FINAL REPORT

HIGHWAY MAINTENANCE IMPROVEMENT RESEARCH PROJECT

JULY, 1972

Prepared by
Planning and Research Division
ARKANSAS STATE HIGHWAY DEPARTMENT
in cooperation with the
U.S. Department of Transportation
Federal Highway Administration

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16. Abstract

The principal objective of this project was to develop improved methods for the conduct of efficient and economical highway maintenance. This objective was accomplished by studying the methods used by the State's maintenance personnel and the resultant productivity and comparing our methods with findings of other states. Training materials incorporating the best of Arkansas' methods with other ideas were developed and tailored to the needs of the Maintenance Division of the Arkansas State Highway Department.

Methods of instruction were studied under field conditions to determine the best means of conveying information acquired during development of the project.

Evaluation procedures were set up on a relative productivity and efficiency basis, establishing a solid basis of comparison for judging accomplishment among the ranks of maintenance personnel. This resulted in a more competitive spirit in the entire Division and established a strong feeling of "esprit de corps."

Application of the training materials and methods formulated under this project should result in a higher standard of highway maintenance at less cost to the taxpayer.

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HIGHWAY MAINTENANCE IMPROVEMENT

RESEARCH PROJECT

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ABSTRACT

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INTRODUCTION

This constitutes the final report by the Project Director and the Principal Investigator on the Highway Maintenance Improvement Research Project. This report briefly outlines setting up the project and implementation of the findings and conclusions resulting from the research. Actual work conducted during the project is documented by the consultant on the project, Roy Jorgensen Associates, Inc., in their final report and two supplemental reports.

This publication has been prepared and compiled by the Project Director and the Principal Investigator. The opinions, findings and conclusions documented herein are explicitly those of the authors and not necessarily those of the State of Arkansas or the Federal Highway Administration

A BRIEF HISTORY

The "Highway Maintenance Improvement Research Project" was initiated in October, 1968. A Project Director and a Principal Investigator were assigned at this time to prepare for the full development of the project. The Project Director resigned shortly thereafter and the Principal Investigator took over as the Project Director. Another investigator was named in June, 1969.

The pilot study began in Clark County on July 1, 1969. Activity codes designed by Research personnel were used for tabulating the work performed in Clark County. These records were kept without altering the existing method of reporting by the county crew. An engineering aide was added to the staff in August, 1969. Later in the year it was decided that further assistance would be necessary for the fullest development of the project. The firm of Roy Jorgensen Associates, Inc., retained to aid in the development of a complete maintenance management system, began working on the project in January, 1970. Work continued in Clark County and in September, 1970, a Standards Committee was established and began work on the development of maintenance function standards. In February, 1971, the pilot study was extended to all of District Seven, which included Clark County. District Seven had seven county crews, a bridge crew, a sealing crew, and a sign crew. This expansion made possible the gathering of much more information than could be collected from Clark County alone. It also facilitated the observation of important district-wide operations. The work was continued until December, 1971, at which time the consultant completed the contracted

portion of the work. At that time the basic research was complete, and implementation was begun statewide in January, 1972. Minor changes and modifications were made and assistance given where needed during the next six months. The basic system of planning, scheduling, and reporting was fully implemented by the beginning of the 1972-73 fiscal year.

During the next year, work will be continued on the development of better standards. Other phases of the project will be upgraded; including training in individual work functions.

LITERATURE REVIEW

A review and indexing of material contained in reports from other highway departments who have conducted similar studies were carried out by Research personnel at the beginning and during the course of the project. The purpose of this review was to familiarize project personnel with methods used by other groups in conducting similar projects and to avoid duplication of research efforts where possible. The reports studied came from many states, cities, and counties throughout the nation. A partial list of these reports is included as the bibliography.

No specific use could be made of the detailed information found in most of the reports. This was due to the individuality of each area. However, the basic methods and ideas expressed were helpful in carrying out the project successfully.

Information found to be most useful was in the form of papers presented to various groups by individuals who had worked with maintenance management. These were of a general nature and were not saturated with minute details unapplicable to Arkansas.

The purpose of this project was not to adapt another organization's maintenance management system to Arkansas, but to understand the basic principles of maintenance management and devise a unique system which would be most beneficial to the State.

A review of articles pertaining to the various maintenance functions established during the course of this project was conducted and is continuing. Many of the articles reviewed have been applicable to Arkansas and, when used in conjunction with existing knowledge of specific conditions in the State, have been helpful in establishing some of the standards, definitions, and procedures for maintenance functions. This data was also useful in preparing training material.

ACCOUNTING REVIEW

After examining the informating sources of the accounting data, it was clearly evident that major changes would be necessary to collect and classify data from the field. The data received was not only inaccurate, but the function classifications were definitely not of a type to which work units could be assigned and evaluated easily (see Figure 1 and the Appendix).

Changes decided upon were of such magnitude that a dual reporting system was used temporarily. This enabled the development of a new system without disturbing the Accounting Division's information flow (see Figures 2, 3, 4, 5, and 6).

The first step in developing the new system was to revise the maintenance functions to which work items were charged. This allowed the assignment of work units to the individual functions. Next, a reporting form was developed for collecting information to help set standards for the individual functions. This form (see Figure 4) contained all of the basic accounting information as well as additional information.

Use of the dual system placed a small burden on the counties involved, but it was much easier than trying to change the statewide accounting system immediately. As the project progressed, the dual system became more of a necessity and finally the basic accounting information was dropped from the reporting form. Sometime in the future

it is expected that this information will be recombined and one form will be sufficient for both accounting and maintenance.

Two things should be noted at this point: (1) It is important that the area selected for accumulation of data is representative of the whole, and (2) Standards defining the procedures to be used and specifying the manpower, equipment, and material requirements for each function should be developed prior to data collection.

FIGURE 1

MAINTENANCE COSTS (Functional)

Routine roadway surface operations:

411 Patching
412 Blading
413 Joint & crack filling
415 Spot Sealing
417 Dust palliatives
419 Other costs

Special roadway surface operations:

422 Mud jacking and undersealing
425 Treatment and resurfacing of bituminous roadway (includes sealing), new material less than ¾" thick.
426 Resurfacing bituminous roadway, new material more than ¾" thick
427 Resurfacing of roadways with gravel
429 Other costs

Shoulders and side approaches:

444 Sealing
445 Reshaping
447 Widening shoulders
449 Other costs

Roadside and drainage, and grading:

462 Drainage channels or drainage structures—cleaning culverts
465 Walls, cribbing, and riprap, and ditch checks
466 Trees, shrubs, and planting
467 Mowing and weed control
468 Seeding & Sodding
469 Other costs

Structures:

491 Repairing and maintaining underpasses and overpasses
494 Repairing and Maintaining Bridges
495 Replacing existing structure with new type, 20' and over
499 Other costs

Traffic services:

511 Snow and ice removal
513 Sanding icy surfaces
514 Application of chemicals

Traffic control and service facilities:

531 Painting of stripes and markings
532 Repairing, maintaining and operating electrical signal equipment and lighting systems
533 Repairing, maintaining and replacing signs
534 Repairing and maintaining guard rails, posts and fences
548 Repairing and maintaining weighing and inspection facilities
550 Repairing and maintaining roadside rest areas and roadside parks
551 Erecting new signs (highway previously not signed)
553 Detours not chargeable to construction
559 Other costs

River crossings:

561 Operations of ferries
563 Operation of drawbridges
569 Other costs

Other services:

571 Maintenance and operation of Radio Equipment
573 Litter cleaning
575 Installation and maintenance of mail box posts
579 Other costs
580 Salvage operations (bridges, etc.)

Unusual or disaster maintenance:

Expenditures under this division will be classified according to the catastrophe or event. For example:

601 Floods and washouts
602 Tornadoes and cyclones
604 Blizzards
605 Major slides
608 Accidents
609 Military Operations
610 Barricades
619 Other Disaster or Unusual Maintenance

Maintenance—General functions:

651 Field maintenance supervision not chargeable to a Route and Section
652 Storage Expense (Freight, Discount, etc.)
653 Inventory gain or loss
655 Maintenance overhead

Special Maintenance Projects:

661 Roadway surface
662 Traffic services
663 Shoulders and side approaches
664 Roadside drainage and grading
665 Bridge
666 Sealing
667 Roadside Parks
668 Buildings and appurtenances

Rock Crusher Operations:

670

Stores:

1520 Maintenance Materials & Supplies

FIGURE 2

Form 19—139-Rev.
50M—5-69—1024—AP&SCo.

Arkansas State Highway Department

Daily Time and Equipment Report

DI[illegible]SO._____ Forward Daily to District Office DATE_____

NAME	COUNTY CODE	ROUTE	SECTION AND TYPE	JOB NO.	HOURS	DISTRIBUTION OF HOURS BY TYPE WORK							
						ROUTINE MAINTENANCE FUNCTIONS HEAD COLUMNS WITH NEEDED CODES					SPECIAL PROJECTS MUST HAVE JOB #		
											666 SEALING	661 THRU 667 BETTERMENTS	668 BUILDINGS & APPURTENANCES

EQUIPMENT

TAG NO.	TYPE	COUNTY CODE	ROUTE	SECTION AND TYPE	JOB NO.	HOURS OR MILES						666	661 THRU 667	668

Signature_____

ARKANSAS STATE HIGHWAY DEPARTMENT DAILY WORK REPORT

FIGURE 3

DISTRICT No.________ COUNTY No.________ DATE __/__/__ SHEET ____ OF ____

Item	Function	Route	Sec.	Sys. Code	Str. Code	Special	Description	Location

Item	Name	Hours	Rate	Wages	Item	Equipment Type	Equipment No.	Hours/ miles	Rate	Rental

Material Distribution

Item	Quant.	Unit of meas.	Description	Unit Cost	Total Cost	Source

Accomplishment

Item	Quant.	Unit of meas.	Description	Comments

12-19-69

Foreman ________________

FIGURE 4

Arkansas State Highway Department

Daily Work Report

6/27/69

Foreward Daily To District Office

FOREMANS DIST. OR SECT. _____ COUNTY NO. _____ DATE _____

☐ REGULAR MEN ☐ MEN BORROWED FROM DIST. NO. _____ COUNTY NO. _____

WORK DESCRIPTION _____

LOCATION _____

ACTIVITY CODING

COUNTY _____

FUNCTION NO. _____

ROUTE	SECTION	PROJECT NUMBER

SYSTEMS CODE

☐ 1 – INTERSTATE
☐ 2 – PRIMARY
☐ 3 – SECONDARY
☐ 4 – FRONTAGE ROADS
☐ 5 – BLDGS. & GROUNDS
☐ 6 – OVERHEAD & UNDISTRIBUTED EXPENSE

STRUCTURE CODE

☐ 1 – TIMBER
☐ 2 – CONCRETE
☐ 3 – STEEL

EMPLOYEE NAME	HOURS WORKED	HOUR RATE	DAILY WAGES	EQUIPMENT TYPE	EQUIPMENT NO.	HOURS	MILES	RENTAL RATE	DAILY RENTAL
TOTALS				TOTALS					

DESCRIPTION OF MATERIAL USED	UNIT	QUANTITY	UNIT COST	TOTAL COST	OBTAINED FROM (STOCKPILE LOCATION)
TOTALS					

ACCOMPLISHMENT

QUANTITY	UNIT OF MEASUREMENT	DESCRIPTION

_____
FOREMAN

FIGURE 5

ARKANSAS STATE HIGHWAY DEPARTMENT

SEMI-MONTHLY ACTIVITY REPORT

6-26-69

Dist. No.	County No.	Period Ending Month	Day	Year	Route	Section	Job No.	System Code	Struct. Code	Function

Day of the Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

RECORD OF LABOR USED

																	Total
Total Number of Men Used																	
Total Man-Hours																	
Daily Wages																	

RECORD OF EQUIPMENT USED

Equip. Type	Equip. No.	Rental Rate	Hours or Miles	Total Hrs./Mi.	Total Rental

RECORD OF MATERIAL USED

Descrip	Stkpile Loc.	Unit	Unit Cost	Quantity	Total Quantity	Total Cost

RECORD OF ACCOMPLISHMENT

Measurement of Accmp'ment	Quantity	Total

FIGURE 6

ARKANSAS STATE HIGHWAY DEPARTMENT
MAINTENANCE ACTIVITY PERFORMANCE ANALYSIS

6/26/69

District No._____ County No._____ Route_____ Section_____

Function_____ Unit of Measure_____ Fiscal Year_____

System Code_____ Structure Code_____

Period	Cumulative Man Hours	Cumulative Quantity	Productivity Rate	Comments
July 1st				
July 2nd				
August 1st				
August 2nd				
September 1st				
September 2nd				
October 1st				
October 2nd				
November 1st				
November 2nd				
December 1st				
December 2nd				
January 1st				
January 2nd				
February 1st				
February 2nd				
March 1st				
March 2nd				
April 1st				
April 2nd				
May 1st				
May 2nd				
June 1st				
June 2nd				

MAINTENANCE STANDARDS

A Standards Committee was established by the project subcommittee in September, 1970, to develop standards for all of the maintenance functions. The committee consisted of all ten maintenance superintendents, an engineer from the Maintenance Division, and Research personnel. After the standards were developed by the committee, they were presented to the project subcommittee for final approval. Once approved, the standards were immediately distributed statewide for use by maintenance forces.

These initial standards were based almost entirely on the judgement and recommendations of the maintenance superintendents. Once the initial standards were developed, work began refining the standards as experience with them increased - pointing up certain deficiencies or inaccuracies. This is a never-ending process. Problems with any standards are discussed at monthly standards committee meetings.

The standards consist of nine basic items (see Figure 7 and 8).

1. Activity Code and Name
2. Definition
3. Guide (when to use function)
4. Procedure (how to do function)
5. Manpower Requirement
6. Equipment Requirement
7. Material Requirement
8. Daily Production
9. Productivity Rate

Not all functions can be completely standardized. Items one, two, and three are set for all functions while items four thru nine are set when at all possible. However, some functions are simply impossible to completely standardize due to the diverse nature of their application. These criteria set two of the three basic standards necessary for the maintenance management system. These are quality and productivity standards. The third is the quantity standard.

These standards along with various reporting forms were field tested in Clark County, and later in District Seven. This was during their development and prior to their use statewide.

FIGURE 7

ARKANSAS STATE HIGHWAY DEPARTMENT

Maintenance Standard

ACTIVITY 412

DATE 11/02/70

PREMIX PATCHING

DEFINITION

Hand patch potholes and minor depressions in roadway surface or shoulders with premixed bituminous material.

GUIDE

Premix patching used when bituminous surface develops potholes, small depressions, or edge irregularities which may cause damage to a vehicle, be a hazard or cause an unsafe driving condition. Repair should be made as soon as possible after discovery.

Premix patching may also be used for minor or temporary repairs to concrete surfaces.

PROCEDURE

1. Remove loose or broken bituminous surface material and soft or loose base material. In case of depressions or unbroken spots broom all loose or foreign material from area to be repaired.
2. Apply a light tack coat of bituminous material to the bottom and sides of the hole to be repaired.
3. Place premix material in the hole, first around the sides, then toward the center in layers not to exceed 2 inches in depth.
4. Hand compact each layer before placing the next.
5. Thoroughly compact final layer.
6. Check finished surface to make sure it is smooth and level with the surrounding surface.
7. Broom loose excess material from roadway surface.

COMMENTS:

1. Remove water and soft material from hole before patching. Hole must be dry if possible.

MEN	EQUIPMENT
1 Truck driver/worker 2 Maintenance men 3 Flagmen as needed NOTE Provide front-end loader and operator at materials stockpile as required.	1 Dump truck

SMALL TOOLS	MATERIALS
1 liquid asphalt container hand brooms, shovels, asphalt rakes, hand tamps and picks. Traffic guides and aides.	Asphalt emulsion tack (Preferably EA-2) Premix

DAILY PRODUCTION	PRODUCTIVITY	UNIT COST
3 tons of premix	8.0 man-hours per ton	

TRAINING

The identification of training needs and the development of training materials was carried out almost exclusively by Roy Jorgensen Associates, Inc. The Arkansas Highway Department assisted in the collection of pictures for use in the audio-visual training program but left the actual development of the training program, including the testing of Highway Department personnel for identification of training needs, up to the professional personnel employed by the consultant.

The training material developed covers:

1. Scheduling and Planning Work
2. Asphalt Surface Care
3. Mowing
4. Drainage Maintenance

All subjects except "Scheduling and Planning Work" are presented in audio-visual programs with accompanying workbooks. "Scheduling and Planning Work" is presented in workbook form only.

Further details of the training development are covered in the consultant's final report.

IMPLEMENTATION

Statewide implementation of Arkansas' Maintenance Management System was initiated in January, 1972. The first six months of implementation were used as a training period to teach maintenance personnel their respective roles in the operation of the system. Most of this time was used in teaching "Planning and Scheduling" techniques and in instructing fundamentals of the reporting system. To accomplish this, each man responsible for planning, scheduling, and reporting was given a training course - "Maintenance Scheduling and Reporting." After this, time was spent with the men individually, going over any special problems which arose. Several district wide and statewide meetings were conducted and proved to be very valuable. The meetings allowed everyone to see what else was being done, what problems were arising, and how these problems were being solved. This was very important because statewide averages were being used in the maintenance management system. Personnel in the individual districts wanted everything adjusted to their particular needs. When they all got together and discussed their ideas and methods, they realized that things were not exactly as they would like them.

The training period was very successful and resulted in excellent acceptance of the system. District and area personnel from all parts of the state felt there was a definite improvement in their ability to perform needed maintenance.

Training is to continue during the next year and will cover most of the individual maintenance functions. Data collected during

the year will then be used to aid in the preparation of the annual plan for the next year. At this time implementation should be complete for planning, scheduling, reporting and the use of standards.

ADDITIONAL BENEFITS

As a result of the "Highway Maintenance Improvement Research Project" there have been many areas of possible improvement opened to the Maintenance Division. Besides permitting the planning, scheduling, and reporting of work clearly and precisely plus the training of personnel in proper methods, a maintenance management system has begun to evolve which, when fully developed, will allow the following:

1. Complete budgetary control of maintenance and betterments.
2. Better utilization of equipment and a better equipment procurement program.
3. Consistent quality of maintenance throughout the state.
4. Better control of manpower to alleviate seasonal fluctuations.
5. Continued improvement of methods and standards for individual maintenance functions.
6. An integrated system of payroll, financial and equipment reporting and inventory control which will benefit both the Accounting Division and the Maintenance Division.

Work has already begun in these areas. However, it will take some time to completely cover all of them. Some will be accomplished much sooner than others because those areas deemed most important to the overall management program will receive more emphasis and effort.

It is the intent of the Maintenance Division to develop more ways to improve the Maintenance Management System in years to come. It is recognized that this effort is a never-ending process.

SUMMARY

The objectives of this research effort have been successfully accomplished. As a result of the project, the following conclusions have been made:

1. With management information needs clearly defined for maintenance management, separate objective evaluations can be made of other related needs.
2. The use of contractors for performance of some maintenance operations has proved successful in solving particular problems.
3. Investigation and research of new equipment and materials and development should be a continuing responsibility of the Maintenance Division.
4. The potential benefits of equipment management can be as significant as the benefits realized by more efficient maintenance management.
5. Level of service objectives are not defined in a way meaningful to superintendents and foremen. Variations which occur are a result of judgments and decisions of individuals as to the kinds of maintenance needed and the required work procedures.
6. Savings from improved maintenance methods and work program control will allow an increased emphasis to be placed on betterment work without an accompanying increase in the budget.

APPENDIX

ARKANSAS STATE HIGHWAY DEPARTMENT

FUNCTION CODES FOR MAINTENANCE WORK

CODE	FUNCTION
	BITUMINOUS SURFACE MAINTENANCE
411	Surface Treatment Patching: (*Cu. Yd. Aggregate) Patching bituminous roadway surface with one or more applications of hot asphalt and aggregate.
412	Premix Patching: (*Tons Premix) Patching potholes and severe depressions in a bituminous roadway surface with hot or cold premixed bituminous material.
413	Patching Base: (*Cu. Yd. Material) Repair of base or subgrade failures under bituminous pavements through the excavation of unsatisfactory material and replacement with concrete, aggregate or other material. (Report surface replacement separately.)
414	Crack Repair: (*Gallons Filler) Cleaning, filling and sealing cracks in bituminous pavement, and minor surface patching of spalled areas.
415	Seal Coat: (*Miles Sealed) Retreatment of full surface width on continuous sections of bituminous pavement with one application of bituminous material and aggregate cover.
416	Premix Levelling: (*Tons Premix) Major levelling of irregularities in bituminous surfaces with premix material.

* Work Accomplishment Measurement

CODE	FUNCTION
417	Spot Surface Replacement: (*Tons Premix) Removal and disposal of bituminous surface from small deteriorated sections and replacement with premix material.
419	Other Bituminous Surface Maintenance
	CONCRETE SURFACE MAINTENANCE
421	Patching Surface: (*Cu. Yd. Concrete) Patching concrete roadway surface by removing faulty sections and replacing with Portland Cement Concrete.
422	Premix Patching: (*Tons Premix) Patching or levelling concrete roadway surface with hot or cold premixed bituminous material.
423	Patching Base: (*Cu. Yd. Material) Repair of base or subgrade failures under concrete pavement through the excavation of unsatisfactory material and replacement with concrete, aggregate or other material. (Report surface removal and replacement separately as Function 421)
424	Crack Repair: (*Gallons Filler) Cleaning, filling and sealing cracks in concrete pavement and minor surface patching of spalled areas.
425	Joint Repair: (*100 Lin. Ft. of Joint) Cleaning and filling joints in concrete pavement.
429	Other Concrete Surface Maintenance

* Work Accomplishment Measurement

CODE	FUNCTION
	GRAVEL SURFACE MAINTENANCE
431	Patching Surface: (*Cu. Yds. Aggregate) Patching non-paved roadway surfaces with gravel to repair soft spots or replace lost material. (Includes shaping.)
432	Reshaping Surface: (*Road Miles Bladed) Blading and/or dragging of non-paved surfaces to smooth and reshape the riding surface. (No material added.)
433	Restoring Gravel Surfaces: (*Cu. Yds. Aggregate) Major rehabilitation of long continuous sections of gravel surface by reshaping and replacement of lost material.
439	Other Gravel Surface Maintenance
	SHOULDER AND APPROACH MAINTENANCE
441	Patching Non-Paves Shoulders: (*Cu. Yds. Material) Spot patching of non-paved shoulders with gravel or earth to correct low spots and replace lost material. (Includes reshaping as necessary.)
442	Reshaping Non-Paved Shoulders: (*Shoulder Miles Bladed) Blading and shaping of non-paved shoulders without additional material.
443	Restoring Non-Paved Shoulders: (*Cu. Yds. Material) Major rehabilitation of long continuous sections of non-paved shoulder by the addition of material and reshaping.

* Work Accomplishment Measurement

CODE FUNCTION

451 Surface Treatment Patching: (*Cu. Yds. Aggregate)

Patching paved shoulders or approaches with one or more applications of hot asphalt and aggregate.

452 Premix Patching: (*Tons Premix)

Patching paved shoulders or approaches with hot or cold premixed bituminous material.

453 Patching Base: (*Cu. Yds. Material)

Repair of base or subgrade failures under paved shoulders or approaches through the excavation of unsatisfactory material and replacement with aggregate, concrete or other material. (Report surface replacement separately.)

454 Seal Coat: (*Shoulder Miles Sealed)

Bituminous retreatment of existing paved shoulders or approaches on continuous sections with one application of bituminous material and aggregate cover.

459 Other Shoulder and Approach Maintenance

Note: Shoulder widening and/or surface betterment should be reported as Special Maintenance Projects.

ROADSIDE AND DRAINAGE

461 Erosion Control and Repair:

Backfilling of erosion on cuts, fills and minor washouts, reshaping of slopes, placement of pine-tops, ditch checks and baffles for erosion protection.

462 Clean and Repair Drainage Structures:

Cleaning, repairing and replacement of catch basins, pipe culverts, and other minor drainage structures (20' span or less), paved ditches and hand-work in connection with cleaning inlet and outlet ditches.

* Work Accomplishment Measurement

CODE	FUNCTION
463	Clean and Reshape Ditches: (*Ditch Miles Cleaned) Machine cleaning and reshaping of roadside ditches and other side ditches with excess material loaded, hauled and disposed of.
464	Machining Ditches: (*Ditch Miles Machined) Smoothing and shaping of ditches by machine. (No excess material to be loaded and hauled.)
465	Maintaining Fences: Repair and maintenance of fencing.
466	Weed and Grass Control: Spraying and application of chemicals in the control of weeds and grass.
467	Mowing: (*Acres Mowed) Machine mowing and hand trimming of grass and weeds.
468	Seeding and Sodding: Seeding and sodding of roadside and ditches.
469	Other Roadside and Drainage Maintenance
	STRUCTURES
491	Repairing and Maintaining Underpasses and Overpasses: Repairs and maintenance to underpasses, overpasses, viaducts, tunnels, walls and other grade separation structures; includes minor alterations.

* Work Accomplishment Measurement

CODE	FUNCTION
494	Repairing and Maintaining Bridges:
	Cleaning, spot painting, re-painting, minor repairing including piling, pier bracing, bulkhead, fenders, caps, stringers, decking rails, riprap, steel members, walkways, etc.; includes protecting traffic during such operations.
495	Replacing Existing Structure with New Type:
	20' and over. Work performed on Special Projects should be coded to Function 665.
499	Other Structures Cost Maintenance

TRAFFIC SERVICES

Snow, Ice and Sand

511	Snow and Ice Removal:
	Plowing and other costs of mechanically removing snow or ice.
513	Sanding Icy Surfaces:
	Application of sand, cinders or other abrasives to roadway surfaces and bridges that have become hazardous as a result of ice, sleet or snow.
514	Application of Chemicals:
	Applying salt or other chemicals to remove snow and ice.
515	Other Costs:
	Other expenses regarding snow and ice not properly includable under 511, 513 or 514.

Note: (Charge standby time to Function 657)

CODE FUNCTION

TRAFFIC CONTROL AND SERVICE FACILITIES

531 Painting of Stripes and Markings: (*Road Miles Painted)

Painting of traffic lanes on pavement includes labor, equipment rental, materials and any other expenses.

532 Repairing, Maintaining and Operating Electrical Signal Equipment and Lighting Systems:

Repairing, replacing, and other cost of utilities used in operation of flashing lights, bridge lights and other highway lighting systems.

533 Repairing, Maintaining and Replacing Signs:

Repairs to and replacement of signs, markers, and sign posts. Includes repainting, repairing and resetting of signs, markers, etc.

534 Repairing and Maintaining Guard Rails, Posts and Fences:

Repair of, painting and replacing guard rail, posts and fences including delineator posts; new installations of guard rail and channelization including curbs on old roadway or intersections when length does not exceed 500 feet in any one mile.

548 Repairing and Maintaining Weighing and Inspection Facilities:

Repairs, painting of weight stations and equipment.

550 Repairing and Maintaining Roadside Rest Areas and Roadside Parks:

Repairs to equipment in parks and rest areas, drives, parking facilities, cleaning of area, mowing, etc. (Report by roadside park and rest area number)

551 Erecting New Signs (Highway not Previously Signed):

Installation of signs, markers, posts, etc., on highway route and section not previously signed - Use Code 533 when replacing old signs.

CODE	FUNCTION
553	Detours Not Chargeable to Construction:
	All cost of providing detours in connection with maintenance or betterment work. Includes pulling or directing traffic through or around impassable or closed roads and includes ferry service when necessitated by closing of bridge for repairs.
559	Other Costs
	RIVER CROSSINGS
561	Operation of Ferries:
	All costs including labor, equipment rental, utilities, supplies, etc., department owned and operated ferries. Includes contract payments when ferry is operated by private individual or concern. Maintaining and constructing ferry approaches from normal highwater elevation to water; constructing concrete ramps, etc.
563	Operation of Drawbridges: (Report by Bridge Number)
	Salaries and/or wages of on call attendants or regular attendants, utilities, lights, power, fuel and other costs in connection with operation of movable span bridges.
569	Other Costs
	OTHER SERVICES
571	Maintenance and Operation of Radio Equipment:
	Salaries of repair personnel, cost of supplies, parts, utility or other power source, maintenance of towers, guy lines, generators, transmitters, receivers, etc., of the Department Radio System.
573	Litter Cleaning:
	All costs of cleaning or clearing litter (cans, bottles, paper, garbage, and other trash) from roadway surface, intersections, structures or rights of way. Includes installation, maintenance, and cleaning of right of way trash barrels.

CODE	FUNCTION
575	Installations and Maintenance of Mail Box Post
576	Landscaping and Scenic Enhancement:

All expenses incurred in road beautification such as landscaping, scenic overlooks, rest and recreation areas, sanitary, and other facilities. This includes planning and supervision, as well as actual acquisition and construction.

577 Control of Outdoor Advertising:

All expenses incurred in controlling the erection and maintenance of outdoor advertising signs, displays, and devices. This function should be charged with all the expenses incurred in making inventories, investigations, acquisitions, and other activities in connection with advertising control.

578 Control of Junkyards:

All expenses incurred in moving, screening, fencing and otherwise controlling junkyards as defined in Title 23, United States Code. This function should be charged with all the expenses incurred in furthering the Control of Junkyards including the expense of surveys, investigations, fencing, moving, etc.

579 Other Costs - such as,
Safety Program for Holidays, etc.

580 Salvage Operations (bridges, etc.):

Costs of dismantling, removing, hauling, painting, etc., of bridge steel and other items that are salvaged for reuse.

UNUSUAL OR DISASTER MAINTENANCE

Expenditures under this category will be classified according to the catastrophe or event. All costs of maintenance work, repairs, replacements, etc., directly caused by any catrastrophe.

601 Floods and Washouts

602 Tornadoes and Cyclones

CODE	FUNCTION
603	Sand Storms
604	Blizzards
605	Major Slides
608	Accidents
609	Military Operations
610	Barricades
619	Other Disaster or Unusual Maintenance

MAINTENANCE - GENERAL FUNCTIONS

651 Field Maintenance Supervision (Not Chargeable to a Route or Section):

Salaries and expenses of Area Foremen and any other supervisory costs which cannot be charged to specific routes and sections.

652 Storage Expense:

Salaries, wages, equipment rental, cash discounts, price adjustments, and freight bills of less than $5.00 provided, however, the freight is billed on a separate invoice more than thirty (30) days after receipt of the item(s) ordered, or when these items are applicable to an order of more than two (2) different items. Includes other expenses incurred in hauling, stacking, unloading and storing materials and also the cost of operating storerooms.

653 Inventory Gain or Loss:

Charge with book value of inventory items which cannot be otherwise recorded. Charges to this account must be the result of a physical inventory. Prior approval of the District Engineer or Division Head must be obtained for charges to this account.

CODE	FUNCTION
654	Decrease in Inventory Value - Obsolescence:
	Charge with value of inventory items turned into Central Warehouse because of obsolescence.
Note:	Charge only when the items are shipped to the Equipment Division.
655	Maintenance Overhead:
	All items of cost, namely, salaries, wages, expense, equipment rental, stores, issues, etc., including small hand tools, that are not chargeable to Route and Section. (Small hand tools used for maintenance of equipment are charged to Function 752).
	Jury duty for maintenance employees when not charged to leave time (701) is charged to this account.
656	Special Supervision:
	All cost incurred for supervising special work programs such as, the Neighborhood Youth Corps, Green Thumb, Welfare, and similar special programs. Enter initials of program (NYC, GT, W, etc.) in "job number space" of charge documents.
657	Field Maintenance Standby Time:
	Salary and equipment rental expense during enforced standby time as a result of weather conditions, equipment breakdown or other situations prohibiting productive work. (Two hours or more continuous time).
658	Travel Time:
	Travel of statewide and districtwide crews involving a change in work location. This function is intended to identify the time involved in change of work location by crews drawing subsistence or expense accounts. Any minor move of less than three hours is to be charged to the work function the crew is moving to or from. (This function applies to both labor and equipment rental).

CODE FUNCTION

SPECIAL MAINTENANCE PROJECTS

Betterment Projects which have more than one function, such as roadway surface and bridges, the cost should be reported on the actual function on which the work is performed. Minor items which are incidental to performing the major function, however, should not be coded separately. For example: If a bridge betterment is included in a project with roadway surface betterment, the bridge work should be coded to Function 665 and the surface work charged to Function 661. However, if minor repairs are made to the bridge in connection with the roadway surface project, such costs may be charged to Function 661.

661 Roadway Surface:

All items of costs including salaries, wages, expense, stores, equipment rental, etc., incurred in connection with roadway surface reconstruction authorized by special allotment A.F.E.

Note: Unless specifically authorized by the District Engineer or other requesting authority, only materials costs will be charged to the Special Project budget; all other costs will be charged to the routine maintenance budget. All documents (regardless of the budget from which paid) must show the budget number to be charged, the function authorized by the A.F.E., the object and the Special Maintenance Projects:

662 Traffic Services

663 Shoulder and Side Approaches

664 Roadside Drainage and Grading

665 Bridges

666 Sealing

667 Roadside Parks

668 Buildings and Appurtenances

CODE	FUNCTION
	ROCK CRUSHER OPERATIONS
670	Rock Crusher Operations:
	All items of cost incurred in operating rock crusher includes salaries, wages, expenses, equipment rental, stores issues, utilities, etc.
	STORES
1520	Maintenance Materials and Supplies
	Include cost of all items carried in maintenance stock inventory. Payments to vendors, including taxes, shipping costs, use tax, sales tax, etc.; cost of salvage material including equipment rental, labor and demurrage on asphalt shipments.

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