-	-	-	1	-	3	3%
10. No experience with crack filling.	1	-	-	-	-	-	1	1%
11. Accumulate enough cracks for one complete days operation.	1	1	-	-	-	-	2	2%
12. Fill cracks before seal coating	-	3	-	-	-	-	3	3%
13. Seldom fills cracks	-	2	-	-	-	-	2	2%
14. Fill when crack is the widest.	-	3	-	-	-	-	3	3%
15. Fill cracks when time becomes available	-	-	1	1	-	1	3	3%
16. Crack filling is a special crew operation.	-	-	-	-	1	-	1	1%
17. No direct reply	1	-	1	-	1	-	3	3%
District Totals	19	15	15	22	22	20	113	
Question 4. What is your recommendation on joint and crack filling?								
1. No recommendations	8	4	6	3	5	7	33	30%
2. Present methods are not very effective.	2	5	3	1	-	6	17	16%
3. Cracking is good indication that major repair is needed	1	-	3	-	3	-	7	6%
4. Seal coating is good preventive maintenance	-	-	-	4	-	2	6	6%
5. Need a more flexible filler material	2	-	3	-	-	-	5	5%
6. Cracks should be filled as they occur	-	-	-	3	1	-	4	4%
7. Roadmix fines seal cracks better than tar	3	-	-	-	-	-	3	3%
8. Fill crack in cool weather when crack is widest.	1	-	-	-	-	-	1	1%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

III. PURPOSE CODE 1010 b) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
9. Should fill cracks more often.	1	-	-	-	-	-	1	1%
10. Present methods do a good job.	-	4	-	-	-	-	4	4%
11. Clean crack before filling with material	-	1	-	-	-	-	1	1%
12. Seal cracks on a regularly scheduled basis	-	-	-	5	-	-	5	5%
13. Mix cement with crack oil for better bonding.	-	-	-	1	-	-	1	1%
14. Backblade rejects into crack with patrol	-	-	-	1	-	-	1	1%
15. Thin crack oil with gasoline for better penetration	-	-	-	1	-	-	1	1%
16. Crack filling is good pot-hole preventive maintenance.	-	-	-	-	6	-	6	6%
17. Always heat crack sealing oil.	-	-	-	-	2	-	2	2%
18. Use tar filler instead of roadoil	-	-	-	-	2	-	2	2%
19. Hairline cracks cause no problems	-	-	-	-	1	-	1	1%
20. Fill cracks only during hot weather.	-	-	-	-	1	-	1	1%
21. Construct thicker mat to prevent cracking.	-	-	-	-	1	-	1	1%
22. Filling cracks in fall seals out winter moisture	-	-	-	-	-	2	2	2%
23. Use only a heavy roadoil for filling cracks	-	-	-	-	-	2	2	2%
24. Use a slurry mix for crack filling	-	-	-	-	-	1	1	1%
25. Fill in late spring when crack is small to save on oil	-	-	-	-	-	1	1	1%
District Totals	18	14	15	19	22	21	109	

IV. PURPOSE CODE 1020 - TRAVELWAY - SPECIAL REPAIR

Question 1. What determines the difference between Code 1010 and Code 1020?

	1	2	3	4	5	6	Totals	%
1. Code 1020 not used by maintenance man	10	11	15	11	17	1	65	50%
2. Code 1020 used when working with special crew	5	9	2	8	4	16	44	34%
3. Code 1020 used if extra equipment is required	-	-	2	-	3	-	5	4%
4. Determined by area foreman.	1	-	-	-	-	-	1	1%
5. Code 1020 used when working with shed gang crew.	-	1	-	-	-	-	1	1%
6. Code 1020 used when working with shed gang crew only if working outside own section	-	-	-	8	-	-	8	6%
7. Doesn't know	3	-	-	-	-	2	5	4%
District Totals	19	21	19	27	24	19	129	

Question 2. Are these criteria always used?

	1	2	3	4	5	6	Totals	%
1. Yes	14	7	5	19	23	17	85	70%
2. No.	1	-	-	-	-	-	1	1%
3. Determined by district office.	1	-	-	-	-	-	1	1%
4. Doesn't know	3	-	-	-	-	2	5	4%
5. No reply.	-	14	14	-	1	-	29	24%
District Totals	19	21	19	19	24	19	121	

Question 3. What repair standards concerning aggregate, asphalt, and rolling are used?

	1	2	3	4	5	6	Totals	%
1. Better equipment than that maintenance man uses.	9	-	-	18	22	16	65	36%
2. Same material as maintenance man uses	14	-	-	18	20	19	71	39%
3. Better material than maintenance man uses.	-	-	-	1	3	-	4	2%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

IV. PURPOSE CODE 1020 - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Standards are not as rigid as those for maintenance man	1	-	-	-	-	-	1	1%
5. Standards determined by special crew	-	-	2	-	-	-	2	1%
6. No direct reply	-	21	17	-	1	-	39	21%
District Totals	24	21	19	37	46	35	182	

Question 4. What condition must a small section be in before it is torn up and the section patched?

	1	2	3	4	5	6	Totals	%
1. Any major repair on a section.	6	1	5	-	-	4	16	12%
2. Section larger than shed crew can handle	5	-	-	1	1	6	13	10%
3. When roadbase is soft	-	-	-	14	15	-	29	21%
4. When surface is entirely worn out	-	-	-	12	10	-	22	16%
5. When section is greater than 50 feet long.	-	-	-	-	-	1	1	1%
6. When section is greater than 100 feet long	1	-	-	-	-	1	2	1%
7. When section is greater than 1/8 mile long	1	-	-	-	-	1	2	1%
8. When section is greater than 1/4 mile long	1	-	-	-	-	3	4	3%
9. When section is greater than 1/2 mile long	-	-	-	-	-	2	2	1%
10. When section is greater than 1 mile long	-	-	-	-	-	1	1	1%
11. District office decides when to tear up section.	-	-	-	1	-	-	1	1%
12. When section requires more than 10 loads of premix.	-	-	-	-	-	1	1	1%
13. No experience to date with this operation.	3	-	-	-	-	-	3	2%
14. No direct reply	4	20	14	1	-	-	39	29%
District Totals	21	21	19	29	26	20	136	

Question 5. What is your opinion on patching small sections?

	1	2	3	4	5	6	Totals	%
1. Special crew does a good job	11	-	-	-	1	12	24	19%
2. Tear up section only a last resort	-	-	-	3	11	-	14	11%
3. Should use special crew more often	1	-	-	2	1	-	4	3%
4. Seal all patches	-	1	-	-	1	-	2	2%
5. Proper maintenance eliminates the need for 1020 code	2	-	-	-	-	-	2	2%
6. Not pleased with special crew work	1	-	-	-	-	-	1	1%
7. Need more men	-	-	-	2	-	3	5	4%
8. Tear up section only when soft spots are present	-	-	-	2	-	-	2	2%
9. Need more travelway sealing	-	-	-	2	-	-	2	2%
10. Tear up a section only during warm weather	-	-	-	1	-	-	1	1%
11. Need more co-operation between shed and special crew	-	-	-	1	-	-	1	1%
12. Only use hot mix for patching small sections.	-	-	-	1	1	-	2	2%
13. Build stronger bases to prevent breakup	-	-	-	-	2	-	2	2%
14. Very seldom patches small areas	-	-	-	-	1	-	1	1%
15. Shed location determines amount of special crew help	-	-	-	-	-	1	1	1%
16. No opinion	4	20	19	6	8	3	60	48%
District Totals	19	21	19	20	26	19	124	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

V. PURPOSE CODE 1021 - TEAR UP AND RELAY

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to determine when it is necessary to tear up a section and relay it?								
1. Code 1021 not used by maintenance man	-	14	6	1	-	-	21	15%
2. When surface is entirely worn out	13	4	7	12	23	11	70	50%
3. When roadbase is soft	2	4	2	12	4	10	34	25%
4. Tear up only as a last resort.	2	-	-	-	-	-	2	1%
5. When section is larger than shed crew can handle	1	-	-	-	-	-	1	1%
6. Badly cracked surface mat	-	-	5	-	-	-	5	4%
7. Travelway oilmat is too rich with oil	-	-	-	-	2	-	2	1%
8. Doesn't know	1	-	1	-	-	1	3	2%
9. No direct reply	2	-	-	-	-	-	2	1%
District Totals	21	22	21	25	29	22	140	
Question 2. Who determines these criteria?								
1. District office	18	6	8	18	23	18	91	91%
2. Area foreman	1	1	4	-	1	-	7	7%
3. Maintenance man	-	-	1	-	-	-	1	1%
4. Doesn't know	-	-	-	-	-	1	1	1%
District Totals	19	7	13	18	24	19	100	

VI. PURPOSE CODE 1022 - HALF SOLE

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to determine when it is necessary to half sole a section?								
1. Code 1022 not used by maintenance man	-	8	5	-	-	-	13	10%
2. When section has solid base but poor surface.	4	13	1	18	24	4	64	52%
3. When surface is rough and expensive to maintain.	12	-	7	-	-	14	33	27%
4. When wider travelway is desired	-	1	-	-	-	1	2	2%
5. When motorists complain about rough surface	-	-	1	-	-	-	1	1%
6. When section too large to maintain by hand methods.	-	-	1	-	-	-	1	1%
7. Doesn't know	3	-	3	1	-	1	8	6%
8. No direct reply	-	1	1	-	-	-	2	2%
District Totals	19	23	19	19	24	20	124	
Question 2. Who determines these criteria?								
1. District office	17	11	13	17	17	18	93	86%
2. Area foreman	2	2	1	2	7	-	14	13%
3. Doesn't know	-	-	-	-	-	1	1	1%
District Totals	19	13	14	19	24	19	108	

VII. PURPOSE CODE 1023 - SEAL COAT

Question 1. What criteria are used to determine when it is necessary to seal coat a section?	1	2	3	4	5	6	Totals	%
1. Not used by maintenance man	-	4	-	-	-	-	4	2%
2. Surface dried out and cracked.	15	3	6	10	16	14	64	36%
3. Wearing surface is worn off	5	1	-	2	15	11	34	19%
4. Seal coat all new roadmats.	2	-	-	-	16	1	19	11%
5. Seal coat all patches	-	1	-	-	16	-	17	10%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VII. PURPOSE CODE 1023 - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. Done on a regularly scheduled basis.	-	3	-	7	4	1	15	8%
7. When moisture is getting into base material	1	-	2	-	-	-	3	2%
8. Seal coat over rich oil spots.	-	-	-	-	2	-	2	1%
9. Doesn't know	-	9	-	-	-	-	9	5%
10. No direct reply	-	-	11	-	-	-	11	6%
District Totals	23	21	19	19	69	27	178	
Question 2. Who determines these criteria?								
1. District office	17	16	19	19	24	19	114	97%
2. Area foreman	-	1	-	-	-	-	1	1%
3. No reply.	2	-	-	-	-	-	2	2%
District Totals	19	17	19	19	24	19	117	

VIII. PURPOSE CODE 1030 - SHOULDERS AND SIDE APPROACHES

1. No shoulders	-	1	-	-	-	-	1	100%

1030 a) Blading or Pulling Shoulders

Question 1. What criteria are used to determine when a shoulder should be pulled?								
1. Shoulders are not pulled	7	5	4	2	1	12	31	21%
2. When shoulder material pulls away from oil mat	7	9	11	11	16	5	59	41%
3. Paved or BST shoulders are not pulled	3	3	3	-	1	1	11	8%
4. Pull shoulders each spring or fall	1	2	2	6	2	3	16	11%
5. When shoulder is rough and out of shape	-	-	-	1	5	-	6	4%
6. Shoulder pulled to control weeds.	1	3	-	-	-	-	4	3%
7. Pull shoulder after severe storm runoff	2	-	-	-	-	-	2	1%
8. Available equipment	1	-	-	-	-	-	1	1%
9. Pull shoulder when ditches fill up with material	-	-	-	4	-	-	4	3%
10. When sod builds up above oil mat.	-	-	-	-	11	-	11	8%
District Totals	22	22	20	24	36	21	145	
Question 2. Who determines these criteria?								
1. District office	6	-	5	2	2	12	27	24%
2. Area foreman	12	15	10	12	19	4	72	64%
3. Maintenance man	1	-	1	5	2	2	11	10%
4. No direct reply	-	2	-	-	-	-	2	2%
District Totals	19	17	16	19	23	18	112	
Question 3. How is the operation performed?								
1. Pull material from ditch with patrol and blade back over shoulder with patrol or snow plow	8	11	10	15	18	6	68	81%
2. Haul in new material.	-	-	3	2	3	-	8	10%
3. Pull material from ditch and haul off	-	-	-	2	4	-	6	7%
4. Doesn't know	1	-	-	-	-	-	1	1%
5. No direct reply	-	1	-	-	-	-	1	1%
District Totals	9	12	13	19	25	6	84	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 (CONTINUED)

1030 b) Replacing Material

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. How big does a hole or low spot in the shoulder have to be before new material is used to fill it?								
1. Filled when hole becomes a hazard	7	3	1	-	11	1	23	19%
2. No particular size of hole.	2	2	7	7	-	-	18	15%
3. Keep holes filled as they occur	-	-	-	5	11	-	16	13%
4. Filled when 1-3 inches deep	-	6	6	1	-	2	15	12%
5. When material not available to pull.	7	-	-	-	-	2	9	7%
6. No maintenance required.	-	2	4	-	-	1	7	6%
7. Holes or low spots in shoulder are not filled	2	3	-	-	-	-	5	4%
8. When edge of oil mat is exposed	-	-	-	3	-	4	7	6%
9. Depends on hole location not size	-	-	-	2	-	4	6	5%
10. Fill shoulder holes as time becomes available	-	-	-	2	2	-	4	3%
11. Holes must be large enough for one truck load	1	-	-	-	-	-	1	1%
12. Holes filled during pulling operation	-	1	-	-	-	-	1	1%
13. Holes filled when business men complain about dropoff.	-	-	1	-	-	-	1	1%
14. Holes must require 4-5 shovels full of material.	-	-	-	-	-	2	2	2%
15. Holes must require 2 cubic yards of material.	-	-	-	-	-	1	1	1%
16. No direct reply	-	3	-	-	-	2	5	4%
District Totals	19	20	19	20	24	19	121	
Question 2. What type of material is used?								
1. Gravel or rejects.	13	13	13	19	19	18	95	65%
2. Premix	4	-	1	5	21	1	32	22%
3. Any available material	-	3	6	4	-	-	13	9%
4. Large boulders covered with gravel	-	-	1	5	-	-	6	4%
District Totals	17	16	21	33	40	19	146	
Question 3. Is the material compacted about the same as the original shoulder material?								
1. Yes	8	2	12	17	23	17	79	73%
2. No	9	13	3	2	1	1	29	27%
District Totals	17	15	15	19	24	18	108	
Question 4. Is water used to help compaction?								
1. Yes	-	-	2	1	2	2	7	6%
2. No	17	15	13	18	22	16	101	94%
District Totals	17	15	15	19	24	18	108	
Question 5. Is material replaced as holes appear or are holes allowed to accumulate and are all filled at the same time?								
1. Holes in shoulder are allowed to accumulate	14	7	5	8	13	11	58	54%
2. Holes are filled as they occur	3	3	4	10	11	7	38	35%
3. Holes are filled only when ditches are pulled	-	3	6	1	-	-	10	9%
4. No direct reply	-	2	-	-	-	-	2	2%
District Totals	17	15	15	19	24	18	108	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 (CONTINUED)

1030 c) Erosion Control

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What methods are used to control erosion of the shoulder?								
1. Allow natural vegetation to grow.	16	-	-	10	20	17	63	34%
2. Backfill eroded areas	8	-	1	13	9	10	41	22%
3. No control used	-	10	7	1	-	1	19	10%
4. Shoulder erosion is not a problem	-	7	8	-	-	-	15	8%
5. Uses drainage curbs	5	1	-	-	2	4	12	6%
6. Uses diversion ditches	4	-	-	-	1	2	7	4%
7. Plant grass seed	1	-	-	3	1	-	5	3%
8. Construct retaining walls	-	-	-	1	4	-	5	3%
9. Place large rock in eroded areas.	1	1	1	1	-	-	4	2%
10. Riprap eroded areas	-	-	-	2	-	1	3	2%
11. Reshape shoulder slopes.	1	-	-	-	1	-	2	1%
12. Spray shoulder with road oil	-	1	-	-	1	-	2	1%
13. Install downspouts and asphalt aprons	-	-	2	-	-	3	5	3%
14. Plow snow and the ice ridge off shoulder	-	-	-	-	-	2	2	1%
15. Keep culverts and ditches open	-	-	-	-	-	1	1	1%
District Totals	36	20	19	31	39	41	186	
Question 2. What criteria are used to determine when to use erosion control methods?								
1. Used after erosion occurs	8	-	1	13	9	10	41	47%
2. Done during construction	5	1	-	-	2	4	12	14%
3. Severe washing problem	2	-	1	1	2	4	10	12%
4. Steepness of eroded shoulder slope	-	-	-	2	5	-	7	8%
5. When vegetation will not grow.	-	-	-	1	4	-	5	6%
6. Amount of water flowing.	-	-	-	1	-	-	1	1%
7. Use control before each spring runoff	-	-	-	-	-	2	2	2%
8. Amount of snow and ice on shoulder	-	-	-	-	-	1	1	1%
9. No direct reply	2	2	2	-	1	1	8	9%
District Totals	17	3	4	18	23	22	87	
Question 3. How often is control used?								
1. Permanent type control	5	1	-	1	5	3	15	37%
2. Seldom used.	2	-	-	2	1	5	10	24%
3. Used only as needed after erosion occurs	-	-	2	1	1	-	4	10%
4. Used each spring and/or fall	-	1	-	-	1	-	2	5%
5. Used approximately once each year	3	-	-	-	-	-	3	7%
6. Used frequently	-	-	-	-	-	2	2	5%
7. No direct reply	2	1	1	-	-	1	5	12%
District Totals	12	3	3	4	8	11	41	
Question 4. How do you determine which method to use?								
1. Frequency of occurence	1	-	-	-	-	5	6	20%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 c) - QUESTION 4 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Slope of eroded shoulder	-	-	-	1	3	1	5	16%
3. Only method used	1	-	1	-	-	-	2	6%
4. Condition of water flow.	-	-	1	1	-	-	2	6%
5. Location of eroded area.	-	-	-	1	-	1	2	6%
6. Cause of erosion	-	-	-	-	1	1	2	6%
7. Severity of erosion	2	-	-	-	-	-	2	6%
8. Type of soil in area.	-	-	-	-	4	-	4	13%
9. No direct reply	2	2	1	1	-	-	6	20%
District Totals	6	2	3	4	8	8	31	
Question 5. Is grass planting ever used on shoulders to control erosion?								
1. Yes	7	-	-	9	6	1	23	19%
2. No.	11	17	13	10	18	17	86	72%
3. Doesn't know	1	-	-	-	-	-	1	1%
4. No direct reply	-	3	6	-	-	1	10	8%
District Totals	19	20	19	19	24	19	120	
Question 6. Does the use of weed sprays and sterilants cause erosion problems around guardrails, bridge abutments, culvert headwalls, etc.?								
1. Yes	4	-	-	-	1	1	6	5%
2. No.	13	2	13	16	18	14	76	63%
3. Doesn't spray weeds	2	18	3	3	5	4	35	29%
4. No direct reply	-	-	3	-	-	-	3	3%
District Totals	19	20	19	19	24	19	120	
Question 7. What are your personal recommendations concerning erosion control?								
1. No recommendations	9	18	12	5	14	11	69	56%
2. Construct flatter shoulder slopes	2	2	-	2	2	1	9	7%
3. Allow natural vegetation to grow.	-	-	1	2	3	3	9	7%
4. Plant grass on shoulders	1	-	2	1	-	-	4	3%
5. Weed sterilants should be used with caution	3	-	-	-	-	1	4	3%
6. Use course material on shoulder to prevent erosion.	-	-	-	2	1	-	3	2%
7. Spray oil seal on shoulders	1	-	-	1	1	1	4	3%
8. Keep sod cut down below travelway surface.	-	-	-	-	1	1	2	2%
9. Should use more drainage curb.	1	-	1	-	-	-	2	2%
10. Proper shoulder compaction reduces erosion	1	-	-	-	-	-	1	1%
11. Natural vegetation is a continual erosion control	1	-	-	-	-	-	1	1%
12. Grassy shoulders hold too much moisture in base.	1	-	-	-	-	-	1	1%
13. Always backfill eroded area with gravel	1	-	-	-	-	-	1	1%
14. Place a clay material on shoulder to reduce erosion	-	-	1	-	-	-	1	1%
15. Make farmers control waste irrigation water	-	-	1	-	-	-	1	1%
16. Erosion of shoulder has not been a problem	-	-	1	-	-	-	1	1%
17. Should BST or pave all shoulders.	-	-	-	1	-	-	1	1%
18. Plow snow completely off shoulders	-	-	-	1	-	-	1	1%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 c) - QUESTION 7 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
19. Need more retaining walls	-	-	-	2	-	-	2	2%
20. Do not drive on wet shoulders.	-	-	-	2	-	-	2	2%
21. Install drains in problem areas	-	-	-	-	1	-	1	1%
22. Make ditches large enough to handle drainage water.	-	-	-	-	1	-	1	1%
23. Asphalt aprons provide good erosion control	-	-	-	-	-	1	1	1%
District Totals	21	20	19	19	24	19	122	

1030 d) Reshaping - Shoulders

Question 1. What determines when shoulders should be reshaped?

	1	2	3	4	5	6	Totals	%
1. Shoulders not reshaped	3	8	6	-	3	5	25	18%
2. When edge of oil mat is exposed	5	8	11	7	10	2	43	32%
3. When the shoulder is rough and torn up.	5	-	-	13	1	4	23	17%
4. When shoulder sod is higher than edge of oil mat	-	-	-	2	12	3	17	13%
5. When shoulder doesn't drain properly	3	-	-	3	-	5	11	8%
6. When a wider shoulder is desired.	1	-	-	1	2	-	4	3%
7. Done annually in spring or fall	-	2	1	-	-	-	3	2%
8. Excessive weed growth	-	3	-	-	-	-	3	2%
9. When shoulder washed out	-	-	1	-	-	-	1	1%
10. When shoulder slope is too steep.	-	-	-	-	-	3	3	2%
11. Not familiar with operation	2	-	-	-	-	1	3	2%
District Totals	19	21	19	26	28	23	136	

Question 2. How is reshaping accomplished?

	1	2	3	4	5	6	Totals	%
1. Pull material from ditch with patrol and blade back over shoulder with patrol or snowplow.	8	11	11	11	21	13	75	74%
2. Haul in new material.	4	-	1	8	3	1	17	17%
3. Reshape with hand tools.	1	-	-	3	-	-	4	4%
4. Cut shoulder sod off with patrol.	2	-	-	-	-	1	3	3%
5. No direct reply	-	1	1	-	-	-	2	2%
District Totals	15	12	13	22	24	15	101	

Question 3. Is any standard slope used?

	1	2	3	4	5	6	Totals	%
1. Use any slope that will drain water.	4	12	12	12	9	10	59	63%
2. Try to maintain original slope	10	-	1	7	12	5	35	37%
District Totals	14	12	13	19	21	15	94	

Question 4. What is the purpose of the reshaping?

	1	2	3	4	5	6	Totals	%
1. To establish good drainage.	6	5	8	4	14	9	46	40%
2. To provide stability to travelway surface.	7	2	2	3	-	3	17	15%
3. To maintain a reasonable slope	-	4	4	1	7	-	16	14%
4. To maintain original shape.	3	-	-	11	-	-	14	12%
5. To present a pleasing shoulder appearance.	4	-	-	2	1	5	12	11%
6. To control weeds	-	4	-	-	-	-	4	4%
7. To provide wider shoulder width	-	-	-	2	1	-	3	3%
8. No direct reply	-	-	-	1	-	-	1	1%
District Totals	20	15	14	24	23	17	113	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 d) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	
Question 5. After reshaping has been completed, is the shoulder rolled to compact it?								
1. Yes	6	-	1	11	5	10	33	36%
2. No.	8	11	12	8	16	1	56	61%
3. No direct reply	-	1	-	-	2	-	3	3%
District Totals	14	12	13	19	23	11	92	

1030 e) Patching - Paved or Bituminous Treated Shoulders

Question 1. What standard is used for shoulder patching?								
1. No BST's or paved shoulders	10	7	11	17	13	8	66	55%
2. Uses main travelway patching standards.	8	10	6	2	11	11	48	40%
3. Add ½ sole patch over broken up areas	-	1	1	-	-	-	2	2%
4. Remove old material and fill with premix	1	-	-	-	-	-	1	1%
5. No maintenance required to date	-	2	1	-	-	-	3	2%
District Totals	19	20	19	19	24	19	120	
Question 2. What criteria are used to determine this standard?								
1. Shoulder considered part of travelway	7	10	5	1	6	5	34	67%
2. Size and depth of pot-hole or failed area.	1	1	2	-	-	-	4	8%
3. Type of shoulder	1	-	-	-	-	3	4	8%
4. No direct reply	-	-	-	1	5	3	9	17%
District Totals	9	11	7	2	11	11	51	
Question 3. What criteria are used to determine when shoulder patching is necessary?								
1. Shoulder patched as holes appear.	8	4	-	2	8	10	32	63%
2. Determined by amount of break-up.	-	7	6	-	-	-	13	25%
3. Accumulate enough holes for one complete days operation	1	-	-	-	-	-	1	2%
4. Number of complaints.	-	-	1	-	-	-	1	2%
5. Patched after travelway is patched	-	-	-	-	-	1	1	2%
6. No direct reply	-	-	-	-	3	-	3	6%
District Totals	9	11	7	2	11	11	51	
Question 4. What guide is used to determine when a patch is no longer practical and an entire section is replaced?								
1. Rough, broken-up section of shoulder	4	-	4	2	7	7	24	47%
2. Number and size of holes	2	11	-	-	-	-	13	25%
3. Shoulders are not patched	-	-	1	-	-	-	1	2%
4. Area foreman determines.	-	-	1	-	-	-	1	2%
5. District office determines.	-	-	1	-	-	-	1	2%
6. Only has had pot-hole type failures to date	-	-	-	-	-	3	3	6%
7. Doesn't know	2	-	-	-	-	-	2	4%
8. No direct reply	1	-	-	-	4	1	6	12%
District Totals	9	11	7	2	11	11	51	
Question 5. Is the material used for the patch the same quality as that used for a pot-hole in the main travelway?								
1. Yes	9	11	7	2	9	11	49	96%

TABLE D: (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 e) - QUESTION 5 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. No direct reply	-	-	-	-	2	-	2	4%
District Totals	9	11	7	2	11	11	51	

1030 f) Surface Treating - Shoulders

Question 1. What criteria are used to determine that a shoulder surface treatment is necessary?	1	2	3	4	5	6	Totals	%
1. Not done by maintenance man	6	20	16	16	20	-	78	62%
2. When wider travelway is desired	8	-	1	1	3	12	25	20%
3. When gravel shoulder is continual problem.	-	-	1	2	-	6	9	7%
4. When travelway mat edge needs additional stability.	2	-	-	-	-	3	5	4%
5. Used for weed control on shoulder	1	-	-	-	1	1	3	2%
6. District office determines.	1	-	1	-	-	-	2	2%
7. Area foreman determines.	1	-	-	-	-	-	1	1%
8. Not familiar with operation	-	-	-	-	-	2	2	2%
District Totals	19	20	19	19	24	24	125	

Question 2. In what ways does the cross-section of the shoulder differ between a gravel shoulder and a surface treated shoulder?	1	2	3	4	5	6	Totals	%
1. No difference between cross-sections	3	-	-	3	1	1	8	20%
2. BST shoulder is wider than gravel shoulder	4	-	-	-	-	3	7	17%
3. Gravel shoulder is thicker.	2	-	-	-	-	-	2	5%
4. Doesn't know	2	-	2	-	-	-	4	10%
5. No direct reply	2	-	1	-	3	13	19	48%
District Totals	13	-	3	3	4	17	40	

Question 3. What types of treatments are used?	1	2	3	4	5	6	Totals	%
1. Apply seal coat in one or two layers	10	-	3	3	3	17	36	71%
2. Construct asphalt mat	2	-	-	-	-	9	11	21%
3. Apply penetration seal	1	-	-	-	1	-	2	4%
4. Doesn't know	1	-	-	-	-	-	1	2%
5. No direct reply	1	-	-	-	-	-	1	2%
District Totals	15	-	3	3	4	26	51	

Question 4. What determines the type of treatment to be used?	1	2	3	4	5	6	Totals	%
1. Only uses one method.	2	-	1	2	-	-	5	12%
2. District office determines.	2	-	-	-	-	1	3	8%
3. Area foreman determines.	1	-	-	-	-	-	1	2%
4. Type of available base material	-	-	-	-	1	1	2	5%
5. Type and amount of shoulder use	-	-	-	-	-	8	8	20%
6. Doesn't know	7	-	1	-	-	-	8	20%
7. No direct reply	1	-	1	1	3	7	13	33%
District Totals	13	-	3	3	4	17	40	

1030 g) Replacing Large Failed Areas

Question 1. What determines when a large failed area should be replaced?	1	2	3	4	5	6	Totals	%
1. Replace as they occur	6	1	1	5	9	11	33	27%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

VIII. PURPOSE CODE 1030 g) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. Replace material before oil mat breaks off	9	-	-	7	4	2	22	18%
3. Replace when shoulder is worn away and dropoff is hazardous	1	-	-	4	2	4	11	9%
4. Replace material as time becomes available	-	-	-	4	2	2	8	6%
5. Presently material not replaced	-	19	2	-	-	-	21	17%
6. District office determines	2	-	-	-	-	-	2	2%
7. When shoulder material is broken up or washed away	-	-	8	-	-	-	8	6%
8. Replace material after travelway is patched	-	-	-	-	-	1	1	1%
9. No maintenance required	-	-	-	-	4	-	4	3%
10. No direct reply	1	-	9	-	3	1	14	11%
District Totals	19	20	20	20	24	21	124	
Question 2. What type of materials are used?								
1. Gravel	9	-	-	18	16	13	56	37%
2. Premix	10	1	9	6	16	8	50	33%
3. Rock	-	-	-	8	12	-	20	13%
4. Pit run material	-	-	-	10	-	4	14	9%
5. Rejects	-	-	1	1	3	-	5	3%
6. Original material	2	-	-	-	-	2	4	3%
7. Dirt	-	-	-	1	-	-	1	1%
8. Sand	-	-	-	-	1	-	1	1%
District Totals	21	1	10	44	48	27	151	
Question 3. To what depth is the failed material removed?								
1. Removed to solid material	8	-	1	14	16	7	46	53%
2. Not removed, add additional material	8	-	-	3	1	11	23	26%
3. Removed approximately 12-18 inches deep	1	-	1	-	-	1	3	3%
4. Removed approximately 2-3 inches deep	1	1	7	-	2	-	11	13%
5. Not removed below ditchline	-	-	-	2	1	-	3	3%
6. No direct reply	1	-	1	-	-	-	2	2%
District Totals	19	1	10	19	20	19	88	
Question 4. What standards are used in reconstructing the section?								
1. Try to maintain original or better standards	7	-	-	6	-	18	31	35%
2. Rebuild section with gravel and surface with premix	1	1	-	2	14	-	18	20%
3. Rebuild section with gravel	3	-	-	9	4	-	16	18%
4. Place ½ sole over original shoulder mat	5	-	-	-	-	-	5	6%
5. Rebuild section with premix	2	-	4	-	-	-	6	7%
6. Reconstruct with a French drain to remove water	-	-	-	1	-	-	1	1%
7. Doesn't know	1	-	4	-	-	-	5	6%
8. No direct reply	-	-	2	1	2	1	6	7%
District Totals	19	1	10	19	20	19	88	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

IX. PURPOSE CODE 1032 - MOWING

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What areas along your section require mowing?								
1. Completely mowed section	18	13	12	15	20	19	97	80%
2. Section not mowed.	1	1	2	2	-	-	6	5%
3. Mow approximately 50% of section.	-	4	5	-	3	-	12	10%
4. Mow approximately 25% of section.	-	-	-	-	1	-	1	1%
5. Paved section mowed, gravel section not mowed	-	-	-	2	-	-	2	2%
6. Only mows flat areas.	-	1	-	-	-	-	1	1%
7. Only mows seeded areas	-	1	-	-	-	-	1	1%
8. No direct reply	-	1	-	-	-	-	1	1%
District Totals	19	21	19	19	24	19	121	
Question 2. What determines when you should mow them?								
1. General weed and grass height.	9	20	6	1	-	2	38	24%
2. When mower is available.	4	1	9	7	9	4	34	22%
3. When grass is 6 inches high	1	-	-	-	-	-	1	1%
4. When grass is 8-12 inches high	1	-	-	10	10	8	29	19%
5. When grass is 12-18 inches high	2	-	-	1	2	1	6	4%
6. When grass is approximately 3 feet high	-	-	-	-	2	-	2	1%
7. Mowed 2 or 3 times each year	3	1	3	2	15	7	31	20%
8. Mowed annually.	-	-	1	-	4	2	7	4%
9. Mowed as time becomes available	2	1	3	-	-	1	7	4%
10. Area foreman determines.	1	-	-	-	-	-	1	1%
District Totals	23	23	22	21	42	25	156	
Question 3. To what height do you mow?								
1. Mow as low as possible	3	13	7	1	5	4	33	28%
2. Mow to 1-3 inches high	1	-	-	5	-	2	8	7%
3. Mow to 3-5 inches high	12	3	5	11	20	6	57	48%
4. Mow to 6-8 inches high	2	3	4	-	1	7	17	14%
5. Mow to 8-12 inches high.	-	1	1	-	-	1	3	3%
District Totals	18	20	17	17	26	20	118	
Question 4. Does the height vary with the type of area being mowed?								
1. Yes	15	14	11	17	23	19	99	86%
2. No.	3	6	6	-	1	-	16	14%
District Totals	18	20	17	17	24	19	115	
Question 5. What equipment is used to do the mowing?								
1. Sickle mower is used.	15	17	11	14	19	18	94	65%
2. Rotary mower is used.	10	6	5	8	12	5	46	32%
3. Combination rotary-sickle mower is used	-	-	2	-	-	1	3	2%
4. Uses hand scythe	-	-	-	1	-	-	1	1%
District Totals	25	23	18	23	31	24	144	
Question 6. What recommendations do you have concerning the mowing operation?								
1. No recommendations	4	17	5	1	8	6	41	33%
2. Need more and better mower.	3	-	9	15	13	1	41	33%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

IX. PURPOSE CODE 1032 - QUESTION 6 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Design flatter slopes for mowing.	3	-	-	3	-	3	9	7%
4. Need to mow more often	1	-	-	3	2	-	6	5%
5. Use weed spray to facilitate mowing operation	-	1	-	-	1	1	3	2%
6. Mow as low as possible	1	-	-	-	-	2	3	2%
7. Cut grass before it blooms and goes to seed	-	-	2	-	-	1	3	2%
8. Mowing late in the season helps to prevent snow drifting.	1	-	-	-	-	1	2	2%
9. Should mow complete right-of-way.	1	-	-	-	1	-	2	2%
10. Allow maintenance man to mow own section	1	-	-	-	1	-	2	2%
11. Assign one man to mow each maintenance area	1	-	-	-	-	-	1	1%
12. Mowing is a secondary maintenance operation	1	-	-	-	-	-	1	1%
13. Pick up trash before mowing	1	-	-	-	-	-	1	1%
14. Remove all grass from shoulder area.	-	1	-	-	-	-	1	1%
15. Need a combination sickle-rotary mower.	-	1	-	-	-	-	1	1%
16. Harrow gopher mounds before mowing	-	-	1	-	-	-	1	1%
17. Need puncture proof tires on mowers.	-	-	1	-	-	-	1	1%
18. Use balloon tires to prevent slipping on shoulders	-	-	-	-	-	2	2	2%
19. Rotary mowers are best for shoulders	-	-	-	-	-	1	1	1%
20. Sage brush is hard to mow	-	-	-	-	-	1	1	1%
District Totals	18	20	18	22	26	19	123	

X. PURPOSE CODE 1033 - TRASH GATHERING

Question 1. What do you use to determine when to gather trash along the right of way?

1. Roadside trash not picked up	-	1	-	-	-	-	1	1%
2. Noticeable trash picked up daily.	2	6	7	8	16	7	46	26%
3. When roadside has trashy appearance.	7	-	5	6	3	2	23	13%
4. Gathers trash each spring and fall	1	11	2	4	4	7	29	17%
5. Trash gathering is a fill-in job.	8	1	5	4	8	7	33	19%
6. Yearly project.	2	-	-	6	11	-	19	11%
7. Spring project.	1	3	-	-	-	5	9	5%
8. Fall project	1	3	-	-	-	-	4	2%
9. Trash gathered on a weekly basis.	-	-	-	-	4	3	7	4%
10. Trash gathered once each month	-	-	-	1	-	-	1	1%
11. No direct reply	1	1	-	-	-	-	2	1%
District Totals	23	26	19	29	46	31	174	

Question 2. Do you clean the complete right-of-way or just the barrow pit?

1. Complete right-of-way is cleaned.	17	14	10	6	12	16	75	62%
2. Barrow pit is cleaned and any noticeable trash picked up.	-	2	8	11	11	-	32	27%
3. Clean only the barrow pit	2	3	1	2	1	3	12	10%
4. No direct reply	-	1	-	-	-	-	1	1%
District Totals	19	20	19	19	24	19	120	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

X. PURPOSE CODE 1033 - QUESTION 3

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	
Question 3. Is any type of equipment used to assist in trash gathering?								
1. No equipment or other aids are used.	3	13	16	11	6	12	61	49%
2. Uses a rockfork or pitchfork	13	2	-	-	2	2	19	15%
3. Uses a bucket	1	-	1	4	11	1	18	14%
4. Uses a gunnysack	4	4	1	-	2	-	11	9%
5. Uses a spud basket	3	-	-	-	-	4	7	6%
6. Uses a sharp stick	-	-	1	2	2	-	5	4%
7. Uses a front end loader.	-	1	-	-	-	-	1	1%
8. Boom on truck lifts litter barrels	-	-	-	2	-	-	2	2%
9. Uses boxes	-	-	-	-	1	-	1	1%
District Totals	24	20	19	19	24	19	125	
Question 4. Do turnouts require more attention than general right-of-way sections?								
1. Yes	10	-	7	14	11	11	53	44%
2. No.	5	19	12	5	11	7	59	49%
3. No turnouts on section	4	-	-	-	2	1	7	6%
4. No direct reply	-	1	-	-	-	-	1	1%
District Totals	19	20	19	19	24	19	120	
Question 5. Does Code 1033 include litter barrels?								
1. Yes	10	19	19	17	21	13	99	82%
2. No.	4	-	-	2	-	5	11	9%
3. No litter barrels on section	5	2	-	-	3	1	11	9%
District Totals	19	21	19	19	24	19	121	

XI. PURPOSE CODE 1034 - SPRAYING AND WEED CONTROL

1. No spraying done on section	2	18	3	3	5	4	35	100%
1034 a) Guardrails								
Question 1. How often is spraying and weed control performed?								
1. No guardrails on section	-	-	1	-	-	2	3	4%
2. Guardrails sprayed annually	11	-	-	16	15	7	49	57%
3. Guardrails sprayed every 2 years.	2	1	1	-	2	2	8	9%
4. Guardrails sprayed every 3 years.	4	-	11	-	-	-	15	18%
5. Guardrails sprayed every 4 or 5 years	-	-	1	-	1	-	2	2%
6. Guardrails sprayed this year for the first time.	-	2	-	-	-	4	6	7%
7. Frequency of spraying depends on previous weed kill	-	-	1	-	-	-	1	1%
8. Guardrails not sprayed	-	-	1	-	-	-	1	1%
9. No direct reply	-	-	-	-	1	-	1	1%
District Totals	17	3	16	16	19	15	86	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	1	1	13	-	11	4	30	28%
2. Spray in the spring	7	-	-	3	8	12	30	28%
3. Spray when adequate ground moisture is present	3	-	-	13	13	-	29	28%
4. Spray when equipment and/or spray are available.	4	-	1	1	-	-	6	6%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 a) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. Spray in the fall.	5	-	-	-	1	-	6	6%
6. Spray during early summer	1	-	-	-	-	-	1	1%
7. District office determines when to spray	-	-	1	-	-	-	1	1%
8. Doesn't know	-	2	-	-	-	-	2	2%
District Totals	21	3	15	17	33	16	105	
Question 3. Do all sections receive the same treatment?								
1. Yes	15	3	14	12	9	11	64	78%
2. No.	2	-	-	4	9	2	17	21%
3. Doesn't know	-	-	-	-	1	-	1	1%
District Totals	17	3	14	16	19	13	82	
Question 4. Does length or size have anything to do with the type of treatment performed?								
1. No.	17	3	12	16	19	13	80	98%
2. No direct reply	-	-	2	-	-	-	2	2%
District Totals	17	3	14	16	19	13	82	

1034 b) Signs - Right-of-Way Markers

Question 1. How often is spraying and weed control performed?								
1. Signs, etc., sprayed annually.	11	-	-	14	14	7	46	54%
2. Signs, etc., sprayed every 2 years	2	-	-	-	1	4	7	8%
3. Signs, etc., sprayed every 3 years	4	1	8	-	1	-	14	16%
4. Signs, etc., sprayed every 4-5 years	-	-	1	-	1	-	2	2%
5. Signs, etc., sprayed this year for the first time	-	2	-	-	-	4	6	7%
6. Salt is used to control weeds around signs	-	-	-	1	-	-	1	1%
7. Signs, etc., sprayed when equipment and spray are available	-	-	-	1	-	-	1	1%
8. Signs, etc., not sprayed	-	-	6	-	-	-	6	7%
9. No direct reply	-	-	1	-	2	-	3	4%
District Totals	17	3	16	16	19	15	86	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	1	1	8	-	6	4	20	18%
2. Spray in the spring	7	-	-	3	16	10	36	32%
3. Spray when adequate ground moisture is present	5	-	-	10	16	3	34	31%
4. Spray when equipment and/or spray are available.	4	-	1	-	2	1	8	7%
5. Spray in the fall.	5	-	-	-	-	-	5	4%
6. Spray during early summer	1	-	-	-	-	1	2	2%
7. District office determines when to spray	-	-	1	-	-	-	1	1%
8. Doesn't know	-	2	-	-	-	-	2	2%
9. No direct reply	-	-	-	3	-	-	3	3%
District Totals	23	3	10	16	40	19	111	
Question 3. Do all sections receive the same treatment?								
1. Yes	15	3	10	9	9	10	56	70%
2. No.	2	-	-	6	9	5	22	28%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 b) - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
3. Doesn't know	-	-	-	1	1	-	2	2%
District Totals	17	3	10	16	19	15	80	
1034 c) Delineators								
Question 1. How often is spraying and weed control performed?								
1. No delineators on section	1	-	-	1	1	5	8	9%
2. Delineators sprayed annually	9	-	1	13	14	3	40	47%
3. Delineators sprayed every 2 years	1	-	-	-	1	2	4	5%
4. Delineators sprayed every 3 years	4	1	6	-	1	-	12	14%
5. Delineators sprayed every 4-5 years	-	-	1	-	1	-	2	2%
6. Delineators sprayed this year for the first time	-	2	-	-	-	2	4	5%
7. Delineators not sprayed	2	-	7	2	1	3	15	17%
8. No direct reply	-	-	1	-	-	-	1	1%
District Totals	17	3	16	16	19	15	86	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	1	1	7	-	6	2	17	19%
2. Spray in the spring	4	-	-	3	13	6	26	30%
3. Spray when adequate ground moisture is present	4	-	-	10	13	3	30	34%
4. Spray when equipment and/or spray are available	5	-	1	-	1	1	8	9%
5. Spray in the fall	4	-	-	-	-	-	4	5%
6. Doesn't know	-	2	-	-	-	-	2	2%
7. No direct reply	-	-	1	-	-	-	1	1%
District Totals	18	3	9	13	33	12	88	
Question 3. Do all sections receive the same treatment?								
1. Yes	12	3	8	9	9	6	47	75%
2. No.	2	-	1	3	7	1	14	22%
3. Doesn't know	-	-	-	1	1	-	2	3%
District Totals	14	3	9	13	17	7	63	
1034 d) Headwalls, Pipes, etc.								
Question 1. How often is spraying and weed control performed?								
1. No headwalls, pipes, etc., on section	-	3	-	-	-	-	3	4%
2. Headwalls, pipes, etc., sprayed annually	10	-	-	10	11	7	38	44%
3. Headwalls, pipes, etc., sprayed every 2 years	1	-	-	-	1	2	4	5%
4. Headwalls, pipes, etc., sprayed every 3 years	4	-	3	-	1	-	8	9%
5. Headwalls, pipes, etc., sprayed every 4-5 years	-	-	-	-	1	-	1	1%
6. Headwalls, pipes, etc., sprayed for the first time	-	-	-	-	-	3	3	4%
7. Headwalls, pipes, etc., sprayed every spring and fall	-	-	-	1	-	-	1	1%
8. Weeds around headwalls, pipes, etc., are cut by hand	-	-	-	-	2	-	2	2%
9. Headwalls, pipes, etc., not sprayed	2	-	13	5	1	2	23	27%
10. Doesn't know	-	-	-	-	-	1	1	1%
11. No direct reply	-	-	-	-	2	-	2	2%
District Totals	17	3	16	16	19	15	86	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XI. PURPOSE CODE 1034 d) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	1	-	3	-	6	4	14	15%
2. Spray in the spring	4	-	-	2	15	12	33	36%
3. Spray when adequate ground moisture is present	5	-	-	8	14	3	30	32%
4. Spray when equipment and/or spray are available	6	-	-	-	2	1	9	10%
5. Spray in the fall	5	-	-	-	-	-	5	5%
6. Spray during early summer	1	-	-	-	-	-	1	1%
7. Clean when plugged with weeds	-	-	-	1	-	-	1	1%
District Totals	22	-	3	11	37	20	93	
Question 3. Do all sections receive the same treatment?								
1. Yes	12	-	3	7	8	9	39	65%
2. No	3	-	-	3	9	4	19	32%
3. Doesn't know	-	-	-	1	1	-	2	3%
District Totals	15	-	3	11	18	13	60	
1034 e) Bridges								
Question 1. How often is spraying and weed control performed?								
1. No bridges on section	-	-	-	1	1	-	2	2%
2. Bridges sprayed annually	10	-	-	11	11	9	41	48%
3. Bridges sprayed every 2 years	1	-	-	-	1	2	4	5%
4. Bridges sprayed every 3 years	4	1	5	-	1	-	11	13%
5. Bridges sprayed every 4-5 years	-	-	1	-	1	-	2	2%
6. Bridges sprayed this year for the first time	-	2	-	-	-	4	6	7%
7. Weeds around bridges are cut by hand	-	-	-	-	2	-	2	2%
8. Bridges not sprayed	2	-	9	4	-	-	15	17%
9. No direct reply	-	-	1	-	2	-	3	4%
District Totals	17	3	16	16	19	15	86	
Question 2. What determines when to perform this work?								
1. Amount of weed growth determines when to spray	1	1	5	1	5	4	17	17%
2. Spray in spring	5	-	-	-	15	13	33	33%
3. Spray when adequate ground moisture is present	5	-	-	7	14	3	29	29%
4. Spray when equipment and/or spray are available	5	-	-	3	2	1	11	11%
5. Spray in fall	5	-	-	-	-	-	5	5%
6. Spray during early summer	1	-	-	-	-	1	2	2%
7. District office determines when to spray	-	-	1	-	-	-	1	1%
8. Doesn't know	-	2	-	-	-	-	2	2%
9. No direct reply	-	-	1	-	-	-	1	1%
District Totals	22	3	7	11	36	22	101	
Question 3. Do all sections receive the same treatment?								
1. Yes	13	3	7	7	9	12	51	74%
2. No	2	-	-	3	8	3	16	23%
3. Doesn't know	-	-	-	1	1	-	2	3%
District Totals	15	3	7	11	18	15	69	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 - ROADSIDE AND DRAINAGE

1040 a) Ditches and Gutters

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What criteria are used to determine when cleaning is required?								
1. No maintenance required.	3	5	1	2	1	-	12	9%
2. Clean as they fill up	7	6	6	4	17	6	46	35%
3. Clean each spring and fall.	-	3	12	2	5	6	28	21%
4. Clean each fall	10	6	-	9	-	11	36	28%
5. Clean each spring.	-	-	-	-	3	-	3	2%
6. Area foreman determines.	1	-	-	-	-	-	1	1%
7. Clean after dragging shoulders	1	-	-	-	-	-	1	1%
8. No ditches on section	-	1	-	-	-	-	1	1%
9. Clean ditches as time becomes available	-	-	-	2	-	-	2	2%
District Totals	22	21	19	19	26	23	130	
Question 2. What methods are used in the cleaning operation?								
1. Remove material from ditch.	15	14	16	17	22	19	103	92%
2. Burn weeds in ditch	-	2	1	-	-	-	3	3%
3. Special crew job	1	-	-	-	-	-	1	1%
4. Cut brush and trees back away from ditch	-	-	-	-	1	-	1	1%
5. No direct reply	-	2	1	-	-	-	3	3%
District Totals	16	18	18	17	23	19	111	
Question 3. What equipment is used for this cleaning?								
1. Motor patrol	7	2	11	10	21	13	64	25%
2. Trucks	3	3	18	9	19	11	63	24%
3. Frontend loader	1	3	11	13	17	13	58	23%
4. Handtools	8	11	7	3	1	6	36	14%
5. Belt loader.	-	-	-	3	11	-	14	5%
6. Power shovel	10	-	-	-	-	-	10	4%
7. Back hoe.	1	-	-	3	1	1	6	2%
8. Tire drag	-	-	1	-	-	-	1	1%
9. Power saw	-	-	-	-	1	-	1	1%
10. No direct reply	-	2	-	-	-	-	2	1%
District Totals	30	21	48	41	71	44	255	

1040 b) Culverts

Question 1. What criteria are used to determine when cleaning is required?								
1. Clean each spring and fall.	2	7	11	1	15	8	44	35%
2. Clean each fall	12	5	1	11	4	8	41	33%
3. Clean each spring.	-	-	3	-	3	1	7	5%
4. Clean when plugged	6	7	4	5	2	2	26	21%
5. Clean when a complaint is made	-	-	1	-	-	-	1	1%
6. Clean when burning weeds on section.	-	-	1	-	-	-	1	1%
7. Clean when grass begins to cover ends of culvert	-	-	1	-	-	-	1	1%
8. Clean as time becomes available	-	-	-	2	-	-	2	2%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 b) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
9. No maintenance required.	-	2	-	-	-	-	2	2%
District Totals	20	21	22	19	24	19	125	
Question 2. What methods are used in the cleaning operation?								
1. Clean material out of culvert ends	16	17	13	19	24	16	105	72%
2. Flush culvert out with water	3	-	3	7	8	-	21	15%
3. Rod out with long rod	1	-	3	-	-	3	7	5%
4. Burn weeds at culvert ends.	-	-	1	-	-	4	5	3%
5. Pull wire hook-drag through culvert.	-	1	-	-	-	-	1	1%
6. During winter chop ice out of culvert ends	-	-	-	-	-	2	2	1%
7. No direct reply	-	4	-	-	-	-	4	3%
District Totals	20	22	20	26	32	25	145	
Question 3. What equipment is used for this cleaning?								
1. Handtools	16	15	15	19	24	18	107	63%
2. Water truck or water pump	3	-	3	7	8	-	21	12%
3. Frontend loader	2	-	5	2	1	6	16	9%
4. Back hoe.	1	-	5	1	2	2	11	6%
5. Long rod with steel hooks on the end	1	-	3	-	-	2	6	3%
6. Weedburner	2	-	-	-	-	1	3	2%
7. Dump truck	-	1	-	-	-	-	1	1%
8. Motor patrol	-	-	-	-	1	-	1	1%
9. Power saw	-	-	-	-	1	-	1	1%
10. No direct reply	-	4	-	-	-	-	4	2%
District Totals	25	2[illegible]	3[illegible]	29	37	29	171	

1040 c) Side Drains and Diversion Ditches

Question 1. What criteria are used to determine when cleaning is required?								
1. No side drains or diversion ditches on section	8	15	-	10	16	12	61	50%
2. No maintenance required.	2	3	8	1	-	-	14	11%
3. Cleaned when ditch is filling or completely plugged	8	1	6	6	4	1	26	21%
4. Cleaned each spring and fall	-	1	3	1	3	-	8	6%
5. Cleaned each fall.	1	1	-	-	-	6	8	6%
6. Inspected twice monthly.	-	-	2	-	-	-	2	2%
7. Cleaned once each year	-	-	-	2	-	-	2	2%
8. Inspected during freezing weather	-	-	-	-	1	-	1	1%
9. Inspected during storms.	-	-	-	-	-	1	1	1%
District Totals	19	21	19	20	24	20	123	
Question 2. What methods are used in the cleaning operation?								
1. Hand clean drains and ditches.	5	3	11	3	7	6	35	66%
2. Wash material out of drains and ditches	2	-	-	5	-	-	7	13%
3. Sweep material out of drains and ditches	5	-	-	-	-	-	5	9%
4. Rod out plugged material	1	-	-	3	-	-	4	8%
5. Use rock salt to melt ice which forms in ditches	-	-	-	-	1	-	1	2%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 c) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
6. Clean ditch with patrol.	-	-	-	-	-	1	1	2%
District Totals	13	3	11	11	8	7	53	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	9	3	10	3	7	6	38	70%
2. Water truck or water pump	2	-	-	5	-	-	7	13%
3. Long rod.	1	-	-	3	-	-	4	7%
4. Motor patrol	-	-	1	-	-	1	2	4%
5. Frontend loader	-	-	-	-	1	1	2	4%
6. Back hoe.	-	-	-	1	-	-	1	2%
District Totals	12	3	11	12	8	8	54	
1040 d) Subdrains								
Question 1. What criteria are used to determine when cleaning is required?								
1. No subdrains on section.	11	19	9	14	17	12	82	68%
2. No maintenance required.	4	-	8	3	5	4	24	20%
3. Cleaned when plugged.	3	2	-	-	1	3	9	7%
4. Cleaned each spring and fall	-	-	1	-	-	-	1	1%
5. Cleaned annually	1	-	-	1	-	-	2	2%
6. Inspected twice monthly.	-	-	1	-	-	-	1	1%
7. Inspected monthly.	-	-	-	1	-	-	1	1%
8. Inspected during freezing weather	-	-	-	-	1	-	1	1%
District Totals	19	21	19	19	24	19	121	
Question 2. What methods are used in the cleaning operation?								
1. Open ends of subdrain pipe.	4	1	-	1	-	1	7	41%
2. Rod out subdrain pipe	-	-	2	2	2	-	6	35%
3. Dig out subdrain and replace pipe	-	1	-	-	-	3	4	24%
District Totals	4	2	2	3	2	4	17	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	4	1	2	1	-	1	9	53%
2. Long rod.	-	-	-	2	2	-	4	24%
3. Back hoe.	-	-	-	-	-	1	1	6%
4. Frontend.	-	-	-	-	-	1	1	6%
5. Motor patrol	-	-	-	-	-	1	1	6%
6. No direct reply	-	1	-	-	-	-	1	6%
District Totals	4	2	2	3	2	4	17	
1040 e) Storm Sewers								
Question 1. What criteria are used to determine when cleaning is required?								
1. No storm sewers on section.	12	17	14	15	22	17	97	80%
2. No maintenance required.	3	3	4	3	-	-	13	11%
3. Cleaned when grate covered with trash	2	1	-	1	2	1	7	6%
4. Cleaned each fall.	2	-	-	-	-	1	3	2%
5. Inspected twice monthly.	-	-	1	-	-	-	1	1%
District Totals	19	21	19	19	24	19	121	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 e) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. What methods are used in the cleaning operation?								
1. Rake trash off grate.	2	1	1	1	2	2	9	75%
2. Shovel out bottom of catch-basin.	2	-	-	-	-	1	3	25%
District Totals	4	1	1	1	2	3	12	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	4	1	1	1	2	2	11	100%
1040 f) Irrigation Siphons and Stock Passes								
Question 1. What criteriaare used to determine when cleaning is required?								
1. None on section	6	9	4	11	20	13	63	52%
2. No maintenance required.	6	7	6	8	4	2	33	27%
3. Cleaned when siphon plugged	3	3	4	-	-	3	13	11%
4. Cleaned each spring and fall	1	-	2	-	-	-	3	2%
5. Cleaned each fall.	2	-	1	-	-	-	3	2%
6. Cleaned each spring	-	1	-	-	-	-	1	1%
7. Inspected daily during irrigation season	1	-	1	-	-	-	2	2%
8. Inspected weekly during irrigation season.	-	1	1	-	-	-	2	2%
9. Inspected 3 times during irrigation season	-	-	-	-	-	1	1	1%
District Totals	19	21	19	19	24	19	121	
Question 2. What methods are used in the cleaning operation?								
1. Clean ends of siphon pipe	2	4	4	-	-	1	11	38%
2. Rod out pipe with long rod.	3	-	-	-	-	1	4	14%
3. Wash material out of pipe	1	1	-	-	-	-	2	7%
4. Drag hook through pipe	-	1	-	-	-	1	2	7%
5. Float rope through pipe and work plugged material out.	1	-	-	-	-	-	1	3%
6. Water pumped out of pipe at end of irrigation season	-	-	3	-	-	-	3	10%
7. Drag old tires through pipe	-	-	-	-	-	2	2	7%
8. Remove siphon pipe and replace with new pipe.	-	-	-	-	-	1	1	3%
9. Doesn't know	1	-	-	-	-	-	1	3%
10. No direct reply	-	-	2	-	-	-	2	7%
District Totals	8	6	9	-	-	6	29	
Question 3. What equipment is used for this cleaning?								
1. Hand tools	2	4	6	-	-	2	14	47%
2. Long rod.	3	-	-	-	-	1	4	13%
3. Water truck or water pump	1	1	3	-	-	-	5	17%
4. Long rope	1	-	-	-	-	-	1	3%
5. Back hoe.	-	-	-	-	-	1	1	3%
6. Power shovel	-	-	-	-	-	1	1	3%
7. Winch and long cable.	-	-	-	-	-	2	2	7%
8. Old tires	-	-	-	-	-	2	2	7%
District Totals	7	5	9	-	-	9	30	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 (CONTINUED)

1040 g) Erosion - Cuts and Fills

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. How often are cuts and fills inspected?								
1. No cuts or fills on section	-	1	3	-	-	1	5	4%
2. No maintenance required.	2	12	5	-	-	-	19	15%
3. Inspected during daily partol.	8	8	10	19	22	17	84	67%
4. Inspected during storms.	7	-	-	-	-	-	7	6%
5. Inspected twice weekly	1	-	-	-	-	-	1	1%
6. Inspected weekly	2	-	-	-	-	-	2	2%
7. Inspected monthly.	-	-	1	-	-	-	1	1%
8. Inspected each spring and fall	-	-	-	-	1	-	1	1%
9. Inspected each spring	2	-	-	-	-	1	3	2%
10. Not inspected	-	-	-	-	1	-	1	1%
District Totals	22	21	19	19	24	19	124	
Question 2. What methods are used to prevent erosion of cut and fill sections?								
1. Nothing is done to prevent erosion	3	8	7	5	6	-	29	24%
2. Allow natural vegetation to grow.	12	-	-	7	14	18	51	42%
3. Use diversion ditches to control runoff	4	-	-	-	2	2	8	7%
4. Use asphalt curbs or gravel berms to control runoff	3	-	1	-	-	3	7	6%
5. Seed bare slopes	1	-	-	4	-	-	5	4%
6. Use retaining walls to stabilize steep slopes	-	-	-	1	3	-	4	3%
7. Spray slopes with road oil.	2	-	-	-	-	-	2	2%
8. Blow mulch on bare slopes	1	-	-	-	-	-	1	1%
9. Place large rock in eroded areas.	1	-	-	-	-	-	1	1%
10. Install downspouts to prevent washing slope	-	-	1	-	-	-	1	1%
11. Use woven wire mesh to hold material on slope	-	-	1	-	-	-	1	1%
12. Grade shoulders to allow a uniform runoff.	-	-	1	-	-	-	1	1%
13. Place riprap in possible erosion areas.	-	-	-	3	-	-	3	2%
14. Construct ditch at top of cuts to drain water to sides	-	-	-	3	-	-	3	2%
15. Reduce slope of cuts and fills	-	-	-	1	-	-	1	1%
16. Terrace long steep slopes	-	-	-	-	2	-	2	2%
17. Use asphalt aprons to prevent washing	-	-	-	-	-	1	1	1%
District Totals	27	8	11	24	27	24	121	
Question 3. How is a particular method selected?								
1. Amount of erosion determines method used	4	-	-	4	1	2	11	26%
2. Slope of cut or fill determines method used	2	-	-	1	5	-	8	19%
3. Location of erosion determines method used	2	-	-	3	-	-	5	12%
4. Curbs were selected during original construction	3	-	-	-	-	3	6	14%
5. Frequency of erosion determines method used	-	-	-	-	1	4	5	12%
6. No direct method of selection.	-	-	2	-	-	-	2	5%
7. No direct reply	-	-	2	-	-	3	5	12%
District Totals	11	-	4	8	7	12	42	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 g) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 4. If erosion is taking place, what is done to stop it and when is this action performed?								
1. Nothing is done to stop erosion	3	3	1	1	7	3	18	16%
2. Try to divert the water	1	-	-	9	10	5	25	22%
3. Backfill while erosion is taking place.	3	-	1	7	4	-	15	13%
4. Backfill after erosion occurs.	8	5	9	8	6	14	50	44%
5. No erosion has occurred to date	2	-	-	-	-	-	2	2%
6. Notify area foreman	2	-	-	-	-	-	2	2%
7. Prevent erosion from occurring in the first place	-	-	-	1	-	-	1	1%
District Totals	19	8	11	26	27	22	113	
Question 5. Is erosion of cut and fill slopes a serious problem on your section?								
1. Yes	4	4	4	4	4	4	24	21%
2. No.	15	15	12	15	20	14	91	79%
3. No direct reply	-	1	-	-	-	-	1	
District Totals	19	20	16	19	24	18	116	

1040 h) Walls, Cribbings, and Riprap

Question 1. What determines when these items are inspected?								
1. None on section	12	18	6	13	16	11	76	63%
2. No maintenance required.	3	-	6	-	-	-	9	7%
3. Inspected after floods and during spring runoff.	1	2	4	2	2	2	13	11%
4. Inspected spring and fall	1	-	1	1	1	1	5	4%
5. Inspected monthly.	1	-	1	2	-	-	4	3%
6. Inspected twice monthly.	-	-	1	-	-	-	1	1%
7. Inspected during daily patrol.	1	-	-	1	4	-	6	5%
8. Inspected under charge Code 1000.	-	1	-	-	-	-	1	1%
9. Not inspected	-	-	-	-	1	-	1	1%
10. Inspected during low water.	-	-	-	-	-	4	4	3%
11. Inspected during heavy irrigation periods.	-	-	-	-	-	1	1	1%
District Totals	19	21	19	19	24	19	121	
Question 2. If failures are present, what methods of repair are used?								
1. No maintenance required.	-	-	-	1	6	1	8	22%
2. Rebuild to original standards.	4	-	-	1	1	7	13	36%
3. Add more riprap to failed area	-	2	7	2	-	-	11	31%
4. Call in special crew.	-	-	-	2	2	-	4	11%
District Totals	4	2	7	6	9	8	36	

1040 i) Seeding

Question 1. What determines when it is necessary?								
1. No seeding performed on section	13	19	16	13	7	10	78	62%
2. Seed all bare slopes.	4	2	1	3	2	-	12	10%
3. Seed when slopes begin to erode	-	-	-	1	-	2	3	2%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 i) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Seeded by contractor during original construction	2	-	2	6	15	6	31	25%
5. Slope seeded under special Forest Service project	-	-	-	-	-	1	1	1%
District Totals	19	21	19	23	24	19	125	
Question 2. How is it performed?								
1. Seed spread by hand	4	2	1	2	2	2	13	82%
2. Blown on slopes with hay chopper	-	-	-	2	-	-	2	12%
3. No direct reply	-	-	-	-	-	1	1	6%
District Totals	4	2	1	4	2	3	16	
Question 3. How successfully have past operations been used?								
1. Have had good success with seeding	3	-	1	3	1	-	8	50%
2. Have had fair success with seeding	1	2	-	1	-	3	7	44%
3. Have had poor success with seeding	-	-	-	-	1	-	1	6%
District Totals	4	2	1	4	2	3	16	
1040 j) Mulching								
Question 1. What determines when it is necessary?								
1. No mulching operation performed on section	14	21	19	16	11	16	97	80%
2. Mulch spread when grass planted	-	-	-	3	2	2	7	6%
3. Mulch spread by contractor during original construction	3	-	-	-	11	1	15	12%
4. Doesn't know	1	-	-	-	-	-	1	1%
5. No direct reply	1	-	-	-	-	-	1	1%
District Totals	19	21	19	19	24	19	121	
Question 2. How is it performed?								
1. Mulch is blown on slope	2	-	-	2	2	-	6	50%
2. Mulch is sprayed on slope	2	-	-	-	-	2	4	34%
3. Doesn't know	1	-	-	-	-	-	1	8%
4. No direct reply	-	-	-	1	-	-	1	8%
District Totals	5	-	-	3	2	2	12	
Question 3. How successfully have past operations been used?								
1. Have had good success with mulching	3	-	-	1	1	1	6	50%
2. Have had fair success with mulching	-	-	-	-	-	1	1	8%
3. Have had poor success with mulching	2	-	-	-	1	-	3	25%
4. No direct reply	-	-	-	2	-	-	2	17%
District Totals	5	-	-	3	2	2	12	
1040 k) Fertilizing								
Question 1. What determines when it is necessary?								
1. Never has used fertilizer on section	18	21	17	16	22	19	113	93%
2. Fertilizer used when seeded area doesn't grow	-	-	1	1	1	-	3	2%
3. Fertilizer used by contractor during original construction	1	-	-	3	-	-	4	3%
4. Doesn't know	-	-	-	-	1	-	1	1%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XII. PURPOSE CODE 1040 k) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
5. No direct reply	-	-	1	-	-	-	1	1%
District Totals	19	21	19	20	24	19	122	
Question 2. How is it performed?								
1. Spread by hand.	-	-	1	-	1	-	2	29%
2. Sprayed on slope	1	-	1	-	-	-	2	29%
3. Blown on slope.	-	-	-	2	-	-	2	29%
4. No direct reply	-	-	-	1	-	-	1	14%
District Totals	1	-	2	3	1	-	7	
Question 3. How successfully have past operations been used?								
1. Have had good success with fertilizing.	-	-	2	2	-	-	4	57%
2. Have had poor success with fertilizing.	1	-	-	-	1	-	2	29%
3. No direct reply	-	-	-	1	-	-	1	14%
District Totals	1	-	2	3	1	-	7	

XIII. PURPOSE CODE 1045 - ROADSIDE AND DRAINAGE - EXTRAORDINARY

Question 1. What determines where the dividing point is between Code 1040 and Code 1045?								
1. Code 1045 not used by maintenance man	4	13	17	18	17	5	74	60%
2. Code 1045 used for any major drainage project	1	6	-	-	2	2	11	9%
3. Code 1045 charge made when special equipment is used	2	-	-	-	2	7	11	9%
4. Code 1045 used when working with special crew	3	-	-	1	2	-	6	5%
5. District office determines.	2	-	-	-	-	1	3	2%
6. Code 1045 used during floods	2	-	-	-	-	-	2	2%
7. Code 1045 used when cutting brush	-	-	2	-	-	-	2	2%
8. Doesn't know	6	-	-	-	1	4	11	9%
9. No direct reply	-	2	-	-	-	-	2	2%
District Totals	20	21	19	19	24	19	122	
Question 2. Who does this type of work?								
1. Special crew handles 1045 operations	11	8	6	19	18	12	74	57%
2. Shed crew handles 1045 operations	3	8	2	1	6	9	29	22%
3. Doesn't know	-	-	-	-	-	3	3	2%
4. No direct reply	7	5	11	-	1	1	25	19%
District Totals	21	21	19	20	25	25	131	

XIV. PURPOSE CODE 1050 - TRAFFIC SIGNS (PLACEMENT AND NORMAL REPAIR)

Question 1. What determines when a sign should be replaced?								
1. Replace if sign is damaged.	4	16	12	15	16	4	67	29%
2. Replace if sign is vandalized.	6	6	13	10	10	7	52	23%
3. Replace if sign has poor legibility.	14	1	-	-	17	11	43	19%
4. Replace if sign post is damaged	2	2	3	13	20	1	41	18%
5. Replace if sign has poor reflectorization.	1	2	1	-	-	6	10	4%
6. Sign crew determines.	-	3	2	1	-	-	6	3%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIV. PURPOSE CODE 1050 - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
7. Replace badly weathered signs.	-	-	-	-	10	-	10	4%
District Totals	27	30	31	39	73	29	229	
Question 2. How often are signs inspected for possible repairs?								
1. Inspected during daily patrol.	19	20	19	18	23	18	117	91%
2. Inspected 2-3 times weekly.	-	-	-	-	1	1	2	1%
3. Inspected weekly	-	1	-	-	-	-	1	1%
4. Inspected monthly.	-	-	-	1	-	-	1	1%
5. Sign crew inspects	-	-	-	-	4	-	4	3%
6. Night patrol inspection every 2 weeks	1	-	-	-	-	-	1	1%
7. Night patrol inspection each month	-	-	-	-	-	2	2	1%
8. Night patrol inspection every 6 months.	-	-	-	-	-	1	1	1%
District Totals	20	21	19	19	28	22	129	
Question 3. What repairs are performed in the field?								
1. Replace damaged posts	17	20	12	15	22	18	104	37%
2. Replace signs	4	5	10	12	21	-	52	18%
3. Paint sign posts	4	6	-	1	10	18	39	14%
4. Replace or tighten sign bolts.	10	-	-	5	-	15	30	11%
5. Replace and repair delineators	-	-	6	2	18	-	26	9%
6. Wash dirty signs	5	-	-	10	3	1	19	7%
7. Notify sign crew of damaged signs	4	-	-	-	1	2	7	2%
8. Erect and remove seasonal signs	-	-	-	-	2	1	3	1%
9. Install new signs.	-	-	-	-	1	-	1	1%
District Totals	44	31	28	45	78	55	281	

XV. PURPOSE CODE 1054 - HIGHWAY SIGNALS AND LIGHTS

1054 a) Signals

Question 1. Who replaces lamps and repairs signal heads?								
1. No signals on section	13	15	8	12	18	12	78	64%
2. City maintains.	1	2	3	2	6	7	21	17%
3. District sign crew maintains	3	2	7	4	-	-	16	13%
4. Boise electrician maintains	-	2	-	-	-	-	2	2%
5. Maintenance man maintains if signal accessible	-	-	1	-	-	-	1	1%
6. Railroad crossing signals maintained by railroad	-	-	-	1	-	-	1	1%
7. Doesn't know	2	-	-	-	-	-	2	2%
District Totals	19	21	19	19	24	19	121	

1054 b) Lights

Question 1. Who replaces needed lamps?								
1. No lights on section.	11	15	9	10	18	10	73	60%
2. City maintains.	-	3	1	2	2	5	13	11%
3. Power company maintains.	5	-	-	2	2	3	12	10%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XV. PURPOSE CODE 1054 - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. District electrical crew maintains	1	1	7	2	1	-	12	10%
5. Maintenance man maintains	-	2	2	2	1	-	7	6%
6. Boise electrician maintains	-	-	-	-	1	-	1	1%
7. Doesn't know	2	-	-	1	-	1	4	3%
District Totals	19	21	19	19	25	19	122	
Question 2. Are lights inspected at regular intervals?								
1. Yes	6	3	9	4	1	6	29	60%
2. No.	2	2	-	2	1	-	7	15%
3. Doesn't know	-	-	-	-	-	1	1	2%
4. No direct reply	-	1	1	3	4	2	11	23%
District Totals	8	6	10	9	6	9	48	
Question 3. If something other than the lamp needs repair who does the repair?								
1. Boise electrician maintains	1	-	4	4	-	2	11	23%
2. District electrical crew maintains	-	4	3	1	1	-	9	19%
3. Power company maintains.	3	-	-	2	1	2	8	17%
4. City maintains.	-	1	-	-	-	-	1	2%
5. Maintenance man maintains	-	-	2	-	-	-	2	4%
6. Doesn't know	1	-	-	-	-	3	4	8%
7. No direct reply	3	1	1	2	4	2	13	27%
District Totals	8	6	10	9	6	9	48	

XVI. PURPOSE CODE 1055 - ROADSIDE REST AND PICNIC AREAS

1. None on section	14	19	16	4	5	16	74	99%
2. No maintenance required.	-	-	-	-	1	-	1	1%
District Totals	14	19	16	4	6	16	75	
1055 a) Trash and Litter								
Question 1. What criteria determine when trash and litterare picked up?								
1. Roadside park trash picked up with section litter barrels	-	1	1	7	13	-	22	42%
2. Roadside park trash picked up weekly	2	-	-	5	3	-	10	19%
3. Roadside park trash picked up twice weekly	2	-	-	-	-	3	5	10%
4. Roadside park trash picked up daily.	1	1	2	1	-	-	5	10%
5. Trash picked up as barrels fill up	1	-	-	3	-	1	5	10%
6. Trash picked up when area begins to look bad.	-	-	-	2	3	-	5	10%
District Totals	6	2	3	18	19	4	52	
Question 2. Is this assigned to any special person or crew?								
1. No, done by section maintenance man.	5	-	3	15	16	3	42	92%
2. Yes, done by summer parks man.	-	2	-	-	-	-	2	4%
3. Yes, done by garbage collector	-	-	-	-	2	-	2	4%
District Totals	5	2	3	15	18	3	46	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 (CONTINUED)

1055 b) Vandalism Repairs

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. Who performs this type of work?								
1. Maintenance man repairs damage	2	-	3	12	18	3	38	74%
2. District carpenter crew repairs damage	3	-	-	4	-	2	9	18%
3. Area foreman determines	1	-	-	-	-	-	1	2%
4. Summer parkman repairs damage	-	2	-	-	-	-	2	4%
5. Special crew repairs damage	-	-	-	1	-	-	1	2%
District Totals	6	2	3	17	18	5	51	

1055 c) Driveways and Parking Areas

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No driveways or parking areas in park	-	-	-	1	-	-	1	2%
2. No maintenance required	2	-	3	1	1	1	8	15%
3. Inspected during daily patrol	2	2	-	6	1	1	12	23%
4. Inspected weekly	1	-	-	-	-	-	1	2%
5. Maintained annually	-	-	-	2	13	-	15	29%
6. Maintained as needed	-	-	-	5	4	-	9	17%
7. Maintained when motor patrol is working in area	-	-	-	-	3	-	3	16%
8. Maintained as time becomes available	-	-	-	-	1	2	3	6%
District Totals	5	2	3	15	23	4	52	
Question 2. What standards are used for the required maintenance?								
1. Maintain surface smooth and in good condition	3	-	-	11	17	2	33	89%
2. Maintain same as travelway	-	-	-	1	-	-	1	3%
3. Keep approaches smooth	-	-	-	1	-	-	1	3%
4. No direct reply	-	2	-	-	-	-	2	5%
District Totals	3	2	-	13	17	2	37	

1055 d) Footpaths and Sidewalks

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. None in park	3	2	-	14	17	2	38	83%
2. No maintenance required	2	-	3	-	-	1	6	13%
3. Inspected during daily patrol	-	-	-	1	1	-	2	4%
District Totals	5	2	3	15	18	3	46	
Question 2. What standards are used for the required maintenance?								
1. Sweep dirt and gravel off sidewalk	-	-	-	-	1	-	1	50%
2. No set standard used	-	-	-	1	-	-	1	50%
District Totals	-	-	-	1	1	-	2	

1055 e) Mowing and Irrigation

Question 1. What criteria are used for mowing grass within rest and picnic areas?								
1. No mowing done in park	2	1	1	12	12	2	30	65%
2. Mow park when mowing section shoulders	3	-	-	3	5	1	10	22%
3. Mow park each week	-	1	2	-	-	-	3	7%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 e) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Mow park twice each week	-	-	-	1	-	-	1	2%
5. Mow as required to keep uniform shape	-	-	-	1	1	-	2	4%
District Totals	5	2	3	15	18	3	46	
Question 2. Is any hand-work performed for trimming and clipping of the edges, etc.?								
1. Yes	3	-	-	2	3	1	9	56%
2. No.	-	1	2	1	3	-	7	44%
District Totals	3	1	2	3	6	1	16	
Question 3. What criteria are used in irrigating the grass?								
1. Grass not irrigated	2	-	-	2	6	1	11	69%
2. Grass irrigated weekly	1	-	1	-	-	-	2	13%
3. Grass irrigated twice weekly	-	1	-	-	-	-	1	6%
4. Grass irrigated three times weekly	-	-	-	1	-	-	1	6%
5. Automatic sprinklers irrigate grass daily.	-	-	1	-	-	-	1	6%
District Totals	3	1	2	3	6	1	16	
1055 f) Curbs								
Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No curbs in park	5	1	-	15	18	3	42	91%
2. No maintenance required.	-	1	3	-	-	-	4	9%
District Totals	5	2	3	15	18	3	46	
Question 2. What standards are used for the required maintenance?								
1. Not applicable.	5	2	3	15	18	3	46	100%
1055 g) Fences								
Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No fences in park.	1	-	1	14	16	1	33	72%
2. No maintenance required.	2	2	-	1	2	1	8	17%
3. Daily patrol inspection.	2	-	1	-	-	1	4	9%
4. No direct reply	-	-	1	-	-	-	1	2%
District Totals	5	2	3	15	18	3	46	
Question 2. What standards are used for the required maintenance?								
1. Splice wire on fence.	2	-	-	-	-	1	3	50%
2. Replace fence posts	1	-	-	-	-	-	1	17%
3. Maintain original standards	-	-	2	-	-	-	2	33%
District Totals	3	-	2	-	-	1	6	
1055 h) Buildings and Tables								
Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No tables or buildings in park	1	-	-	8	5	-	14	31%
2. No maintenance required.	-	-	-	-	2	-	2	4%
3. Daily patrol inspection.	3	1	2	2	1	2	11	24%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 h) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Inspected three times weekly	-	-	-	-	-	1	1	2%
5. Inspected twice weekly	-	1	-	-	2	-	3	7%
6. Inspected weekly	1	-	1	4	6	-	12	26%
7. Tables cleaned as needed	-	-	-	-	2	-	2	4%
8. Treat toilets twice each year.	-	-	-	1	-	-	1	2%
District Totals	5	2	3	15	18	3	46	
Question 2. What standards are used for the required maintenance?								
1. Keep clean and sanitary.	1	2	3	3	11	-	20	67%
2. Keep in original condition.	1	-	-	2	-	1	4	13%
3. Paint annually.	-	-	-	1	-	2	3	10%
4. Paint every 2 years	-	-	-	1	-	-	1	3%
5. No direct reply	2	-	-	-	-	-	2	7%
District Totals	4	2	3	7	11	3	30	

1055 i) Structures

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. No structures in park	3	1	2	13	17	2	38	83%
2. No maintenance required.	1	1	1	-	1	-	4	9%
3. Daily patrol inspection.	1	-	-	-	-	-	1	2%
4. Inspected three times weekly	-	-	-	-	-	1	1	2%
5. Inspected weekly	-	-	-	1	-	-	1	2%
6. Inspected annually	-	-	-	1	-	-	1	2%
District Totals	5	2	3	15	18	3	46	
Question 2. What standards are used for the required maintenance?								
1. Keep in good repair	1	-	-	1	-	1	3	75%
2. Clean annually.	-	-	-	1	-	-	1	25%
District Totals	1	-	-	2	-	1	4	

1055 j) Water Supply

Question 1. How often is water supply checked for possible contamination?								
1. No water in park	4	-	1	12	15	2	34	74%
2. Never has been checked	-	-	2	1	1	-	4	9%
3. City checks water periodically	1	-	-	-	-	1	2	4%
4. Checked twice a year.	-	2	-	-	-	-	2	4%
5. Chlorine purifier checked weekly.	-	-	-	-	1	-	1	2%
6. Doesn't know	-	-	-	2	1	-	3	7%
District Totals	5	2	3	15	18	3	46	

1055 k) Fireplaces, Pits, and Barbecue Facilities

Question 1. How often is an inspection made and if necessary, when is the required maintenance performed?								
1. None in park	5	2	3	13	17	3	43	92%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVI. PURPOSE CODE 1055 k) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	
2. Clean as needed	-	-	-	1	-	-	1	2
3. Clean each spring.	-	-	-	1	-	-	1	2
4. Inspect weekly.	-	-	-	-	1	-	1	2
5. Clean twice each year	-	-	-	-	1	-	1	2%
District Totals	5	2	3	15	19	3	47	
Question 2. What standards are used for the required maintenance?								
1. Maintain in a useable condition	-	-	-	2	1	-	3	100%
Question 3. What criteria are used to determine when to clean grease, ashes, etc., from the facilities?								
1. Clean as needed	-	-	-	1	-	-	1	33%
2. Clean twice each year	-	-	-	-	1	-	1	33%
3. Clean annually.	-	-	-	1	-	-	1	33%
District Totals	-	-	-	2	1	-	3	

1055 l) Insect and Disease Control

Question 1. What methods are used to perform this work?								
1. No control used	1	2	2	12	8	-	25	50%
2. Clean with Disinfectant.	2	-	1	2	8	3	16	32%
3. Treat with lime	2	-	-	1	-	-	3	6%
4. Wash picnic tables	-	-	-	-	3	-	3	6%
5. Spray insecticide around litter barrels	-	-	-	-	2	-	2	4%
6. Use plastic bags in garbage barrels.	-	-	-	-	1	-	1	2%
District Totals	5	2	3	15	22	3	50	
Question 2. What criteria are used to determine when it should be done?								
1. Control used each day during summer season	-	-	-	-	1	-	1	4%
2. Control used 2-3 times each week.	1	-	-	-	5	3	9	32%
3. Control used weekly	2	-	1	-	4	-	7	25%
4. Control used twice monthly.	1	-	-	-	-	-	1	4%
5. Control used when smell is bad	-	-	-	3	5	-	8	28%
6. Control used when bugs get thick.	-	-	-	2	-	-	2	7%
District Totals	4	-	1	5	15	3	28	

XVII. PURPOSE CODE 1060 - SNOW AND ICE REMOVAL

1060 a) Plowing

Question 1. What determines when the snow plowing operation should begin?								
1. Plow when storm begins	5	1	2	-	3	4	15	12%
2. Plow when snow is 1-2 inches deep	11	18	13	19	16	15	94	78%
3. Plow when snow is 2-3 inches deep	2	-	-	-	3	-	5	4%
4. Plow secondary state highway after primary section.	-	1	-	-	-	-	1	1%
5. Plow when sanding no longer effective	-	-	1	-	-	-	1	1%
6. Plow when travelway becomes slick	-	-	1	-	-	-	1	1%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVII. PURPOSE CODE 1060 a) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
7. No direct reply	1	1	2	-	-	-	4	3%
District Totals	19	21	19	19	24	19	121	
Question 2. Is maintaining a snow-free surface the end objective of the plowing?								
1. Yes	17	18	8	17	24	18	102	84%
2. No.	2	3	11	2	-	1	19	16%
District Totals	19	21	19	19	24	19	121	
Question 3. If not, what is the end objective?								
1. Try to maintain a sanded snow floor.	1	3	10	2	-	-	16	84%
2. Keep highway passable	1	-	-	-	-	1	2	11%
3. No direct reply	-	-	1	-	-	-	1	5%
District Totals	2	3	11	2	-	1	19	
Question 4. Are the same criteria used when plowing approaches, intersections or crossroads?								
1. Only plows main travelway	3	-	-	2	9	1	15	12%
2. Plowed after main travelway	11	21	17	5	4	18	76	63%
3. Plowed after main travelway if time available	4	-	-	11	11	-	26	21%
4. Plowed before main travelway	-	-	1	-	-	-	1	1%
5. Plowed along with main travelway.	-	-	-	1	-	-	1	1%
6. No direct reply	1	-	1	-	-	-	2	2%
District Totals	19	21	19	19	24	19	121	
1060 b) Salt or Chemicals								
Question 1. How is the rate of application determined?								
1. Salt or other chemicals not used without sanding material	11	9	15	7	5	4	51	42%
2. Rate determined by amount of ice and slickness	1	11	4	3	-	2	21	17%
3. No set rate, use judgement in applying.	1	-	-	6	11	-	18	15%
4. No set rate, all salt spread by hand as needed	4	-	-	-	-	5	9	7%
5. Rate determined by temperature conditions.	1	-	-	-	-	4	5	4%
6. Only one rate is used	-	-	1	-	-	3	4	3%
7. Applies 100-150 pounds per mile	-	-	-	2	4	-	6	5%
8. Applies 200-250 pounds per mile	-	-	-	1	-	-	1	1%
9. Applies 300-400 pounds per mile.	-	-	-	-	2	1	3	2%
10. Applies 500 pounds per mile	-	-	-	-	2	-	2	2%
11. No direct reply	1	1	-	-	-	-	2	2%
District Totals	19	21	20	19	24	19	122	
Question 2. Is salt used only for certain areas or conditions?								
1. Salt used on icy spots	2	9	1	5	8	2	27	24%
2. Salt used on slick intersections.	4	-	2	2	-	5	13	12%
3. Salt used on snowfloors over 2 inches thick	-	-	-	3	10	-	13	12%
4. Salt used on slick grades and hills.	-	-	-	5	5	1	11	10%
5. Salt used on slick curves	-	-	-	4	4	2	10	9%
6. Salt used only during temperature conditions of 20-30°F	-	-	-	2	5	1	8	7%
7. Salt used only during temperature conditions near 32°F	-	-	-	-	7	-	7	6%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVII. PURPOSE CODE 1060 b) - QUESTION 2 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
8. Salt used on black ice sections	2	-	1	-	-	-	3	3%
9. Salt used on icy storm drains and culverts	1	1	1	-	-	-	3	3%
10. Salt used on approaches to railroad crossings	1	-	-	2	-	-	3	3%
11. Salt used on city streets	1	-	-	-	-	1	2	2%
12. Salt used on entire section if section slick.	1	-	-	-	-	-	1	1%
13. Salt used on frosty sections	-	-	-	1	-	-	1	1%
14. Salt used on slick bridges and overpasses.	-	-	-	-	-	4	4	4%
15. No direct reply	-	2	-	-	-	3	5	5%
District Totals	12	12	5	24	39	19	111	
Question 3. Are other chemicals used to remove snow and ice?								
1. No other chemical is used	11	21	18	19	24	14	107	89%
2. Also uses calcium chloride.	5	-	-	-	-	5	10	8%
3. Doesn't know	1	-	-	-	-	-	1	1%
4. No direct reply	2	-	1	-	-	-	3	2%
District Totals	19	21	19	19	24	19	121	

XVIII. PURPOSE CODE 1065 - SANDING ICY SURFACES

Question 1. What criteria are used to determine when sanding is necessary?								
1. No sanding done on section.	1	-	-	-	-	-	1	1%
2. Sand after plowing	15	1	8	16	24	17	81	51%
3. Sand when travelway is slick	6	20	9	9	13	1	58	36%
4. Sand when snow not deep enough to plow.	2	2	-	2	2	1	9	6%
5. Weather conditions determine when to plow.	-	2	-	-	-	-	2	1%
6. Area foreman decides.	-	-	2	-	-	-	2	1%
7. Sand frosty travelway surfaces	-	-	-	3	-	-	3	2%
8. Sand black ice conditions	-	-	-	1	-	-	1	1%
9. Sand during freezing rain conditions	-	-	-	1	-	-	1	1%
10. Sand when the public demands it	-	-	-	-	-	1	1	1%
District Totals	24	25	19	32	39	20	159	
Question 2. What materials are used?								
1. Sand	6	21	19	-	7	7	60	26%
2. Gravel	-	-	-	17	12	6	35	15%
3. Rejects	3	-	-	10	9	6	28	12%
4. Cinders	10	-	-	-	-	-	10	4%
5. Salt	17	18	17	9	20	18	99	42%
6. Calcium chloride	1	-	-	-	-	-	1	1%
District Totals	37	39	36	36	48	37	233	
Question 3. How much salt is used with the sanding material?								
1. No salt used with sanding material	-	3	2	10	4	1	20	17%
2. Uses 1 sack of salt per ½ cubic yard of sanding material.	1	3	-	-	-	-	4	3%
3. Uses 1 sack of salt per 1 cubic yard of sanding material.	14	11	15	4	16	17	77	64%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XVIII. PURPOSE CODE 1065 - QUESTION 3 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
4. Uses 1 sack of salt per 2 cubic yards of sanding material	2	1	-	3	4	1	11	9%
5. Uses 1 sack of salt per 5 cubic yards of sanding material	-	-	-	2	-	-	2	2%
6. Uses 1 sack per 10 cubic yards of sanding material. . .	-	1	-	-	-	-	1	1%
7. Doesn't know	1	2	2	-	-	-	5	4%
District Totals	18	21	19	19	24	19	120	
Question 4. At what locations is sanding performed?								
1. Entire section.	-	3	6	-	6	-	15	5%
2. Grades and hills	14	14	12	19	21	14	104	33%
3. Curves	10	15	14	19	19	14	81	26%
4. Intersections	9	10	10	9	3	13	54	17%
5. Shaded areas or dangerous spots	7	3	4	13	7	1	35	11%
6. Bridges	-	1	2	4	3	1	11	3%
7. Railroad crossings	-	4	-	-	1	1	6	2%
8. Narrow sections	1	-	1	1	-	-	3	1%
9. Interchange ramps.	1	-	-	-	2	-	3	1%
10. City streets	1	-	-	-	-	-	1	1%
11. Port of entry station	-	2	-	-	-	-	2	1%
12. School bus stops	-	-	-	-	1	-	1	1%
District Totals	43	52	49	65	63	44	316	

XIX. PURPOSE CODE 1070 - BRIDGE MAINTENANCE

1. No bridges on section	2	2	2	4	3	-	13	100%
1070 a) Inspections								
Question 1. What determines when an inspection is necessary?								
1. Bridges not inspected	3	2	2	1	-	-	8	6%
2. Inspected during high water	4	7	5	6	1	3	26	20%
3. Bridge crew determines	-	-	-	2	13	-	15	12%
4. Inspected annually	1	1	-	-	-	-	2	2%
5. Inspected each fall	-	-	-	2	-	2	4	3%
6. Inspected spring and fall	4	9	7	1	9	13	43	33%
7. Inspected 3-4 times yearly.	1	-	-	1	-	-	2	2%
8. Inspected every 2 months	1	-	-	1	-	-	2	2%
9. Inspected monthly.	-	1	1	-	1	1	4	3%
10. Inspected twice monthly.	-	-	2	-	-	-	2	2%
11. Inspected weekly	1	-	1	-	-	-	2	2%
12. Inspected daily	3	-	-	-	-	2	8	6%
13. Inspected when bridge is under heavy use	-	-	-	1	-	-	1	1%
14. Inspected when something looks wrong	-	-	-	-	5	-	5	4%
15. Inspected when working in area	-	-	-	-	4	-	4	3%
District Totals	21	20	18	15	33	21	128	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 a) (CONTINUED)

Question and Type of Respons	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. What is looked for in an inspection?								
1. Undercutting of the structure.	5	14	14	3	6	3	45	25%
2. Cracks in deck.	3	3	2	5	6	5	24	13%
3. Damaged stringers.		2	6	5	1	3	23	13%
4. Trash and debris collecting under bridge		4	1	2	1	6	18	10%
5. Damaged or plugged expansion joints and rollers		-	-	5	1	6	15	8%
6. Spalling of concrete surface		-	-	-	-	12	12	7%
7. Broken or cracked abutments		1	-	5	1	2	11	6%
8. Plugged drainage holes		-	-	-	-	4	9	5%
9. Broken or damaged railings.		-	-	-	2	2	5	3%
10. Loose bolts.		-	1	-	-	1	2	1%
11. Bird nests under bridge.		1	-	-	-	-	1	1%
12. Damaged wind bracing.		-	2	-	-	-	2	1%
13. Rough approaches		-	1	-	-	-	1	1%
14. Ice jams.		-	1	-	-	-	1	1%
15. Damaged bridge signs		-	-	-	-	2	2	1%
16. Vandalism	-	-	-	-	-	2	2	1%
17. Bridge crew determines	-	-	-	-	5	-	5	3%
18. No direct reply	-	1	-	-	-	-	1	1%
	29	26	28	25	23	48	179	
1070 b) Cleaning Expansion Joint								
Question 1. What determines when cleaning is								
1. No expansion joints on bridges	5	6	-	3	6	8	28	25%
2. Not cleaned by maintenance man	8	10	10	2	2	1	33	30%
3. Cleaned when joint fills up with materia	1	3	5	1	1	5	16	14%
4. Cleaned spring and fall.	-	-	1	4	5	2	12	11%
5. Cleaned each spring	3	1	-	1	7	1	13	12%
6. Cleaned each fall.	-	-	-	3	-	-	3	3%
7. Cleaned annually	-	-	-	1	-	-	1	1%
8. Cleaned 3-4 times annually.	-	-	-	-	1	-	1	1%
9. Cleaned 2-3 times each summer.	-	-	-	-	-	1	1	1%
10. Cleaned after snow storms	-	-	-	-	-	1	1	1%
11. Doesn't know	-	-	-	-	-	1	1	1%
12. No reply.	-	-	1	-	-	-	1	1%
District Totals	17	20	17	15	22	20	111	
Question 2. What method is used for cleaning joints?								
1. Joints are cleaned by hand.	4	3	2	9	11	10	39	64%
2. Wash out with water under pressure	1	-	3	6	8	-	18	30%
3. Blow out with compressed air	-	-	-	1	1	-	2	3%
4. No direct reply	-	-	2	-	-	-	2	3%
District Totals	5	3	7	16	20	10	61	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 c)

1070 c) Concrete Surface Spalling

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 1. What measures are taken to prevent spalling?								
1. Nothing done to prevent spalling.	12	12	10	7	5	9	55	49%
2. Bridges surfaced with asphalt.	2	6	3	6	11	5	33	30%
3. Salt not used on bridges	1	1	3	2	5	4	16	14%
4. Bridge deck sprayed with linseed oil	-	-	-	-	1	2	3	3%
5. Bridge deck washed off periodically with water	-	-	-	1	-	-	1	1%
6. Doesn't know	2	-	-	-	-	-	2	2%
7. No direct reply	-	-	1	-	-	-	1	1%
District Totals	17	19	17	16	22	20	111	
Question 2. What determines when a repair is necessary?								
1. No maintenance required.	9	16	13	9	12	3	62	59%
2. Concrete scaled off bridge deck	2	-	-	4	4	12	22	21%
3. Rough surface on bridge deck	-	3	3	2	-	-	8	8%
4. Determined by area foreman.	1	-	-	-	-	-	1	1%
5. Determined by bridge crew	-	-	-	-	1	-	1	1%
6. Doesn't know	3	-	-	-	-	-	3	3%
7. No direct reply	-	-	1	-	4	3	8	8%
District Totals	15	19	17	15	21	18	105	
Question 3. What method is used in this repair?								
1. Repair with a thin concrete patch	-	-	-	3	1	8	12	28%
2. Seal coat bridge surface	-	2	-	2	1	4	9	20%
3. Patch with premix.	1	-	-	-	-	-	1	2%
4. Pour melted tar into raveled area	-	-	2	-	-	-	2	5%
5. Boise bridge crew decides	-	-	-	-	-	1	1	2%
6. Doesn't know	5	-	1	1	1	2	10	23%
7. No direct reply	-	1	1	-	5	2	9	20%
District Totals	6	3	4	6	8	17	44	
Question 4. Is spalling a problem on your structures?								
1. Yes	1	1	2	1	1	11	17	16%
2. No.	12	18	14	14	20	6	84	81%
3. No direct reply	2	-	1	-	-	-	3	3%
District Totals	15	19	17	15	21	17	104	

[1070 d] Joint Repair

Question and Type of Response	1	2	3	4	5	6	Totals	%
Question 1. Is this performed by a special crew?								
1. No joints on bridges.	4	3	-	4	3	7	21	19%
2. No maintenance required.	1	7	8	-	1	-	17	16%
3. Yes, bridge crew maintains.	3	4	8	7	17	6	45	42%
4. No, maintenance man maintains.	2	5	-	-	-	1	8	7%
5. Doesn't know	7	-	-	4	-	5	16	15%
6. No direct reply	-	-	1	-	-	-	1	1%
District Totals	17	19	17	15	21	19	108	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 e) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. What methods are used in repairing joints?								
1. Methods determined by bridge crew	-	-	-	5	11	-	16	25%
2. Add or replace filler material	-	5	-	-	-	1	6	9%
3. Replace steel caps and supports	-	-	1	2	3	-	6	9%
4. Weld joint plates back	-	-	-	2	4	-	6	9%
5. Patch [illegible]	1	-	1	-	-	1	3	5%
6. Tighten joints	1	-	-	-	-	-	1	2%
7. Reinforce joints with steel and concrete	-	-	-	-	-	1	1	2%
8. Fill joint with sand and outer plaster	-	-	-	-	-	1	1	2%
9. Doesn't know	3	3	1	-	-	8	15	23%
10. No direct reply	-	1	8	3	-	-	10	15%
District Totals	5	9	9	12	18	12	65	
Question 3. What criteria determine when a joint repair is necessary?								
1. Joint cracked	-	-	-	7	9	-	16	23%
[illegible]				-	5	-	15	22
[illegible]				-	-	-	6	9
4. Joint [illegible]	-	-	-	3	[illegible]	-	4	6%
5. Joint filler [illegible]	-	-	-	-	-	4	4	6
6. Foreign [illegible]	-	1	-	-	-	-	1	1%
7. Bridge [illegible]	2	-	-	-	-	1	3	4
8. Doesn't know	-	-	-	-	7	5	12	17%
9. No direct reply	1	-	4	1	-	2	8	12%
District Totals	5	9	10	11	22	12	69	

1070 e) Hand Rail Repair

Question 1. Is this type of maintenance performed by a special crew?								
1. No hand rail on bridges.	5	-	-	1	-	14	20	17%
2. No maintenance required.	1	3	10	1	-	2	17	15%
3. Yes, bridge or [illegible] crew maintains	1	2	6	12	20	1	42	36%
4. No, maintenance man maintains.	1	2	1	2	8	2	16	14%
5. Repair needed but not done by anyone to date.	9	12	-	-	-	-	21	18%
District Totals	17	19	17	16	28	19	116	
Question 2. What type of maintenance is used?								
1. Repair to original conditions.	1	4	4	8	5	1	23	35%
2. Replace damaged members.	-	-	5	2	10	1	18	28%
3. Repaint worn railings	-	-	1	-	9	2	12	18%
4. Determined by bridge crew	-	-	-	1	4	-	5	8%
5. Wash railings	1	-	-	-	-	1	2	3%
6. Weld broken sections.	-	-	-	1	-	-	1	2%
7. No direct reply	-	-	-	4	-	-	4	6%
District Totals	2	4	10	16	28	5	65	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 e) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 3. What determines when a hand rail needs repair?								
1. When hand rail damaged or broken.	2	4	7	10	9	2	34	53%
2. When paint is worn off hand rail.	-	-	-	-	11	1	12	19%
3. When hand railing falls off bridge	-	-	-	3	7	-	10	15%
4. When hand rail becomes a hazard	-	-	-	-	4	-	4	6%
5. When public complains about hand rail	-	-	-	1	-	-	1	2%
6. When support posts become rotten.	-	-	-	-	1	-	1	2%
7. No direct reply	-	-	-	2	-	-	2	3%
District Totals	2	4	7	16	32	3	64	
1070 f) Drainage Cleanouts								
Question 1. How often are cleanouts inspected?								
1. No drainage cleanouts on bridge	4	4	-	1	3	4	16	14%
2. Daily patrol inspection.	6	1	-	-	1	2	10	9%
3. Inspected 1-2 times each week.	1	-	1	1	1	-	4	4%
4. Inspected 1-2 times each month	-	1	3	1	6	1	12	11%
5. Inspected 3-4 times each year.	2	2	1	-	-	-	5	5%
6. Inspected each spring and fall	3	-	3	5	1	5	17	15%
7. Inspected each spring	-	-	-	5	7	3	15	14%
8. Inspected each fall	1	-	-	1	-	2	4	4%
9. Inspected after storms	2	-	-	-	2	1	5	5%
10. Inspected while cleaning bridge deck	-	3	-	-	-	-	3	3%
11. Cleaned when they plug up with material	-	-	-	1	-	1	2	2%
12. No direct reply	-	8	9	-	-	-	17	15%
District Totals	19	19	17	15	21	19	110	
Question 2. What methods are used to clean them?								
1. No maintenance required.	4	10	9	2	4	5	34	35%
2. Rod out with long rod	7	1	-	10	6	8	32	33%
3. Hand sweep or shovel out	3	4	7	-	3	3	20	21%
4. Wash out with water under pressure	1	-	1	2	7	-	11	11%
District Totals	15	15	17	14	20	16	97	
1070 g) Removal of Used Sanding Material								
Question 1. When is cleaning considered to be necessary?								
1. Sand not cleaned off bridges	1	1	3	1	-	1	7	6%
2. Bridges cleaned each spring	14	-	-	13	17	12	56	49%
3. Cleaned when material builds up and drainage affected.	5	17	13	-	2	1	38	33%
4. Cleaned each spring and fall	-	-	-	1	3	5	9	8%
5. Cleaned each fall.	1	-	-	-	-	-	1	1%
6. Cleaned twice monthly	-	-	-	-	-	1	1	1%
7. No direct reply	-	1	1	-	-	-	2	2%
District Totals	21	19	17	15	22	20	114	

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XIX. PURPOSE CODE 1070 g) (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
Question 2. How is the cleaning performed?								
1. Swept and shoveled off by hand	16	15	10	14	19	17	91	72%
2. Washed off with water under pressure	-	-	3	3	13	-	19	15%
3. Swept off with power broom	-	3	6	-	6	1	16	12%
4. Bladed off with motor patrol	-	-	-	1	-	-	1	1%
District Totals	16	18	19	18	38	18	127	

XX. PURPOSE CODE 1095 - YARDS AND BUILDINGS

1. Charge Code 1095 not used by maintenance man	1	-	3	-	-	1	5	100%

1095 a) Trash and Litter Pickup

Question 1. How is scheduling of pickup determined?								
1. Picked up as barrels fill up	12	8	16	2	7	6	51	35%
2. Picked up weekly	6	-	-	8	8	2	24	17%
3. Picked up when time available	4	-	-	2	8	7	21	15%
4. Major cleanup each spring	-	-	-	11	7	-	18	13%
5. Major cleanup each spring and fall	-	-	-	-	5	-	5	4%
6. Picked up monthly	-	-	-	-	2	3	5	4%
7. Determined by area foreman	1	-	-	-	-	-	1	1%
8. Picked up by night watchman	-	1	-	-	-	-	1	1%
9. Picked up with section barrels	-	-	-	3	-	-	3	2%
10. Picked up 3 times each year	-	-	-	1	-	-	1	1%
11. No direct reply	-	12	-	-	-	-	12	8%
District Totals	23	21	16	27	37	18	142	

1095 b) Painting Buildings, etc.

Question 1. What criteria are used in deciding when to paint a building?								
1. Determined by paint crew	14	6	14	19	24	16	93	80%
2. Amount of available "slack" time determines	-	15	1	-	-	-	16	14%
3. Determined by district office	1	-	-	-	-	-	1	1%
4. Determined by area foreman	1	-	-	-	-	-	1	1%
5. No painting required to date	1	-	-	-	-	2	3	3%
6. No direct reply	1	-	1	-	-	-	2	2%
District Totals	18	21	16	19	24	18	116	
Question 2. Is this work performed during a "slack" period?								
1. Yes	-	15	1	-	-	-	16	94%
2. No direct reply	-	-	1	-	-	-	1	6%
District Totals	-	15	2	-	-	-	17	

1095 c) Roofing

Question 1. Is roofing inspected periodically?								
1. Yes	12	7	6	6	6	11	48	42%

TABLE D (continued)

MAINTENANCE MEN QUESTIONNAIRE RESPONSES (CONTINUED)

XX. PURPOSE CODE 1095 c) - QUESTION 1 (CONTINUED)

Question and Type of Response	Number of Responses By District 1	2	3	4	5	6	Totals	%
2. No.	1	12	6	11	9	3	42	36%
3. Inspected annually	-	-	-	1	3	-	4	3%
4. Inspected 2 times each year	1	-	-	1	-	-	2	2%
5. No maintenance required.	1	-	1	-	-	2	4	3%
6. Doesn't know	2	2	1	-	6	2	13	11%
7. No direct repl.	1	-	2	-	-	-	3	3%
District Totals	18	21	16	19	24	18	116	
Question 2. When a roof is in need of repai is any special crew used to perform the work?								
1. Carpenter crew does the repair work	1	20	12	19	19	10	81	67%
2. Shed crew does the repair work	-	1	2	-	3	13	19	16%
3. Repair work contracted out.	13	-	-	-	1	2	16	13%
4. Doesn't know	-	-	-	-	1	-	1	1%
5. No direct reply	3	-	1	-	-	-	4	3%
District Totals	17	21	15	19	24	25	121	
1095 d) Grading and Surfacing								
Question 1. Does any special crew do this type of work?								
1. No, done by shed crew	18	20	15	18	21	17	109	95%
2. Yes, done by special crew	-	1	1	1	1	-	4	3%
3. No yard to maintain	-	-	-	-	1	-	1	1%
4. No grading or surface repair done	-	-	-	-	1	-	1	1%
5. No direct reply	-	-	-	-	-	1	-	-
District Totals	18	21	16	19	24	18	116	
Question 2. What are the criteria used to determine when a yard needs to have some grading work?								
1. When surface is rough and broken up.	9	21	15	12	14	7	78	67%
2. When time available	3	-	-	4	-	3	10	8%
3. Graded each spring and fall	-	-	-	1	6	-	7	6%
4. Graded during spring cleanup	-	-	-	4	2	-	6	5%
5. Determined by area foreman.	5	-	-	-	-	-	5	4%
6. No grading done in yard.	1	-	1	-	1	-	3	3%
7. No direct reply	-	-	-	-	-	8	8	7%
District Totals	18	21	16	21	23	18	117	
Question 3. Are pot-holes, etc., handled in the same manner in yards as they are on the highways?								
1. Yes	1	5	10	2	13	1	32	28%
2. No.	12	1	4	-	-	7	24	21%
3. Repair yard with gravel road type patches.	5	15	2	17	9	9	57	50%
4. No direct reply	-	-	-	-	-	1	1	1%
District Totals	18	21	16	19	22	18	114	