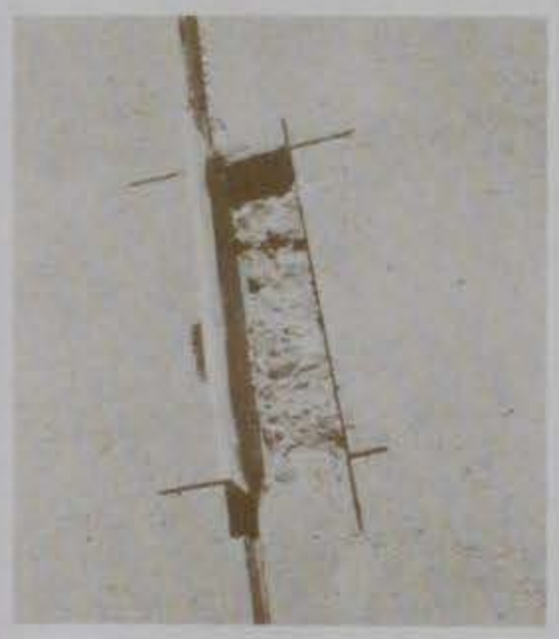

TECHNICAL REPORT GL-90-7

MAINTENANCE MANAGEMENT SYSTEM

by

Joseph Banks, Jan Coester, Peter Graziano

DeLeuw, Cather and Company
Engineering Management Services Division
Gaithersburg, Maryland 20879

June 1990
Final Report

Prepared for US Army Corps of Engineers
Engineering Housing Service Center
Fort Belvoir, Virginia 22060-5516

Under Contract No. DACA39-87-M-0999

Monitored by Geotechnical Laboratory
US Army Engineer Waterways Experiment Station
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188
Exp. Date: Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION
Unclassified

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

3. DISTRIBUTION/AVAILABILITY OF REPORT
Approved for public release; distribution unlimited.

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)
Technical Report GL-90-7

6a. NAME OF PERFORMING ORGANIZATION
DeLeuw, Cather & Company
Engineering Management Services

6b. OFFICE SYMBOL (If applicable)

7a. NAME OF MONITORING ORGANIZATION
USAEWES
Geotechnical Laboratory

6c. ADDRESS (City, State, and ZIP Code)
Six Montgomery Village Avenue
Gaithersburg, MD 20879

7b. ADDRESS (City, State, and ZIP Code)
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

8a. NAME OF FUNDING/SPONSORING ORGANIZATION
See reverse

8b. OFFICE SYMBOL (If applicable)

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
Contract No. DACA39-87-M-0999

8c. ADDRESS (City, State, and ZIP Code)
See reverse

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)
Maintenance Management System

12. PERSONAL AUTHOR(S)
Banks, Joseph; Coester, Jan; Graziano, Peter

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final report	FROM Sep 87 TO Sep 88	June 1990	257

16. SUPPLEMENTARY NOTATION
Available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Maintenance management system; Work activity; Pavement maintenance; Work unit; Planning guideline

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

A need exists to develop a maintenance management system to manage the routine, day-to-day pavement maintenance work not included in the pavement management system (PAVER). This project involved the identification of pavement items to be included, associated maintenance work activities and planning guidelines for each identified maintenance work activity. Over 60 planning guidelines were developed and are presented in the report. Each planning guideline includes the labor, equipment and materials resources and recommended work procedures to perform the work in an effective and economical manner. Daily work accomplished is measured in work units. The work activities and planning guidelines were used to develop a routine maintenance work program and budget for one of the six army installations visited. This demonstrated the potential for further development and implementation of maintenance management systems involves the development and implementation of the complete cycle of planning, organizing, directing and controlling at two pilot test installations. The maintenance management system for routine pavement maintenance would be interfaced with PAVER and the microcomputer Intergrated Facilities System.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION
Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted.
All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

8a.& 8c. NAME AND ADDRESS OF FUNDING/SPONSORING ORGANIZATION (Continued).

US Army Corps of Engineers, Engineering Housing Service Center, Fort Belvoir, VA 22060-5516.

PREFACE

This report documents the development of maintenance planning guidelines for routine pavement maintenance at US Army installations. This work was sponsored by US Army Corps of Engineers, Engineering Housing Service Center (EHSC) and performed for the US Army Corps of Engineers, Waterways Experiment Station (WES), under Contract No. DACA39-87-M-0999. The EHSC Technical Monitor was Ken Gregg.

Information on existing pavement maintenance operations was obtained by the Principal Investigators conducting on-site visits and data collection at Fort Leonard Wood, Fort Bliss, Fort Devens, Fort Stewart, Rock Island Arsenal, and Sierra Army Depot. Personnel from the Office of the Chief of Engineers, Washington, DC, provided information on the work management and contracting procedures being used by the Corps of Engineers. The Tri-Service Manual, "Maintenance and Repair of Surface Areas," TM 5-624/NAVFAC MO-102/AFM 85-8, provided the basic framework for the maintenance and repair procedures of the maintenance planning guidelines. References to TM 5-624 are made throughout the planning guidelines.

Appreciation is extended to the Corps of Engineers personnel at the Army installations visited, especially, Sierra Army Depot's assistance in developing the illustrative maintenance work program. Contributions and assistance provided by other Corps of Engineer contacts are also appreciated.

The study was conducted under the general supervision of Dr. W. F. Marcuson III, Chief, Geotechnical Laboratory (GL); Messrs. H. H. Ulery, Jr., Chief, Pavements Systems Division (PSD), GL; J. W. Hall, Jr., Chief, Engineering Investigations, Testing, and Validation Group, PSD; and L. N. Godwin, Chief, Materials Research Center, PSD. This report was produced under the direct supervision of Dr. R. S. Rollings, Chief, Materials Research and Construction Technology Branch, PSD. Mr. Timothy Vollor was the WES Technical Monitor.

Commander and Director of WES during the preparation of this report was COL Larry B. Fulton, EN. Dr. Robert W. Whalin was Technical Director.

CONTENTS

LIST OF FIGURES

CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
acre	0.40469	hectare
acre	0.00405	square kilometer
cubic feet	0.02832	cubic meter
cubic yard	0.76464	cubic meter
feet	0.30480	meter
gallon	3.78532	liter
inch	0.02540	meter
mile	1.60934	kilometer
pound	0.45359	kilogram
square feet	0.09290	square meter
square yard	0.83613	square meter
ton (U.S.)	907.1848	kilogram
ton (U.S.)	0.90718	metric ton
yard	0.91440	meter

GLOSSARY OF TERMS

Contract Maintenance

The use of private contractors to perform routine maintenance work.

Daily Production

The amount of work expressed in work units accomplished during a standard work day using the recommended work procedure, personnel, equipment and materials.

Inventory Unit of Measure

The pavement feature and unit of measure, e.g. bituminous lane mile, ditch mile.

Maintenance Item

Feature of the pavement system top be maintained, e.g. bituminous surface, unpaved shoulder, traffic sign. Also referred to as pavement item.

Maintenance Management System (MMS)

A method for planning, organizing, directing and controlling routine pavement maintenance and other operations.

Planning Guideline

The documentation for each work activity that provides the recommended work procedure and resources required to perform the work activity in an effective and economical manner.

Routine Maintenance

The minor repair, preservation and upkeep of pavement items to provide a safe, smooth and structurally sound pavement.

Work Activity

The type of maintenance work that is performed on each maintenance item or feature of the pavement; e.g., crack sealing, full-depth patch, machine mowing, plow runways.

Work Unit of Measure

The measurement unit used to plan annual work quantities and to report daily work accomplished for a work activity, e.g., tons, square yards, miles, acres.

Work Procedure

A series of work tasks required to complete a whole job with a single measurable output. Typically performed by a crew of work team.

MAINTENANCE MANAGEMENT SYSTEM

PART I: SUMMARY

1. The Corps of Engineers recognized the need for army installations to have a maintenance system to manage the routine, day-to-day pavement maintenance work not included in the pavement management system (PAVER). Maintenance management systems encompass the full management cycle of planning, organizing, directing and controlling.

2. The initial effort in the development of a maintenance management system for pavements involved the following three tasks:

a. Identify pavement items or components to be maintained, such as bituminous pavement, concrete pavement, unpaved shoulders, ditches, traffic control markings and other features.

b. Identify maintenance work activities associated with each pavement item.

c. Develop planning guidelines for identified maintenance work activities.

The pavement items, activities and guidelines had to be adaptable to any installation of the Department of the Army. Therefore, information on pavement maintenance operations and requirements was collected at six army installations that represented different missions, climates, terrains and sizes.

3. US Army technical manuals provided the basic information. Information from implemented maintenance management systems at the national, state and local government levels was also utilized.

4. The identified pavement items, work activities and planning guidelines represent requirements on a regional or national basis, as opposed to a specific installation. The intent was to define a sufficient number to accommodate army installations throughout the United States.

5. Maintenance items. The physical features of the pavement systems requiring routine maintenance were identified and given a unit of measure for inventory purposes. Maintenance features include bituminous surface, unpaved surface, unpaved shoulders, traffic signs, ditches and other items.

6. Maintenance work activities. Sixty-four (64) work activities related to the maintenance items were also identified. Example work activities are pothole patching, crack sealing, epoxy patching, patch paved

shoulder, runway sweeping and repair signs. A work unit was selected for each activity to measure the output produced by a maintenance crew, for example, tons of material placed, square yards of surface patched, road miles graded and number of signs repaired. Work measurement was kept simple not to burden field workers with calculations and paper work.

7. Planning guidelines. A planning guideline was developed for each work activity. The guidelines contain a recommended work procedure and the labor, equipment and materials resources required to economically accomplish quality work. Typical daily crew production is also provided. The planning guidelines reflect current field maintenance practices for army pavement systems and can be easily modified for use at a specific installation where deviation from typical practice is warranted and necessary.

8. Demonstration program and budget. Planning guidelines and other information were used to develop a routine maintenance work program and budget for Sierra Army Depot, one of the six installations visited. This demonstrated the potential for further development and implementation of maintenance management for pavements at army installations.

Findings

9. Findings address the management of routine maintenance for pavements at US Army installations.

a. An annual quantified program of routine maintenance work is not provided to the first line supervisor.

b. Current maintenance evaluation reports do not include quantities of accomplished work current reporting focuses on resources.

c. Current resource estimates for activities are "built up" from detailed tasks by craft. Frequently, these estimates have minimum value to the first-line supervisor in scheduling, mobilizing crews and performing work.

d. Reports on person-hour usage and costs do not provide the first-line supervisor information required to effectively direct and control field operations.

e. A significant portion of routine and cyclic maintenance is performed by contract. The absence of planning guidelines and annual work estimates limits the effectiveness of contracts and gives little direction for contract management.

f. There are areas where a management system for routine pavement maintenance would enhance PAVER, as well as other information support for first-line supervisors. Example areas are annual

work planning, job estimating, resource requirements and work history.

Recommendations

10. The following recommendations are made for developing the additional components of a routine pavement maintenance management system for the US Army Corps of Engineers.

a. The complete maintenance management cycle of planning, organizing, directing and controlling be developed and implemented for the pavement systems at a minimum of two pilot test locations with emphasis on work and support of first-line supervisors.

b. Pilot test development and implementation efforts be interfaced with PAVER for inventory, annual work quantity planning and possibly routine maintenance history by pavement section.

c. Existing informational systems be utilized as data input for planning and organizing routine pavement maintenance operations.

d. Available national maintenance management system (MMS) software be utilized to develop the planning, organizing, directing and controlling components of MMS for routine pavement maintenance, as demonstrated for Sierra Army Depot for planning.

e. Planning guidelines developed for routine pavement maintenance be utilized to better estimate resource and work requirements in-house hand work requirements for contracts.

PART II: INTRODUCTION

Why Develop a Maintenance Management System

11. The pavement management system, entitled PAVER, identifies pavement repair and rehabilitation needs. Pavement strategies are determined at the network and project level and tend to be cyclic improvements. The Corps of Engineers developed PAVER which has been implemented successfully by several Army, Air Force and Navy installations. Additionally, PAVER has been adopted by the American Public Works Association (APWA) and implemented in various cities and counties throughout the United States.

12. The Corps of Engineers recognized the need to have a pavement maintenance management system to manage the routine, day-to-day, maintenance work activities not included in PAVER. The maintenance management system includes the full management cycle of planning, organizing, directing and controlling.

Components of Phase One

13. As the first step in the development of a pavement maintenance management system specific components of the management system were developed during this project. These components included the following:

a. Pavement items, or features, of the pavement system to be included.

b. Maintenance work activities associated with each pavement item.

c. Planning guideline for each identified maintenance work activity.

14. The elements of the maintenance management system developed during this project provides the framework for subsequent phases of development and implementation. The pavement maintenance management system for routine maintenance work encompasses pavement maintenance not included in PAVER and provides management support for the complete scope of work performed on pavements.

Designated Work Tasks

15. The initial effort in the development of a pavement maintenance management system involved three (3) designated work tasks. These tasks were:

a. Identify pavement items of the pavement systems to be included. These are the pavement components to be maintained, such as bituminous pavement, concrete pavement, unpaved shoulders, ditches, traffic control markings and other features.

b. Identify maintenance work activities associated with each pavement item.

c. Develop planning guidelines for identified maintenance work activities.

16. Maintenance and repair techniques in the Tri-Service Manual, Maintenance and Repair of Surface Areas, TM 5-624/NAVFAC MO-102/AFM 85-8 were designated to be followed in the development of pavement maintenance planning guidelines. This manual provides guidance for the maintenance and repair of roads, streets, parking areas, airfields, walks and other pavement areas at the Army, Air Force and Navy installations.

US Army Installations Visited

17. Since the maintenance management system was to be adaptable to any of the Department of Army installations in the United States, information on pavement maintenance operations and requirements was to be collected at army installations that represented different missions, climates, terrains and sizes.

18. Two (2) installations were selected from each of the three major commands responsible for the majority of the pavement surfaces at army installations. The following installations were selected for on-site visitation and in-depth data collection on pavement maintenance operations:

a. FORSCOM - Forces Command
   Fort Devens, Massachusetts
   Fort Stewart, Georgia

b. TRADOC - Training and Doctrine Command
   Fort Bliss, Texas
   Fort Leonard Wood, Missouri

c. AMC - Army Materials Command
   Rock Island, Arsenal, Illinois
   Sierra, AD, California

These six (6) installations provided good geographic distribution with varying terrains, climates and sizes. Figure 1 shows this distribution.

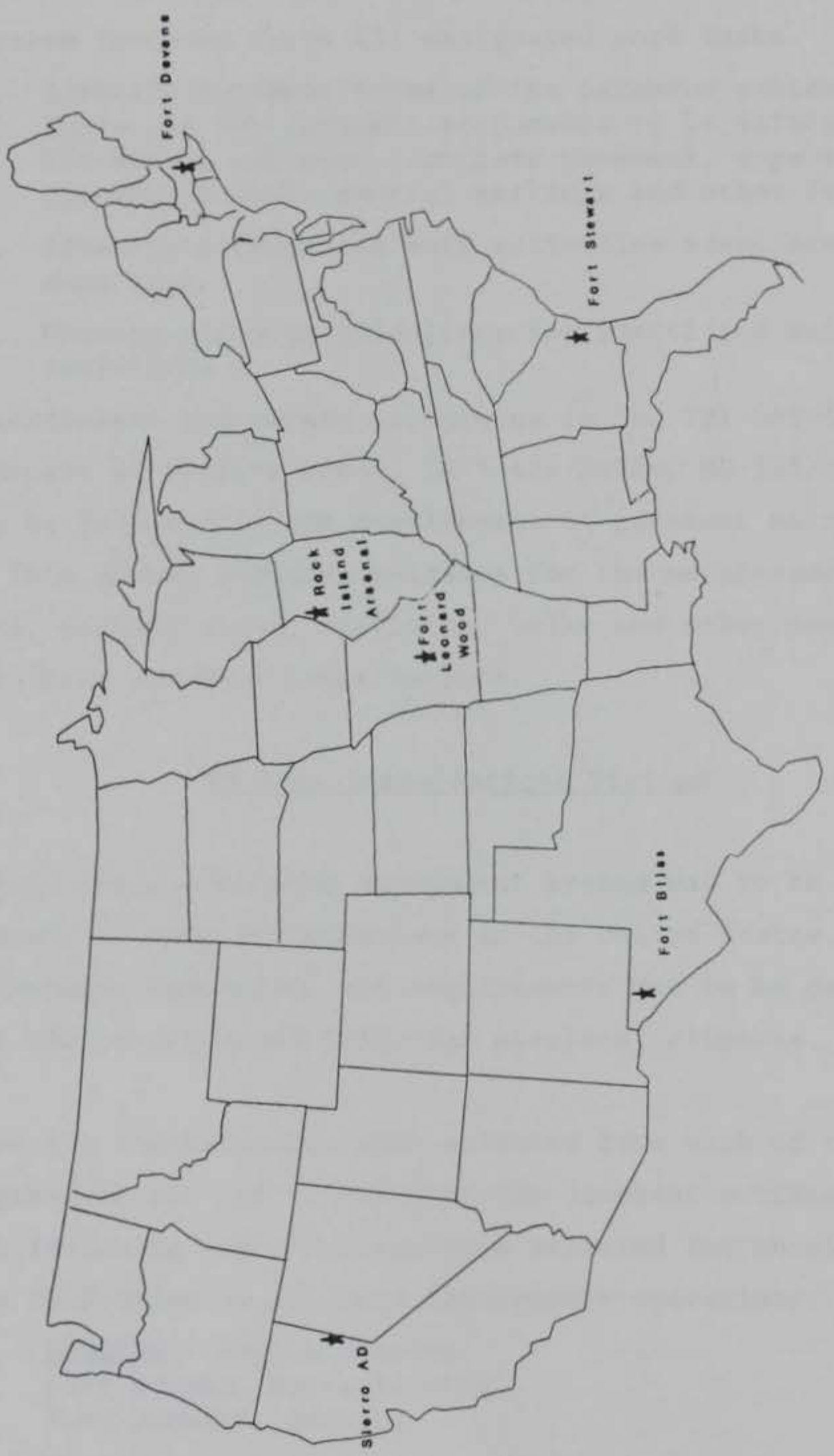

Figure 1. Army Installations Visited

PART III: STUDY APPROACH

Existing Maintenance Information

19. Current pavement maintenance operations by the Corps of Engineers provided the starting point in the development of a pavement maintenance system. The joint Departments of the Army, the Navy and the Air Force, USA, Technical Manual TM 5-624/NAVFAC MO-1021/AFM 85-8, Maintenance and Repair of Surface Areas provides guidance for the maintenance and repair of roads, streets, parking areas, walks and airfields. The manual discusses the types of surfaces and materials, causes and types of distress and different methods of maintenance and repair. The information in this manual presents a good overview of the scope of pavement maintenance, but it is not organized into maintenance work activities or planning guidelines. However, it provided an excellent base for developing an initial list of maintenance items and work activities.

20. Another source on pavement maintenance is the joint Department of the Army, the Navy and Air Force handbook of Engineered Performance Standards for Real Property Maintenance Activities TB 420-22/NAVFAC P-712.0/AFM 85-51 that cover roads. This handbook provides guidance in estimating person hour requirements for workers to perform typical facilities maintenance tasks. However, for roads only five task areas, work activities, are listed. Within each task area the work performed is broken down into minute work units for estimating person hour requirements. Separate estimates are made for individual work steps. Typical work steps for "Replacing Bituminous Surface" include operate pneumatic hammer, remove broken material, sweep area, apply tack coat, place bituminous material and hand tamp. This type of detail may be beneficial for planning and evaluating selected type of maintenance work but has not proven effective, or required, for planning and evaluating routine pavement maintenance work performed on a day-to-day basis.

21. The American Public Works Association (APWA) manual, Street and Highway Maintenance Manual, contains detailed information on pavement maintenance operations and performance standards for selected maintenance work activities. Several cities and counties have utilized this manual to assist them in developing and implementing a maintenance management system for their agency.

22. Other sources of existing information on maintenance management systems include state and local transportation agencies throughout the United States and national agencies, such as the National Park Service which has developed a servicewide maintenance management system that is being implemented in over 300 parks throughout the nation. This system encompasses roads, trails, walks, grounds and all physical features of the park that must be maintained.

23. These existing sources of maintenance management information were utilized to develop initial lists of maintenance items and work activities.

Installation Visits

24. Installation visits were coordinated through the Directorate of Engineering and Housing (DEH) at each installation. A key contact person responsible for pavement maintenance was identified and arrangements finalized for an on-site visit to review pavement maintenance operations at the installation.

25. Prior to the installation visits the preliminary lists of pavement maintenance items work activities developed from existing information was transmitted to the installation, together with draft definitions for each work activity that describe the type of work included in each work activity. An agenda of subjects to be covered during the installation visit was also provided to the maintenance contact. These subjects included:

a. Current budgeting and work planning process.

b. Work reporting forms and procedures.

(1) Labor, equipment and materials.

(2) Work accomplished.

c. Available inventory of pavement maintenance items (features to be maintained).

d. Personnel and equipment available for maintenance.

e. Types and magnitude of pavement maintenance performed.

(1) DEH personnel.

(2) Troops.

(3) Commercial contract.

f. Labor, equipment and materials used to perform specific work activities.

26. The preliminary lists of maintenance items and work activities were reviewed during the installation visits and modified to reflect pavement maintenance requirements at the installation being visited. The level of work effort normally associated with each work activity was recorded as high, medium or low. Additionally, it was determined whether the maintenance was performed with in-house personnel, commercial contract or a combination of both.

27. The Commercial Activity (CA) process, which involves routine maintenance being performed by private contractor, was very active at the installations visited. One installation was performing all pavement maintenance by a private contractor and another was scheduled to start complete contractor pavement maintenance on April 1, 1988. At the other installations private contract maintenance effort ranged from major to minor. Routine maintenance work typically being contracted includes traffic line striping, roadside mowing and crack/joint sealing. Cyclic type of maintenance such as resurfacing, seal coating and pavement rehabilitation are also normally contracted.

28. PAVER, the pavement management system being implemented by the Corps of Engineers was found to be in varying levels of implementation at the six installations. PAVER was fully implemented and being utilized at two installations; implementation was underway at two locations; and two installations had not initiated implementation efforts. PAVER is being operated by a private contractor at one installation and by DEH personnel at the other location. Personnel at these locations were complimentary of PAVER application as an objective rating of pavement condition to develop cyclic maintenance projects.

29. Field observations of maintenance work in progress and items to be maintained were made at the installations to ensure the maintenance items and work activities identified during this phase were representative of pavement facilities at the army installation. Pavement surface types observed included bituminous concrete, portland cement concrete, gravel and dirt. One unique feature found on army installations was the concrete tank crossings and intersections on bituminous roads, however, the maintenance requirements are the same as other concrete surfaces. Snow and ice control activities for airfield facilities differ from roadways due to aircraft movements and the prohibition of corrosive-type chemicals. The majority of the activities had been

identified on the preliminary listings and were confirmed during the installation visits.

30. Pavement maintenance at army installations is performed by the Roads Branch of DEH. Staffing for pavement maintenance at two installations has decreased significantly in the last ten (10) years. In terms of paved lane miles per person, staffing at these two locations is low compared to the other two installations performing pavement maintenance with in-house personnel. The equipment available at the installations included the types typically required to perform pavement maintenance and was well maintained.

PART IV: MAINTENANCE MANAGEMENT ELEMENTS

Maintenance Workload Planning

31. Maintenance workload planning is the first step in a comprehensive maintenance management system encompassing routine maintenance. It is based on the physical features to be maintained, maintenance work to be performed and resources (labor, equipment and materials) required to accomplish the planned maintenance workload. The identification of these basic maintenance management planning elements for pavement systems formed the overall objective for the first phase of maintenance management system development.

32. The maintenance management planning elements developed reflect the routine maintenance needs and requirements of the pavement systems at US Army installations. The elements identified represent requirements on a regional or national basis, as opposed to a specific installation. The intent was to define a sufficient number of the individual planning elements that would accommodate army installations throughout the United States. The following planning elements were developed.

a. Maintenance items.

b. Maintenance work activities.

c. Maintenance planning guidelines.

Maintenance Items

33. Maintenance items are features of the pavement system requiring routine maintenance work. The types and amounts of routine maintenance to be performed at each army installation depend on the types of pavement features to be maintained at each installation. A typical army installation's inventory of maintenance items includes features such as:

a. Bituminous surface.

b. Unpaved surface.

c. Unpaved shoulder.

d. Mowable roadside.

e. Traffic sign.

34. The quantity of the maintenance item is expressed as units of measure for each feature. For example:

a. Bituminous surfaces are measured by lane miles.

b. Unpaved surfaces are measured as road miles.

c. Unpaved shoulders are measured by shoulder miles.

d. Mowable roadsides are measured in acres.

e. Traffic signs are counted (each).

Figure 2 shows the maintenance items and units of measure that were identified as being applicable for pavement facilities at army installations. The maintenance item and unit of measure that most directly affect the amount of routine maintenance work required are designated for each maintenance work activity to be performed at the installation.

Maintenance Work Activities

35. The maintenance workload planning process is work activity oriented. A maintenance work activity is defined as a task or related tasks performed by maintenance personnel work as a team or crew to accomplish a specific single measurable result. Each type of work that uses a definite mix of labor, equipment and materials is defined as a separate work activity. For example, in surface maintenance, a work activity called "patching" is too general for good workload planning. Surface maintenance can involve pothole patching with hand tools and major full-depth patching with excavating equipment. Each is a separate work activity because the team composition (man/machine mix) and measurable results are different.

36. Work activities were identified for the major categories of pavement items to be maintained and specific services to be provided for these features. The major categories selected for maintenance work activities are:

a. Bituminous pavement.

b. Concrete pavement.

c. Other surfaces.

d. Shoulders.

e. Roadside.

f. Drainage.

g. Bridge surface.

h. Traffic services.

i. Snow and ice control.

Maintenance Item	Unit of Measure
Bituminous Surface	Lane Mile
Concrete Surface	Lane Mile
Unpaved Surface	Road Mile
Unpaved Shoulder	Shoulder Mile
Troop Trail	Mile
Paved Roadway	Lane Mile
Runway Surface	Lane Mile
Roadway	Road Mile
Unpaved Ditch	Mile
Drainage Canal	Mile
Culverts and Inlets	Each
Mowable Roadside	Acre
Roadside Fence	Linear Feet
Bridge Deck	Square Yard
Timber Deck	Square Yard
Non-Timber Deck	Square Yard
Traffic Line Stripe	Miles
Traffic Sign	Each
Roadway Light	Each
Traffic Signal	Each
Runway Light	Each
Sidewalk and Walkway	Linear Feet

Figure 2. Maintenance items and unit of measurement

Specific work activities were identified for each category. A total of 64 work activities was selected for routine pavement maintenance at army installations. Figure 3 lists the work activities for each category.

37. For each work activity a work unit was selected to measure the work performed by maintenance personnel. The work unit also is used to plan the total workload for each work activity. Typical work units include tons of material placed, square yards of surface patched, road miles bladed and number of signs repaired. The work unit should describe the results of the work effort and be practical and easy to measure. The field crew doing the work should be able to measure and record the amount of work with minimal effort. For some work activities, the work unit is best expressed as person hours. This is the case for work activities such as "Hand Mowing and Trimming" and "Remove Roadway Debris". It is difficult, if not impossible, to identify a work unit that is practical and reasonable to measure and is representative of the nature of the work. The work units for each work activity are shown in Figure 3.

38. Work activities and their measurement units are directly related to inventory units to facilitate planning maintenance workloads. The relationship of the work to the inventory unit is shown in Figure 3.

39. The work activity name identifies the work, but is not necessarily fully descriptive of the work. For each work activity a general description of the work was prepared that further defines the work to be performed, the deficiency to be corrected, reasons for doing the work and the result to be achieved. The description should leave little doubt about what work is included in the activity. Figure 4 illustrates the activity descriptions. A complete list is contained in Appendix A.

Maintenance Planning Guidelines

40. One of the basic objectives of a maintenance management system is to ensure effective and economical use of labor, equipment and materials in the performance of pavement maintenance activities. This is accomplished, in part, by developing planning guidelines for planning and organizing work according to the work methods and resources established to perform the work activities in an effective and economical manner. An important requirement is

WORK ACTIVITY		WORK UNIT	MAINTENANCE UNIT AND ITEM (Inventory Unit)
BITUMINOUS PAVEMENT			
1110	Pothole Patching	Tons	Lane Mile Bituminous Surface
1120	Partial-Depth Patch	Tons	Lane Mile Bituminous Surface
1130	Full-Depth Patch	Tons	Lane Mile Bituminous Surface
1140	Surface Treatment Patch	Square Yards	Lane Mile Bituminous Surface
1150	Surface Treatment	Square Yards	Lane Mile Bituminous Surface
1160	Skid Resistance Treatment	Square Yards	Lane Mile Bituminous Surface
1170	Crack Sealing	Gallons Sealant	Lane Mile Bituminous Surface
1180	Treat Bleeding Asphalt	Square Yards	Lane Mile Bituminous Surface
1190	Treat Fuel Spillage	Square Yards	Lane Mile Bituminous Surface
CONCRETE PAVEMENT			
1310	Bituminous Patching of PCC	Tons	Lane Mile Concrete Surface
1320	Partial-Depth Patch of PCC	Square Yards	Lane Mile Concrete Surface
1330	Full-Depth Patch of PCC	Square Yards	Lane Mile Concrete Surface
1340	Epoxy Patching	Square Yards	Lane Mile Concrete Surface
1350	Bituminous Undersealing	Square Yards	Lane Mile Concrete Surface
1360	Crack/Joint Sealing	Linear Feet	Lane Mile Concrete Surface
1370	Slab Replacement	Square Yards	Lane Mile Concrete Surface
1380	Slabjacking	Square Yards	Lane Mile Concrete Surface
1390	Slab Grinding	Square Yards	Lane Mile Concrete Surface
1400	Surface Grooving	Square Yards	Lane Mile Concrete Surface
OTHER SURFACES			
1510	Blade Unpaved Surface	Road Miles	Road Mile Unpaved Surface
1520	Add Gravel Unpaved Surface	Road Miles	Road Mile Unpaved Surface
1530	Cement/Lime Stabilization	Road Miles	Road Mile Unpaved Surface
1540	Dust Control	Road Miles	Road Mile Unpaved Surface
1550	Blade Troop Trails	Trail Miles	Miles Troop Trails
SHOULDERS			
1710	Patch Paved Shoulder	Tons	Miles Paved Shoulder
1720	Seal Coating	Square Yards	Miles Paved Shoulder
1730	Blade Unpaved Shoulder	Shoulder Miles	Miles Unpaved Shoulder
1740	Add Gravel Unpaved Shoulder	Tons	Miles Unpaved Shoulder

Figure 3. Pavement Maintenance Work Activities

WORK ACTIVITY		WORK UNIT	MAINTENANCE UNIT AND ITEM (Inventory Unit)
ROADSIDE			
2110	Roadway Sweeping	Lane Miles	Lane Miles Paved Roadway
2120	Runway Sweeping	Lane Miles	Lane Miles Runway
2130	Magnet Sweeping	Lane Miles	Lane Miles Paved Surface
2140	Machine Mowing	Acres	Acres Mowable Area
2150	Hand Mowing/Trimming	Person Hours	Acres Mowable Area
2160	Spraying/Weed Control	Person Hours	Acres Mowable Area
2170	Reseeding and Sodding	Square Yards	Acres Mowable Area
2180	Erosion Control	Person Hours	Acres Mowable Area
2190	Litter Pickup	Bags Litter	Acres Grounds Area
2200	Brush and Tree Cutting	Person Hours	Acres Grounds Area
2210	Repair Fences	Linear Feet	Linear Feet Fence
2220	Clean Grit Chambers	Person Hours	Number Wash Racks
2230	Remove Roadway Debris	Person Hours	Miles Roadway
DRAINAGE			
3110	Clean/Reshape Ditches	Ditch Miles	Miles Unpaved Ditch
3120	Clean Culverts/Inlets	Number Culverts/Inlets	Number Culverts/Inlets
3130	Repair/Replace Culverts	Number Culverts/Inlets	Number Culverts/Inlets
3140	Place Riprap	Person Hours	Miles Unpaved Ditch
3150	Clean/Clear Canals	Linear Feet	Miles Canal
BRIDGE SURFACE			
4110	Clean Bridge Surface	Square Yards	Square Yards Bridge Deck
4120	Repair Timber Deck	Square Yards	Square Yards Timber Deck
4130	Repair Bridge Deck	Square Yards	Square Yards Non-Timber Deck
TRAFFIC SERVICES			
5110	Traffic Line Striping	Linear Feet	Miles Traffic Lines
5120	Repair Signs	Number Signs	Number Traffic Signs
5130	Repair Guardrail	Linear Feet	Linear Feet Guardrail
5140	Repair Lights	Number Lights	Number Lights
5150	Repair Signals	Number Signals	Number Signals

Figure 3. Pavement Maintenance Work Activities
(Continued)

WORK ACTIVITY		WORK UNIT	MAINTENANCE UNIT AND ITEM (Inventory Unit)
SNOW AND ICE CONTROL			
6110	Plow Roadways	Roadway Miles	Miles Roadway
6120	Plow Runways	Person Hours	Lane Miles Runway
6130	Rotary Snow Removal	Person Hours	Lane Miles Paved Surface
6140	Load/Haul Snow	Person Hours	Lane Miles Paved Surface
6150	Sweep Snow from Runways	Person Hours	Lane Miles Runway
6160	Apply Chemicals/Abrasives - Ice Control	Tons	Lane Miles Paved Surface
6170	Clear Snow/Ice Runway Lights	Number Lights	Number Runway Lights
6180	Clear Walkways	Linear Feet	Linear Feet Sidewalk
6190	Install/Remove Snow Fence	Linear Feet	Number Locations
6200	Install/Remove Snow Markers	Number Markers	Number Locations

Figure 3. Pavement Maintenance Work Activities
(Continued)

BITUMINOUS PAVEMENT

1110 Pothole Patching

Patching small areas (25 sq. ft., or less) of bituminous surfaces with asphalt material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Bituminous Lane Mile

1120 Partial-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

Work Unit: Tons Material
Inventory Unit: Bituminous Lane Mile

1130 Full-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

Work Unit: Tons Material
Inventory Unit: Bituminous Lane Mile

1140 Surface Treatment Patch

Patching small areas (25 sq. ft., or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1150 Surface Treatment

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

Figure 4. Sample Maintenance Work Activity Definitions

that the guidelines are practical and easily communicated to first-line supervisors and field crews.

41. Planning guidelines support work program and budget development by providing the framework for estimating the labor, equipment, materials, and the expected daily productivity for each activity. The guidelines also provide information about:

a. What work is to be done.

b. When the work is to be done.

c. Why the work is to be done.

d. What basic work steps are to be done.

These data, for each activity, support managers and supervisors in their efforts to maximize the use of limited resources in accomplishing maintenance work programs.

42. Planning guidelines were developed for each identified routine maintenance work activity. These guidelines have been developed from data abstracted from the Army's Manual, "Maintenance and Repair of Surface Areas" (TM 5-624), interviews and work observations at the six installations visited and planning guideline data available from other sources such as the American Public Works Association and the National Park Service. Information contained in the planning guidelines are representative of routine pavement maintenance operations and sound maintenance practices. The guidelines reflect current maintenance practices for army pavement systems and could be modified for use at a specific installation with minimal effort.

43. Planning guideline data are presented in a format as shown in Figure 5. Descriptions of the information included in each planning guideline are presented in the following sections:

a. Work activity. The title of the maintenance work activity as shown on the activity list.

b. Code. A numeric identification code as shown on the activity list.

c. Description. The narrative description of work to be performed and results to be achieved.

d. Maintenance item. The pavement item to be maintained and its unit of measure.

e. Planning criteria. Information about when to schedule work, and additional guidance about the severity of the deficiency or priority of the work. Other important scheduling or coordination information may also be presented. The monthly section

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Pothole Patching	**CODE**	1110

DESCRIPTION

Patching small areas (25 sq. ft, or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

MAINTENANCE ITEM Bituminous Surface Lane Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X	X	X	X	X	X	X	X	X	X	X	X

Perform when potholes and other hazards are identified. Schedule the work by geographical area, except for emergencies. Hot-mix asphalt concrete is the preferred patching material when available.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Vibratory Tamper	1
Heater-Blower	1
Saw or Air Hammer	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

DAILY PRODUCTION

3 - 5 Tons Asphalt Concrete

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-37, 38, par. 3-5.6.7.1-3.

Figure 5. Planning Guideline

WORK ACTIVITY	Pothole Patching	CODE	1110

RECOMMENDED WORK PROCEDURE

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

6.00000 Hours per Ton

Figure 5. Planning Guideline
(Continued)

provides an indication of the typical calendar distribution of the work activity.

f. Resources requirements - personnel. The numbers and types of personnel required to perform the work are listed. Specific personnel classifications have not been used. Titles related to work assignments and required skills have been used instead for these performance standards. Quantity is based on average conditions for flagging and materials hauling. Personnel may be added or deleted to satisfy special traffic, safety, or hauling requirements.

g. Resource requirements - equipment. The major types of equipment and the number required to perform the work are listed. The lack of availability of a specific type of equipment may require a substitution. The material haul distance for a specific work site may affect the actual number of trucks required.

h. Resource requirements - material. The major materials typically required to perform the work are shown. Requirements may vary depending on the type of deficiency to be corrected.

i. Daily production. The estimated amount of work to be accomplished in an 8 hr day using the recommended work procedure, crew, equipment and materials. This estimate is presented in terms of a quantity of work units and is shown as a range recognizing that day-to-day accomplishments will vary.

j. References - methods and safety. Technical references for manuals, specifications, standards, safety criteria and other information to be considered in planning the work activities.

k. Recommended work procedure. On the back of the performance standard is a recommended work procedure to follow when planning and accomplishing the work. These procedures may be modified to fit a specific work location or condition. However, the basic steps should be performed to ensure the deficiency is corrected properly and/or the desired quality of workmanship is obtained.

l. Engineered performance standard. Person-hours per unit of work accomplishment.

44. Appendix B contains the planning guidelines developed for the pavement maintenance work activities identified during this phase of maintenance system development. These planning guidelines will not apply uniformly at all army installations due to variations in factors such as terrain, weather, installation size, installation missions and available labor, equipment and material resources. As required, these guidelines can be modified to develop installation-specific planning guidelines which address the individual installation situation.

45. The resource requirements for personnel, equipment and material should represent the most effective and efficient complement of resources to accomplish each work activity. Resources, and quantities, shown on the planning guidelines represent average conditions and actual use may vary to satisfy special work site locations. Appendix C contains the resource lists for personnel, equipment and material classifications used in the planning guidelines and the measurement units used for the resource.

PART V: ANALYSIS AND DEMONSTRATION

46. Current use of maintenance management principles and the potential for application of a comprehensive maintenance management system were reviewed and analyzed. This analysis was not directed toward an audit of existing maintenance operations and work management procedures, as only six (6) army installations were contacted and visited on site. However, these installations were selected as being representative of the army installations throughout the United States.

Existing Routine Maintenance Operations

47. Routine maintenance work for pavement systems is performed by in-house personnel, by private contractors and by a combination of both. The annual work program and budget for routine pavement is included in the Operations and Maintenance portion of the Annual Work Program (AWP) for the installation. The AWP does not identify every project to be performed during the year, but rather is a planning document which reflects the best information available when the work program is developed.

48. The maintenance work program consists of estimated personnel and material costs for standing operations, service orders, individual jobs/projects and emergency work as well as private contract work. Equipment requirements typically are estimated as a separate line item in the budget. These estimates are based on historical data, field inspections and other identified needs. The annual routine maintenance work program does not appear to be based on accomplishing a designated amount (quantity) of routine maintenance--except when the commercial activity (CA) process is involved.

49. The CA process involves identifying and quantifying the specific types of routine maintenance work to be performed during the year. Sufficient detail is provided to permit private contractors to bid on performing the work. The Facilities Engineer also prepares a bid to perform the routine maintenance work with in-house personnel. A private contractor must bid more than 10 percent less than the in-house bid in order to receive the contract for the routine maintenance work. At the two installations where private contractors had been awarded contracts for routine maintenance, the roads and

pavement maintenance personnel appeared to have minimal input into the in-house bid for the pavement maintenance portion.

50. Work authorization, or organizing and directing, is provided through three (3) separate categories of work: service orders, standing operations orders and individual job orders.

a. Service Orders (SOs). Small service-type maintenance and repair jobs not exceeding 16 person-hours of labor and $350 material costs. Includes emergencies and work requiring immediate action.

b. Standing Operations Orders (SOOs). Work of a continuing, year-around basis such as utility plant operations or custodial services. Road and pavement maintenance usually is not performed by SOO except for repetitious type work performed during certain months, such as snow removal operations.

c. Individual Job Orders (IJOs). All maintenance and road repair work involving more than 16 person-hours and $350 material costs, but not in excess of the installation commander's approval authority.

Proper use of these categories provides an effective work authorization and organization component for maintenance management.

51. IJO resource estimates are not performed by maintenance operations personnel, but rather by planner-estimators using Engineered Performance Standards (EPS) on a task-by-task basis or general person-hour estimates based on experience. Engineered Performance Standards are the estimated number of person-hours required to accomplish a certain unit of work according to a specified method and to an acceptable quality. A recognized limitation in using EPSs for estimating routine pavement maintenance work is that only a limited number of EPSs are available. Field personnel at the installations visited indicated there were wide variations in estimated resources on IJOs and the resources actually required to perform the work. There were doubts on how the estimated resources were developed.

52. Routine pavement maintenance does not lend itself to a rigid, mechanistic application of industrial engineering principles for measuring work production. This was recognized over 25 years ago by the professionals pioneering the development and application of maintenance management concepts. Typically, work production is expressed as "average daily production" for a compliment of resources (labor, equipment, materials) to accomplish during a standard work day. The work performed includes all the separate work tasks (work activity) required to produce the completed whole job with a single unit

of measure performed by a team or crew. The reasons for this approach were twofold. First, administrative and management costs needed to be kept in line with the costs of performing the work. Second, procedures had to be simple for effective communications at the working level.

53. Priorities are assigned to SOs and IJOs as they are received and approved for work assignment. Various work scheduling approaches were used by the installations visited. These approaches ranged from formal weekly schedules to daily scheduling/work assignments. The key factors affecting maintenance scheduling seemed to be installation size and supervisory personnel preference.

54. Reporting of maintenance work accomplished varied among the installations contacted. Some used the phase and task codes of the Integrated Facilities System (IFS). Others had developed their own task codes that grouped the individual tasks involved in completing a work function (activity). In some cases, work accomplishment was reported in measurable work units for each task. All installations used the form Labor and Equipment (DA FORM 4288) to report labor and equipment used.

55. Installations with an IFS have the capability to develop several standard evaluation reports including the following:

a. Labor and Equipment Report - Daily list of work performed by person for all SO, WO, JO.

b. SO Backlog Report - Lists backlog of Service Orders by task code and priority.

c. SOO Shop Schedule Report - Shows estimated person-hours versus completed person-hours.

d. Projects-in-Progress Schedule - Status of IJOs.

Pavement maintenance personnel indicated these reports were of limited use to them in evaluating their work efforts. The reports did not list work accomplishment or cost per unit of work and the reports were not always current. Some supervisors prepared manual evaluation reports.

Application of Maintenance Management Elements

Maintenance management overview

56. Maintenance management systems provide a formalized process and procedures for managing maintenance operations for various facilities such as pavements, roads, parks, utilities and buildings. Although the magnitude of

the maintenance workload varies from area to area, the same procedures are adaptable to installations of all sizes and with differing responsibilities. The four major functions of maintenance management systems are:

a. Planning.

b. Organizing.

c. Directing.

d. Controlling.

These are systems that focus on the field work and first-line supervision and have capability to summarize for higher levels of management.

57. Maintenance management elements are developed to reflect the maintenance requirements and conditions at the specific installation. Maintenance management provides managers and supervisors with effective procedures to manage and control their maintenance responsibilities. Microcomputers are often used to store relevant maintenance data, perform calculations and prepare reports. By eliminating the need for tedious, time consuming manual tasks, the maintenance staff is available to perform important field direction and other maintenance work.

58. The planning, organizing, directing and controlling functions are shown in the maintenance management flowchart in Figure 6. Each function has several components which are integral to maintenance management systems.

59. Planning. The planning function provides a work program and budget that reflects management decisions and objectives for maintenance activities. This process includes the development of several planning elements that are organized and compiled to form a work program and budget. These elements are:

a. Organization data.

b. Work activities.

c. Inventory and condition assessment.

d. Planning guidelines.

e. Service levels*

f. Resources and unit costs.

Work activities and performance standards for pavements at army Installations have been developed during this study.

60. Organizing. As shown in Figure 6, the organizing elements are:

---

* Frequencies of maintenance work or annual quantities of maintenance work per unit of inventory.

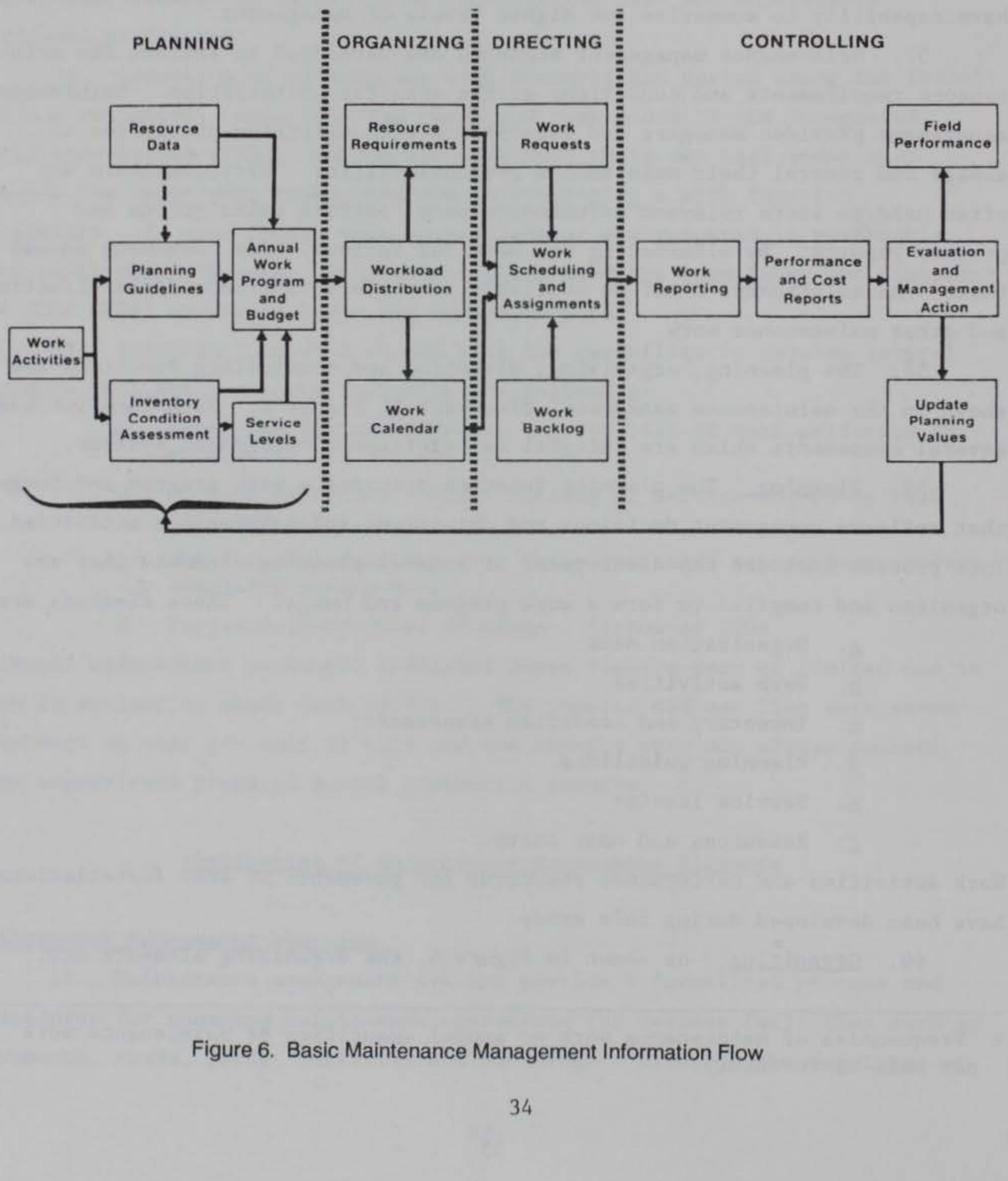

Figure 6. Basic Maintenance Management Information Flow

a. Workload distribution.

b. Work calendar.

c. Resource requirements.

Workload distribution procedures are used to allocate the total annual work program to the months the work will or should be performed. The need for staffing to match seasonal workload variations is readily apparent from this process. A work calendar to be used for preparing short-term schedules is provided. The monthly requirements for labor, equipment and materials needed to do the annual work program are identified.

61. Directing. The work directing function involves identifying and documenting work needs, preparing short-term work schedules and assigning work to the maintenance staff. These elements involve the use of:

a. Work calendar status reports.

b. Work requests and backlog reports.

c. Knowledge of other factors affecting maintenance activities.

These work directing procedures assist the managers and supervisors in their efforts to accomplish the work program objectives in an efficient and cost effective manner.

62. Controlling. The work controlling function consists of monitoring the progress of work performed in comparison to the plan and taking action to direct or redirect future efforts. Procedures are provided for collecting, evaluating and using work performance data reported by field maintenance personnel. Work performance and cost reports are available for managers and supervisors to use in analyzing and evaluating maintenance work efforts in their respective areas of responsibility.

63. Maintenance management systems (MMS) provide detailed documentation of the maintenance workload and help identify when specific activities should be performed. MMS allows the work program to be easily modified when funding availability or other conditions change. MMS provides guidance in scheduling work and provides more timely and useful information to maintenance managers.

64. Maintenance management systems are designed to assist maintenance managers in their efforts to plan, organize, direct and control the maintenance program. It is a tool for managers to use in setting objectives, preparing programs, and carrying out those programs. Maintenance management is a work management system with associated cost data.

Sierra Army Depot Demonstration

65. Unless pavement maintenance data and planning guidelines are used to assist managers in more effectively accomplishing the maintenance mission, the value of expending effort to collect or develop this data is questionable. Therefore, a methodology for using this data to develop an annual maintenance program which will assist the managers in planning, organizing, directing, and controlling scarce resources to perform pavement and grounds maintenance is presented for the Roads and Grounds Branch of the Buildings, Grounds and Utilities Division of the Directorate of Engineering and Housing, Sierra Army Depot. The program which was developed is based on information provided by the Depot but is only representative of their operations and is not intended to depict, accurately, their current financial or operating programs.

Maintenance management principles involved

66. Focused Management. All of the work activities performed by the Roads and Grounds Branch were identified. Then using the principle of the "vital few versus trivial many" shown in Figure 7, those activities which required the most effort, money or management were selected to be included in the program as specific activities. The remainder of the activities were grouped into appropriate "General" activities in the work program. As a result of this selection process, the numerous bituminous pavement activities performed were included in the activity, General Bituminous Maintenance, because no one bituminous maintenance activity was large enough to single out for managerial emphasis. As Sierra, this is due to the large contract maintenance and repair program currently underway which reduces the amount of work performed on pavements by the in-house staff. The identification of the "Vital Few" activities focuses the managers attention in those areas where improvements or degradations in performance will significantly affect the overall program.

67. Performance based. Planning an annual work program is most effective if the planning effort is based on the type and amount of work to be accomplished. Identification of the total amount of a work activity to be performed upon the entire inventory during the year provides the basis for a rational approach to the allocation and distribution of resources necessary to accomplish that work. Realistic planning guidelines for the individual work

Management Should Focus Its Attention to the "Vital Few" Activities -- Instead of the "Trivial Many"

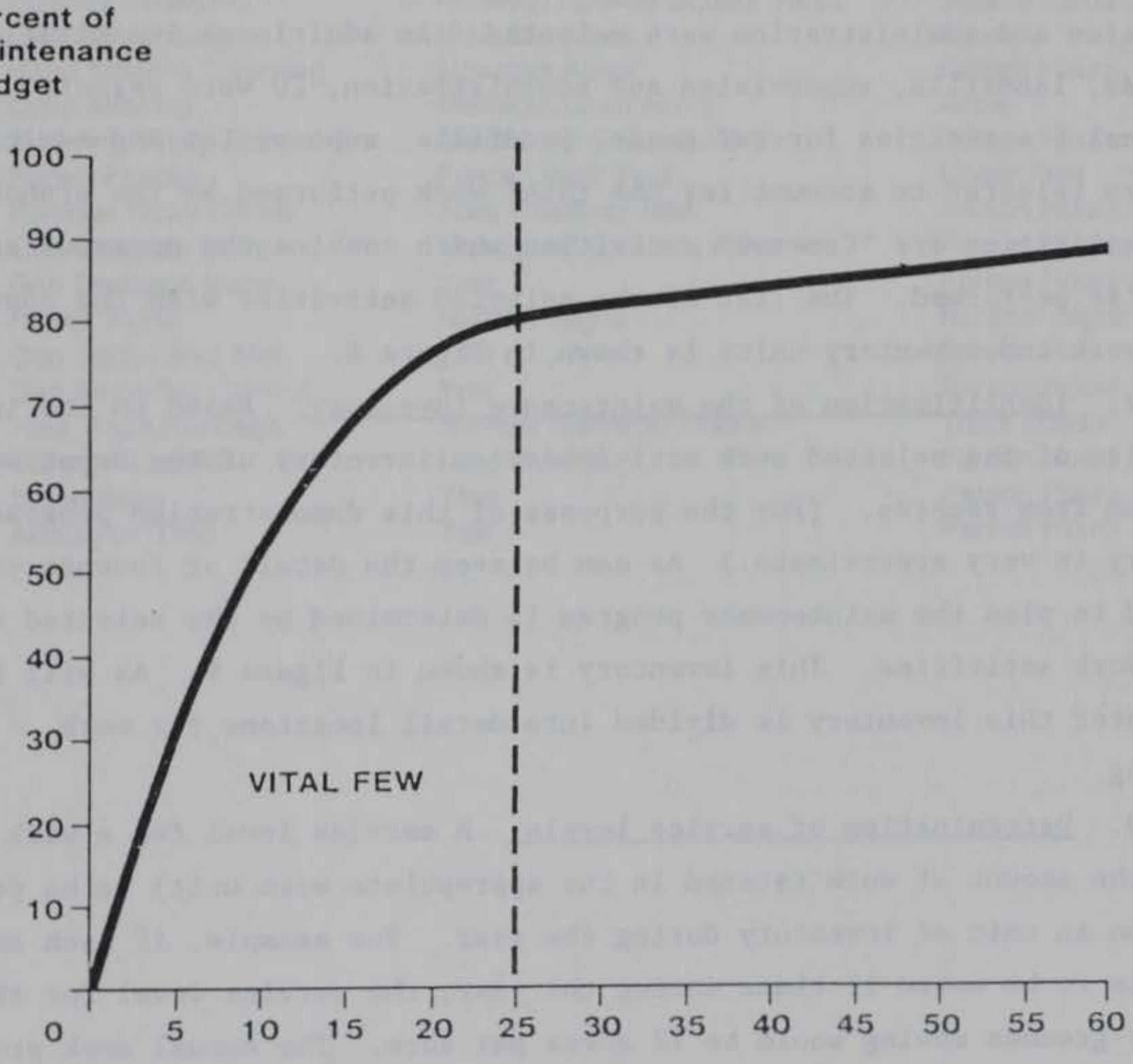

Figure 7. The Importance of the "Vital Few" Activities Within the Maintenance Budget

activities based on the use of expected resources simplifies the determination of the amount, cost and time distribution of resources required to accomplish a year's amount of work.

Planning-developing the
work program and budget

68. Selection of Work Activities. The work activities listed in Figure 3, Part IV, provided the basis for selecting the work activities for Sierra Army Depot. From the total list of 64 routine maintenance work activities, 20 were selected. An additional 6 activities for railroads, landfills, supervision and administration were selected. An additional 6 activities for railroads, landfills, supervision and administration, 20 were selected. An additional 6 activities for railroads, landfills, supervision and administration were selected to account for the total work performed by the Branch. Six of the activities are "General" activities which combine the numerous small activities performed. The list of the selected activities with the appropriate work and inventory units is shown in Figure 8.

69. Identification of the maintenance inventory. Based on the inventory units of the selected work activities, an inventory of the Depot was conducted from records. (For the purposes of this demonstration program the inventory is very approximate.) As can be seen the detail of inventory required to plan the maintenance program is determined by the selected significant work activities. This inventory is shown in Figure 9. As will be shown later this inventory is divided into detail locations for work reporting.

70. Determination of service levels. A service level for a work activity is the amount of work (stated in the appropriate work unit) to be performed on an unit of inventory during the year. For example, if each acre of ground is to be mowed 12 times during the year, the service level for the work activity-grounds mowing would be 12 acres per acre. The annual work program for any work activity is simply the service level multiplied by the amount of inventory.

71. The service levels for the work activities at Sierra Army Depot were determined through discussions with the appropriate foremen in the Roads and Grounds Branch. Ideally, these service levels would be based on a determination of the condition of the inventory. These service levels would reflect the amount of work required to bring the inventory into a desired

	WORK ACTIVITY	INVENTORY UNIT	WORK UNIT
1195	Gen Bit Pvmnt Maint	Bituminous Road Mile	Person Hours
1395	Gen Conc Pvt Rpr	Concrete Surface Square Yards	Person Hours
1510	Blade Unpvd Surfcs	Unpaved Road Mile	Road Mile
1520	Add Gravel Unpvd Srfc	Unpaved Road Mile	Road Mile
1540	Dust Control	Unpaved Road Mile	Road Mile
1730	Blade Unpvd Shldrs	Unpaved Shoulder Mile	Shoulder Mile
1820	Maint RR Switch	Number RR Switch	Number Switches
1830	Repair RR Track	RR Track Mile	Track Mile
2110	Roadway Sweeping	Paved Road Mile	Road Mile
2120	Runway Sweeping	Runway/Taxiway Square Yards	Square Yards
2140	Machine Mowing	Mowable Acres	Acres
2150	Hand Mowing Trimming	Mowable Acres	Person Hours
2151	Lawn Mowing	Mowable Lawn Acres	Acres
2160	Spraying/Weed Control	Maintained Grounds Acres	Person Hours
2210	Repair Fences	Fence Linear Feet	Linear Feet
2230	Remove Rdwy Debris	Total Roadway Mile	Person Hours
2290	Gen Grounds Maint	Maintained Grounds Acres	Person Hours
3190	Gen Drainage Maint	Year	Person Hours
5120	Repair Signs	Number Signs	Number Signs
5190	Gen Traffic Srvc Mnt	Year	Person Hours
6290	Gen Snow/Ice Control	Year	Person Hours
7110	Haul Trash/Garbage	Number Garbage Trucks	Truck Loads
7120	Maintain Landfill	Landfill Acres	Person Hours
9100	Supervision	Year	Person Hours
9200	Admin/Lv/Trng	Year	Person Hours

Figure 8. Selected Work Activities for Sierra Army Depot

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

FEATURE INVENTORY DATA

CODE	FEATURE	MEASRMNT UNITS	MGMT UNIT	TOTAL INVENTORY	CONDITIONS 1	2	3
1110	BITUMINOUS ROAD	MILES	ROAD	260.00	.00	.00	.00
1300	CONCRETE PAVEME	K SQ YDS	ROAD	200.00	.00	.00	.00
1310	RUNWAY/TAXIWAY	K SQ YDS	ROAD	150.00	.00	.00	.00
1500	UNPAVED ROAD	MILES	ROAD	300.00	.00	.00	.00
1600	TOTAL ROADWAY	MILE	ROAD	760.00	.00	.00	.00
1700	UNPAVED SHLDRS	MILES	ROAD	1,000.00	.00	.00	.00
1820	RR SWITCH	EA	ROAD	10.00	.00	.00	.00
1830	RR TRACK	MILES	ROAD	35.00	.00	.00	.00
2000	MNTND GROUNDS	ACRES	ROAD	400.00	.00	.00	.00
2100	MOWABLE ROADSID	ACRES	ROAD	400.00	.00	.00	.00
2140	MOWABLE LAWN	ACRE	ROAD	150.00	.00	.00	.00
2220	FENCE	LIN FT	ROAD	10,000.00	.00	.00	.00
5120	SIGNS	EA	ROAD	300.00	.00	.00	.00
7110	GARBAGE TRUCK	EA	ROAD	2.00	.00	.00	.00
7120	LANDFILL	ACRE	ROAD	40.00	.00	.00	.00
7130	LEACHATE WELLS	EA	ROAD	6.00	.00	.00	.00
9100	YEAR	EA	ROAD	1.00	.00	.00	.00

Figure 9. Sierra Army Depot Road Inventory

state of maintenance. Of course, in the real world, the resources required to achieve this state are seldom available so it is necessary to revise the desired service level to a planned service level achievable with the available resources. The difference between the desired and the planned service levels provides the basis for the quantification of the amount of maintenance which must be deferred.

72. Using the planning guidelines. The planning guidelines developed for the project provide the basis for determining the quantity and types of resources required to perform the amount of work in the annual work program. At Sierra Army Depot the developed planning guidelines were modified to reflect the available resources, the actual organization of crews and the production expected under the local working conditions. This data determined the number and the cost of the crew days to accomplish the annual work program. A compilation of this data for each work activity into one report is called the Work Program and Budget Report. The Work Program and Budget for Sierra Army Depot is shown in Figure 10.

73. Work program and budget report. The Work Program and Budget Report represents the product of the planning process. This report compiles and summarizes management decisions and objectives relative to the kinds and amounts of work to be planned; the productivity of the work force; and the costs of the planned work. These are key elements in the process of managing the routine pavement maintenance effort. Figure 10 shows the Work Program and Budget Report developed for Sierra to demonstrate the application of the planning elements. The following items explain in the data in the report.

a. Activity. The code and name of the work activity.

b. Feature inventory. The quantity and unit of the inventory item used in planning the activity.

c. Planned service level. The planned service level in terms of the number of work units per each unit of inventory.

d. PCT of DES. The value indicating that portion of the desired service level that is included in the planned work program.

e. Annual work quantity. The planned annual work quantity -- the product of the feature inventory, the service and it is stated in terms of the work unit for the activity.

f. Average daily production. The estimated average daily production established for the activity. It is used to calculate the estimated crew days required for the work. This number is divided into the annual work quantity.

DeLEUW, CATHER & Co. WORK PROGRAM AND BUDGET REPORT Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

CODE	ACTIVITY NAME	FEATURE INVENTORY QUANTITY	UNIT	PLANNED SERVICE LEVEL	PCT OF DES	ANNUAL WORK QUANTITY	AVG DAILY PROD	CR SZ	PERSON DAYS	COST DISTRIBUTION LABOR	EQUIP	MAT/OTH	TOTAL COST
1195	GEN BIT PVMNT MAINT	260.0	MILES	1.92 PER HR	38	499	30.0	3	49	5666	1071	2490	9227
1395	GEN CONC PVT RPR	200.0	K SQ YDS	1.24 PER HRS	82	248	20.0	2	24	2389	186	7750	10325
1510	BLADE UNPVD SURFCS	300.0	MILES	2.50 ROAD MI	100	750	9.0	2	124	16793	12928	0	29721
1520	STAB UNPVD SRFC	300.0	MILES	.15 ROAD MI	60	45	4.0	4	45	5754	3876	3390	13020
1540	DUST CONTROL	300.0	MILES	.30 ROAD MI	60	90	6.0	1	15	1590	998	1875	4463
1730	BLADE UNPVD SHLDRS	1000.0	MILES	2.00 SHLDR MI	66	2000	20.0	1	100	14860	12050	0	26910
1820	MAINT RR SWITCH	10.0	EA	10.00 SWITCH	83	100	3.0	2	66	6474	500	999	7973
1830	REPAIR RR TRACK	35.0	MILES	.71 MILE	71	25	.5	2	99	9662	746	994	11402
2110	ROADWAY SWEEPING	260.0	MILES	2.00 ROAD MI	50	520	12.0	2	64	8729	3642	0	12371
2120	RUNWAY SWEEPING	150.0	K SQ YDS	15.00 K SQ YD	75	2250	150.0	1	15	1590	908	0	2498
2140	MACHINE MOWING	400.0	ACRES	4.00 ACRES	80	1600	15.0	1	106	11310	2134	0	13444
2150	HAND MOWING TRIMMING	400.0	ACRES	1.25 PER HRS	62	500	20.0	2	50	4335	2075	0	6410
2151	LAWN MOWING	150.0	ACRE	9.60 ACRES	80	1440	10.0	2	288	24970	11952	0	36922
2160	SPRAYING/WEED CONTRL	400.0	ACRES	.75 PER HRS	75	300	10.0	1	30	3180	600	4200	7980
2210	REPAIR FENCES	10000.0	LIN FT	.30 LIN FT	75	3000	300.0	3	30	2794	355	2250	5399
2230	REMOVE RDWY DEBRIS	760.0	MILE	1.92 PER HRS	96	1459	30.0	3	145	16587	6041	0	22628
2290	GEN GROUNDS MAINT	400.0	ACRES	.75 PER HRS	75	300	20.0	2	30	2891	225	300	3416
3190	GEN DRAINAGE MAINT	1.0	EA	200.00 PER HR	100	200	20.0	2	20	1927	355	300	2582
5120	REPAIR SIGNS	300.0	EA	.25 signs	83	75	5.0	2	30	2891	225	1200	4316
5190	GEN TRAFFIC SRVC MNT	1.0	EA	125.00 PER HRS	83	125	20.0	2	12	1214	95	315	1624
6290	GEN SNOW/ICE CONTROL	1.0	EA	150.00 PER HRS	100	150	30.0	3	15	1707	780	350	2837
7110	HAUL TRASH/GARBAGE	2.0	EA	150.00 TRUCK LD	75	300	3.0	1	100	14860	12000	0	26860
7120	MAINTAIN LANDFILL	40.0	ACRE	6.00 PER HRS	100	240	10.0	1	24	3566	7877	0	11443
9100	SUPERVISION	1.0	EA	1500.00 PER HR	100	1500	10.0	1	150	22530	2250	0	24780
9200	ADMIN/LV/TRNG	1.0	EA	4000.00 PER HR	100	4000	120.0	12	399	45571	0	0	45571
									TOTALS:	2037	233840	83869	26413	344122
									OVERHEAD	.0% OF LABOR				0
									OVERHEAD	.0% OF TOTAL				0
										TOTAL BUDGET				344122

Figure 10. Example Work Program and Budget Report for Sierra Army Depot

g. Crew size. This is the estimated average crew size to be assigned to the work activity.

h. Person days. The estimated number of person days needed to perform the work on the activity. It is the product of the crew size times the crew days.

i. Cost distribution. The estimated annual cost of labor, equipment, and materials/other for the activity. These costs are calculated by multiplying the cost per crew day for labor, equipment and materials/other times the planned crew days.

j. Total cost. The total cost of labor, equipment and materials/other for the activity.

k. Totals. These values represent the sum of the person days, labor, equipment, material/other, and total costs for all activities.

l. Overhead percent of labor. The additional calculated cost to reflect a budget additive as a function of the total labor cost. This additional cost is not reflected in the individual activities.

m. Overhead percent of total. The additional calculated cost to reflect a budget additive as a function of the total cost. Note--in the example, there is no total overhead cost shown.

n. Total budget. The estimated total cost to perform the planned work for the management unit, including any overhead additives.

74. Deferred maintenance report. The planned maintenance work program represents planned annual maintenance based on budgetary limits or available resources. The initial work program and budget calculations are made with the desired service levels (related to unconstrained requirements), or quantities of work that should be performed for optimum service. Adjustments are made in the desired service levels for selected work activities and are reflected in the planned service levels. The deferred maintenance report is a comparison of the work program derived from the desired and planned service levels. For each of the two programs the annual work quantities and total costs are displayed. The difference between these programs is calculated and displayed as deferred maintenance. With these data maintenance managers can readily identify the volume of work that is not included in the planned work program. The deferred maintenance report developed for Sierra is shown in Figure 11. The following items explain the data presented in the report.

a. Activity. The code and name of the activity.

b. Feature inventory. The quantity and unit of the inventory item used in planning the activity.

DeLEUW, CATHER & Co. DEFERRED BUDGET Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

ACTIVITY		FEATURE INVENTORY		DESIRED PROGRAM		PLANNED PROGRAM			DEFERRED BUDGET		
CODE	NAME	QUANTITY	UNIT	ANNUAL WORK QTY	COST	ANNUAL WORK QTY	COST	PCT	ANNUAL WORK QTY	COST	PCT
1195	GEN BIT PVMNT MAINT	260.0	MILES	1300.00 PER HR	24066	499.20 PER HR	9227	38	800.80 PER HR	14839	62
1395	GEN CONC PVT RPR	200.0	K SQ YDS	300.00 PER HRS	12491	248.00 PER HRS	10325	82	52.00 PER HRS	2166	18
1510	BLADE UNPVD SURFCS	300.0	MILES	750.00 ROAD MI	29721	750.00 ROAD MI	29721	100	0.00 ROAD MI	0	0
1520	STAB UNPVD SRFC	300.0	MILES	75.00 ROAD MI	21661	45.00 ROAD MI	13020	60	30.00 ROAD MI	8641	40
1540	DUST CONTROL	300.0	MILES	150.00 ROAD MI	7438	90.00 ROAD MI	4463	60	60.00 ROAD MI	2975	40
1730	BLADE UNPVD SHLDRS	1000.0	MILES	3000.00 SHLDR MI	40365	2000.00 SHLDR MI	26910	66	1000.00 SHLDR MI	13455	34
1820	MAINT RR SWITCH	10.0	EA	120.00 SWITCH	9576	100.00 SWITCH	7973	83	20.00 SWITCH	1603	17
1830	REPAIR RR TRACK	35.0	MILES	35.00 MILE	16058	24.85 MILE	11402	71	10.15 MILE	4656	29
2110	ROADWAY SWEEPING	260.0	MILES	1040.00 ROAD MI	24770	520.00 ROAD MI	12371	50	520.00 ROAD MI	12399	50
2120	RUNWAY SWEEPING	150.0	K SQ YDS	3000.00 K SQ YD	3330	2250.00 K SQ YD	2498	75	750.00 K SQ YD	832	25
2140	MACHINE MOWING	400.0	ACRES	2000.00 ACRES	16796	1600.00 ACRES	13444	80	400.00 ACRES	3352	20
2150	HAND MOWING TRIMMIN	400.0	ACRES	800.00 PER HRS	10256	500.00 PER HRS	6410	62	300.00 PER HRS	3846	38
2151	LAWN MOWING	150.0	ACRE	1800.00 ACRES	46152	1440.00 ACRES	36922	80	360.00 ACRES	9230	20
2160	SPRAYING/WEED CONTR	400.0	ACRES	400.00 PER HRS	10640	300.00 PER HRS	7980	75	100.00 PER HRS	2660	25
2210	REPAIR FENCES	10000.0	LIN FT	4000.00 LIN FT	7181	3000.00 LIN FT	5399	75	1000.00 LIN FT	1782	25
2230	REMOVE RDWY DEBRIS	760.0	MILE	1520.00 PER HRS	23606	1459.20 PER HRS	22628	96	60.80 PER HRS	978	4
2290	GEN GROUNDS MAINT	400.0	ACRES	400.00 PER HPS	4554	300.00 PER HRS	3416	75	100.00 PER HRS	1138	25
3190	GEN DRAINAGE MAINT	1.0	EA	200.00 PER HR	2582	200.00 PER HR	2582	100	0.00 PER HR	0	0
5120	REPAIR SIGNS	300.0	EA	90.00 signs	5179	75.00 signs	4316	83	15.00 signs	863	17
5190	GEN TRAFFIC SRVC MN	1.0	EA	150.00 PER HRS	1933	125.00 PER HRS	1624	83	25.00 PER HRS	309	17
6290	GEN SNOW/ICE CONTRO	1.0	EA	150.00 PER HRS	2837	150.00 PER HRS	2837	100	0.00 PER HRS	0	0
7110	HAUL TRASH/GARBAGE	2.0	EA	400.00 TRUCK LD	35804	300.00 TRUCK LD	26860	75	100.00 TRUCK LD	8944	25
7120	MAINTAIN LANDFILL	40.0	ACRE	240.00 PER HRS	11443	240.00 PER HRS	11443	100	0.00 PER HRS	0	0
9100	SUPERVISION	1.0	EA	1500.00 PER HR	24780	1500.00 PER HR	24780	100	0.00 PER HR	0	0
9200	ADMIN/LV/TRNG	1.0	EA	4000.00 PER HR	45571	4000.00 PER HR	45571	100	0.00 PER HR	0	0
				TOTALS:	438790		344122	78		94668	21

Figure 11. Example Deferred Budget for Sierra Army Depot

c. Desired program. The annual work quantity and total cost based on the desired service level.

d. Planned program. The annual work quantity and total cost based on the planned service level.

e. PCT. This is the ratio of the planned to desired work plan and indicates what percent of the desired service level is being planned. A 100 signifies that they are the same. A number less than 100 indicates a lower level of service was planned than was desired.

f. Deferred maintenance. The difference between the desired and planned programs in work quantity and cost. Usually, the planned program will be less than the desired. However, in cases where the planned values are greater than desired, the deferred maintenance values will be shown as negatives.

g. PCT. The percent of the desired program that is not included in the planned program.

h. Totals. Three total cost values are provided. These represent the sum of all costs for desired, planned and deferred programs. Percent values are calculated and shown for planned and deferred costs.

Work organizing

75. Workload distribution. The planned annual work program is distributed among the months that the work typically is performed. An example workload distribution report for Sierra is shown in Figure 12. Total person days by months are distributed for each work activity.

76. Work calendar. The work calendar shows the planned maintenance on a monthly basis for standard crew days. Figure 13 illustrates the work calendar for Sierra. This report serves as a guide to the supervisor for when specific work should be scheduled.

77. Resource requirements. Labor, equipment and material resource requirements are summarized by each resource classification used in the planning process. Monthly requirements are compiled and compared to available resources. These reports assist in decisions regarding staffing, equipment needs and materials procurement. The labor requirements report can be very helpful in determining the needs for temporary personnel, contract assistance, or overtime work to accomplish peak or seasonal workloads. Figure 14 shows the labor summary report developed for Sierra. The following items describe the information shown in this report.

a. Labor resource. The code and name of the labor classification.

b. Inventory. The number of these labor types assigned to the management unit.

DeLEUW, CATHER & Co. WORKLOAD DISTRIBUTION Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

CODE	ACTIVITY NAME	PERSON DAYS PER MONTH OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	CR SZ	CREW DAYS
1195	GEN BIT PVMNT MAINT	3.9	4.2	3.9	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	49.8	3	16.6
1395	GEN CONC PVT RPR	2.4	2.4	2.4	2.4	2.4	2.0	1.8	1.8	1.8	1.8	1.8	1.8	24.8	2	12.4
1510	BLADE UNPVD SURFCS	10.5	10.5	9.0	9.0	9.5	9.0	12.0	12.0	12.0	10.5	10.5	10.5	125.0	2	83.3
1520	STAB UNPVD SRFC	4.4	4.4	4.4	4.4	4.0	3.6	3.6	3.6	3.6	3.6	2.8	2.8	45.2	4	11.3
1540	DUST CONTROL	1.4	1.4	1.2	1.4	1.4	1.4	1.3	1.1	1.1	1.1	1.1	1.1	15.0	1	15.0
1730	BLADE UNPVD SHLDRS	8.3	8.3	8.3	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.2	8.2	100.0	1	100.0
1820	MAINT RR SWITCH	6.0	6.0	6.0	6.0	5.4	5.4	5.4	5.4	5.4	5.2	5.2	5.2	66.6	2	33.3
1830	REPAIR RR TRACK	8.4	8.4	8.0	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.0	7.8	99.4	2	49.7
2110	ROADWAY SWEEPING	5.6	5.6	5.6	5.7	5.7	5.7	5.7	5.1	5.1	5.1	5.1	5.1	65.1	2	43.3
2120	RUNWAY SWEEPING	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	15.0	1	15.0
2140	MACHINE MOWING	9.0					10.7	12.0	15.0	15.0	15.0	15.0	15.0	106.7	1	106.7
2150	HAND MOWING TRIMMING	4.0	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	50.0	2	25.0
2151	LAWN MOWING	32.0					32.0	40.0	40.0	36.0	36.0	36.0	36.0	288.0	2	144.0
2160	SPRAYING/WEED CONTRL	3.0					3.0	4.0	4.0	4.0	4.0	4.0	4.0	30.0	1	30.0
2210	REPAIR FENCES	3.9	3.9	3.0	2.7	2.7	2.4	2.4	1.8	1.8	1.8	1.8	1.8	30.0	3	10.0
2230	REMOVE RDWY DEBRIS	12.6	12.6	12.6	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	145.8	3	48.6
2290	GEN GROUNDS MAINT	2.6	2.6	2.4	2.6	2.6	2.6	2.6	2.4	2.4	2.4	2.4	2.4	30.0	2	15.0
3190	GEN DRAINAGE MAINT	1.8	1.8	1.8	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	20.0	2	10.0
5120	REPAIR SIGNS	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	2.0	2.0	2.0	30.0	2	15.0
5190	GEN TRAFFIC SRVC MNT	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12.6	2	6.3
6290	GEN SNOW/ICE CONTROL			3.0	3.0	3.0	3.0	3.0						15.0	3	5.0
7110	HAUL TRASH/GARBAGE	8.3	8.3	8.3	8.5	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.2	100.0	1	100.0
7120	MAINTAIN LANDFILL	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	24.0	1	24.0
9100	SUPERVISION	12.5	12.5	12.5	12.6	12.7	12.6	12.6	12.4	12.4	12.4	12.4	12.4	150.0	1	150.0
9200	ADMIN/LV/TRNG	33.6	33.6	33.6	34.8	33.6	33.6	33.6	33.6	32.4	32.4	32.4	32.4	399.6	12	33.3

Figure 12. Example Workload Distribution for Sierra Army Depot

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

WORK CALENDAR

Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

Date: 09/19/88

CODE	ACTIVITY NAME/ANNUAL WORK QTY	CR SZ	CREW DAYS - PLANNED OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL	AVG DAILY PRODUCTION
1195	GEN BIT PVMNT MAINT 499 PER HR	3	1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	16.6	30.0
1395	GEN CONC PVT RPR 248 PER HRS	2	1.2	1.2	1.2	1.2	1.2	1.0	.9	.9	.9	.9	.9	.9	12.4	20.0
1510	BLADE UNPVD SURFCS 750 ROAD MI	2	7.0	7.0	6.0	6.0	6.3	6.0	8.0	8.0	8.0	7.0	7.0	7.0	83.3	9.0
1520	STAB UNPVD SRFC 45 ROAD MI	4	1.1	1.1	1.1	1.1	1.0	.9	.9	.9	.9	.9	.7	.7	11.3	4.0
1540	DUST CONTROL 90 ROAD MI	1	1.4	1.4	1.2	1.4	1.4	1.4	1.3	1.1	1.1	1.1	1.1	1.1	15.0	6.0
1730	BLADE UNPVD SHLDRS 2000 SHLDR MI	1	8.3	8.3	8.3	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.2	8.2	100.0	20.0
1820	MAINT RR SWITCH 100 SWITCH	2	3.0	3.0	3.0	3.0	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	33.3	3.0
1830	REPAIR RR TRACK 25 MILE	2	4.2	4.2	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.0	3.9	49.7	.5
2110	ROADWAY SWEEPING 520 ROAD MI	2	3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.4	3.4	3.4	3.4	3.4	43.3	12.0
2120	RUNWAY SWEEPING 2250 K SQ YD	1	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	15.0	150.0
2140	MACHINE MOWING 1600 ACRES	1	9.0	.0	.0	.0	.0	10.7	12.0	15.0	15.0	15.0	15.0	15.0	106.7	15.0
2150	HAND MOWING TRIMMING 500 PER HRS	2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25.0	20.0
2151	LAWN MOWING 1440 ACRES	2	16.0	.0	.0	.0	.0	16.0	20.0	20.0	18.0	18.0	18.0	18.0	144.0	10.0
2160	SPRAYING/WEED CONTRL 300 PER HRS	1	3.0	.0	.0	.0	.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	30.0	10.0
2210	REPAIR FENCES 3000 LIN FT	3	1.3	1.3	1.0	.9	.9	.8	.8	.6	.6	.6	.6	.6	10.0	300.0
2230	REMOVE RDWY DEBRIS 1459 PER HRS	3	4.2	4.2	4.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	48.6	30.0
2290	GEN GROUNDS MAINT 300 PER HRS	2	1.3	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	15.0	20.0
3190	GEN DRAINAGE MAINT 200 PER HR	2	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8	10.0	20.0
5120	REPAIR SIGNS 75 signs	2	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	15.0	5.0
5190	GEN TRAFFIC SRVC MNT 125 PER HRS	2	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	6.3	20.0
6290	GEN SNOW/ICE CONTROL 150 PER HRS	3	.0	.0	1.0	1.0	1.0	1.0	1.0	.0	.0	.0	.0	.0	5.0	30.0
7110	HAUL TRASH/GARBAGE 300 TRUCK LD	1	8.3	8.3	8.3	8.5	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.2	100.0	3.0
7120	MAINTAIN LANDFILL 240 PER HRS	1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	24.0	10.0
9100	SUPERVISION 1500 PER HR	1	12.5	12.5	12.5	12.6	12.7	12.6	12.6	12.4	12.4	12.4	12.4	12.4	150.0	10.0
9200	ADMIN/LV/TRNG 4000 PER HR	12	2.8	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.7	33.3	120.0

Figure 13. Example Work Calendar for Sierra Army Depot

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

LABOR REQUIREMENTS REPORT (SUMMARY)

Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

CODE	RESOURCE NAME		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL NEED	TOTAL COST
			PERSON DAYS BY MONTH													
1110	MNT GEN FRMN-EW	INVENTORY:			1.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:		15.3	15.3	15.3	15.5	15.5	15.4	15.4	15.2	15.1	15.1	15.1	15.1	183.3	27531
	AVG NO STAFF REQUIRED:		1.0	1.0	.9	.9	1.0	.9	1.0	.8	.9	1.0	.8	.9	.9	27531
1120	ENG EQUIP OP	INVENTORY:			3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:		45.4	45.5	45.4	46.3	46.1	45.6	47.2	45.5	45.1	44.0	43.6	43.6	543.3	80734
	AVG NO STAFF REQUIRED:		2.8	2.8	2.7	2.6	3.1	2.5	3.0	2.5	2.7	2.9	2.3	2.7	2.7	80734
1130	MOT VEH OP	INVENTORY:			3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:		42.4	30.5	30.3	30.7	30.2	43.3	47.3	48.6	48.3	46.8	46.4	46.4	491.3	52088
	AVG NO STAFF REQUIRED:		2.7	1.9	1.8	1.7	2.0	2.4	3.0	2.7	2.8	3.1	2.4	2.9	2.4	52088
1160	LABORER	INVENTORY:			3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:		57.5	25.6	26.0	26.0	25.6	57.2	66.1	64.6	60.3	59.3	59.3	59.3	586.8	50875
	AVG NO STAFF REQUIRED:		3.6	1.6	1.5	1.4	1.7	3.2	4.1	3.6	3.5	4.0	3.1	3.7	2.9	50875
1170	RR MNT OP	INVENTORY:			2.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:		20.0	20.0	19.6	20.2	19.4	19.4	19.4	19.4	19.2	19.0	18.6	18.4	232.6	22608
	AVG NO STAFF REQUIRED:		1.3	1.3	1.2	1.1	1.3	1.1	1.2	1.1	1.1	1.3	1.0	1.2	1.1	22608

Figure 14. Example Labor Requirements Reports for Sierra Army Depot

c. Availability. The estimated percent of time that the labor resource is available for work.

d. Person days by month and total. The sum of all person days required for those activities specifying this labor type.

e. Total cost. The estimated annual cost of this labor class, derived by multiplying the days required by the respective hourly rates.

f. Average number staff required. Represents the average number of persons required in this labor class for each month and an annual average. It is derived by dividing the person days required by the average person days per person per month and the availability percent.

Similar reports are available for equipment and material resources.

Work controlling

78. The last component of the complete maintenance management system consists of reporting work accomplishment and evaluating the actual and planned work accomplishment and costs. Work reports completed by field personnel record work accomplished and related use of labor, equipment and materials. These data are entered into the computerized work data files. Various evaluation and performance reports are available for maintenance managers and field supervisors to use in analyzing and evaluating the progress toward the planned work programs. These reports present key information concerning work accomplishments, costs and resource use. Two of the work evaluation reports were prepared for the demonstration data at Sierra Army Depot. These were the Performance Report and the Location Maintenance Report.

79. Performance report. A comparison of planned and actual work performance is provided for five key elements of each work activity -- person days, work accomplishment, average daily production, total cost. Figure 15 illustrates the format and content of this report.

80. Location maintenance report. Routine maintenance work for pavements is not planned by individual route or road section, but by an overall organizational unit. However, actual costs and work performed by unique road section or locations are often required by management for other purposes. The pavement location used by PAVER to assess pavement conditions were input into the sample data used to demonstrate MMS application at Sierra. Figure 16 is an example of a location maintenance report using these data.

Identify maintenance repairs

81. Identified maintenance repairs are primarily cyclic-type maintenance, such as overlays, seal coating and surface replacement. However, other

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

PERFORMANCE REPORT
Period from 10/01/87 TO 04/30/88
Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

CODE	ACTIVITY NAME	PERFORMANCE INDICATOR	CURRENT MONTH PERFORMANCE PLAN	ACTUAL	PCT	YEAR TO DATE PERFORMANCE PLAN	ACTUAL	PCT
1195	GEN BIT PVMNT MAINT	Person Days	4	12	300	29	28	97
	PER HR	Accomplishment	42.0	120.0	286	288.0	280.0	97
		Avg Daily Prod	30.0	30.0	100	30.0	30.0	100
		Total Cost	778	2223	286	5335	5335	100
		Unit Cost ($)	18.52	18.53	100	18.52	19.05	103
1395	GEN CONC PVT RPR	Person Days	2	16	800	16	16	100
	PER HRS	Accomplishment	18.0	160.0	889	158.0	160.0	101
		Avg Daily Prod	20.0	20.0	100	20.0	20.0	100
		Total Cost	750	4672	623	6579	4672	71
		Unit Cost ($)	41.67	29.20	70	41.64	29.20	70
1510	BLADE UNPVD SURFCS	Person Days	12	6	50	69	24	35
	ROAD MI	Accomplishment	72.0	35.0	49	416.7	145.0	35
		Avg Daily Prod	9.0	8.8	98	9.0	9.1	101
		Total Cost	2855	1481	52	16520	5443	33
		Unit Cost ($)	39.65	42.31	107	39.64	37.54	95
1520	STAB UNPVD SRFC	Person Days	4	0	0	29	0	0
	ROAD MI	Accomplishment	3.6	.0	0	28.8	.0	0
		Avg Daily Prod	4.0	.0	0	4.0	.0	0
		Total Cost	1037	0	0	8296	0	0
		Unit Cost ($)	288.06	.00	0	288.06	.00	0
1540	DUST CONTROL	Person Days	1	0	0	10	0	0
	ROAD MI	Accomplishment	7.8	.0	0	57.0	.0	0
		Avg Daily Prod	6.0	.0	0	6.0	.0	0
		Total Cost	387	0	0	2827	0	0
		Unit Cost ($)	49.62	.00	0	49.60	.00	0
1730	BLADE UNPVD SHLDRS	Person Days	8	4	50	59	14	24
	SHLDR MI	Accomplishment	166.0	70.0	42	1180.0	225.0	19
		Avg Daily Prod	20.0	17.5	88	20.0	16.1	81
		Total Cost	2233	1076	48	15877	3767	24
		Unit Cost ($)	13.45	15.37	114	13.46	16.74	124
1820	MAINT RR SWITCH	Person Days	5	0	0	40	0	0
	SWITCH	Accomplishment	8.1	.0	0	60.3	.0	0
		Avg Daily Prod	3.0	.0	0	3.0	.0	0
		Total Cost	647	0	0	4812	0	0
		Unit Cost ($)	79.88	.00	0	79.80	.00	0
1830	REPAIR RR TRACK	Person Days	8	0	0	58	0	0
	MILE	Accomplishment	2.1	.0	0	14.6	.0	0
		Avg Daily Prod	.5	.0	0	.5	.0	0
		Total Cost	963	0	0	6698	0	0
		Unit Cost ($)	458.57	.00	0	458.77	.00	0

Figure 15. Example Performance Report

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

LOCATION PERFORMANCE REPORT
Period from 10/01/87 TO 09/30/88
Activity: ALL

Page: 1
Date: 09/08/88

LOCATION/TYPE/ACTIVITY CODE	NAMES			MONTH ACCOMPLISHMENT QTY	UNIT	COST	YEAR TO DATE ACCOMPLISHMENT QTY	UNIT	COST	COST FROM DATE OF FIRST ENTRY
1195	GEN BIT PVMNT MAINT									
A001P	A STREET PARKING	P		0	PER HR	0	240	PER HR	4446	4446
A018P	HEADQUARTERS PARKING	P		0	PER HR	0	40	PER HR	888	888
			TOTALS:	0		0	280		5334	5334
1395	GEN CONC PVT RPR									
A046	BLDG P-130 APRON	A		0	PER HRS	0	160	PER HRS	4672	4672
			TOTALS:	0		0	160		4672	4672
1510	BLADE UNPVD SURFCS									
A096	EQUESTRIAN STABLE ROAD	I		0	ROAD MI	0	70	ROAD MI	2962	2963
A104	RESERVOIR ACCESS ROAD	I		0	ROAD MI	0	75	ROAD MI	2480	2480
			TOTALS:	0		0	145		5442	5443
1730	BLADE UNPVD SHLDRS									
A0051	CALIFORNIA AVE.	I		0	SHLDR MI	0	225	SHLDR MI	3767	3767
			TOTALS:	0		0	225		3767	3767
2110	ROADWAY SWEEPING									
A0051	CALIFORNIA AVE.	I		0	ROAD MI	0	60	ROAD MI	1078	1078
			TOTALS:	0		0	60		1078	1078
2140	MACHINE MOWING									
A096	EQUESTRIAN STABLE ROAD	I		0	ACRES	0	260	ACRES	2016	2016
			TOTALS:	0		0	260		2016	2016
6290	GEN SNOW/ICE CONTROL									
DEPOT	ANY OTHER UNASSIGNED LOC	Z		0	PER HRS	0	590	PER HRS	11286	11286
			TOTALS:	0		0	590		11286	11286
9100	SUPERVISION									
DEPOT	ANY OTHER UNASSIGNED LOC	Z		0	PER HR	0	590	PER HR	9746	9747
			TOTALS:	0		0	590		9746	9747

Figure 16. Example Location Maintenance Report

identified repairs include crack filling, patching, grinding, grooving, joint filling and other repairs usually considered routine maintenance.

82. The type of routine maintenance repairs identified by PAVER are included as maintenance activities in maintenance management systems for work planning, organizing, directing and controlling. Maintenance management does not include an automated assessment of pavement condition to identify maintenance needs, but inputs these requirements as service levels, or quantity standards, which are developed from external sources. Routine maintenance repairs identified from PAVER are a logical input into the annual work planning component of a maintenance management system.

Maintenance feature condition

83. The condition of maintenance features to be maintained is used to determine where and how much work is needed to maintain the features at a level consistent with policies and priorities of the agency. Because planned maintenance often depends on the condition of a specific feature, an up-to-date condition assessment is necessary. This assessment of feature conditions provides the basis for preparing a maintenance work program that reflects the actual conditions of the features to be maintained.

84. Army installations with implemented PAVER systems have a complete inventory and condition assessment of pavement surfaces. This information is on a section-by-section basis and is updated periodically. The PAVER condition data can be used very effectively to develop planned service levels for pavement surface activities.

Contract Maintenance

Management responsibility

85. Pavement maintenance by contract relieves the governmental agency of some of the management responsibility associated with the actual performance of the work and mobilization of the necessary resources. Responsibility for organizing and directing the labor forces is assigned to the contractor. The agency retains responsibility for planning the maintenance and controlling work quality. Some directing and scheduling responsibility also remains with the agency. Figure 17 shows the respective management responsibilities for maintenance by contract and maintenance by governmental agency forces.

MANAGEMENT/SUPERVISION FUNCTIONS	RESPONSIBILITY: MAINTENANCE BY INSTALLATION FORCES	RESPONSIBILITY: MAINTENANCE BY CONTRACTORS
1. Planning, Programming and Budgeting	Government	Government
2. Organizing		
• Contract Bids and Documents	Not Applicable	Government
• Equipment	Government	Contractor
• Material	Government	Contractor
• Work Force	Government	Contractor
• Payment for Resources	Government	Contractor
3. Scheduling/Directing		
• Maintenance Needs	Government	Government/Contractor
• Crew Mobilization	Government	Contractor
• Scheduling	Government	Contractor/Government
• Work Assignment	Government	Contractor
• Supervision	Government	Contractor
4. Controlling		
• Execution of the Work	Government	Contractor
• Verification of Work Quantity	Government	Government
• Verification of Work Quality	Government	Government
• Payment for Work	Not Applicable	Government
• Productivity	Government	Contractor
• Updating Planning Values	Government	Government

Figure 17. A Comparison of Management/Supervision Functions for In-House and Contracted Maintenance Work

86. Effective maintenance planning and work control are vital to a successful contract maintenance or commercial activity process. Successful contracting must begin with adequate planning and be supported by managers experienced in contract maintenance control. Management control involves the types and quantities of work scheduled and performed, as well as the quality of work performed. Work control must be linked to the field work for successful contract management.

Planning and control

87. Maintenance management systems offer work planning and control components for managing routine day-to-day maintenance. Planned work is based on features of the physical assets to be maintained and the level of service, or work quantity, to be provided for the assets. Work quantities can be incorporated into the Request for Bid to private contractors. Comparable bids for designated quantities of work would be obtained from private contractors as well as in-house staff.

88. Work control consists of monitoring the progress of maintenance performed in comparison to the planned work, or the maintenance contract for private contractors. Work performance and cost reports are provided for assessing and controlling maintenance work efforts.

PART VI: FINDINGS AND RECOMMENDATIONS

Findings

Existing information systems

89. The US Army has developed several automated information systems to provide assistance to DEH's in planning and controlling construction and maintenance work on facilities and physical features. The Integrated Facilities Systems (IFS) is one of the most comprehensive automated information and evaluation systems developed. IFS has been implemented at several installations throughout the commands during the past 10 years. IFS has been revised, expanded and improved during this period and is currently being adapted to function on micro/minicomputer hardware (IFS-M). This will provide a more user-friendly, better integrated and more flexible environment to serve the operational and information needs of the individual installations.

90. An objective of IFS-M is to establish a standardized "core" facilities engineering data base that provides the minimum data set to support DEH management and reporting requirements. Existing systems to be integrated with IFS-M include:

a. Facilities Engineering Job Estimating (FEJE).

b. Facilities Engineering Supply System (FESS).

c. Job Order Contracting System (JOC).

A long-range plan is to also interface PAVER with IFS-M. The intent of IFS-M is to support a broader and higher level of maintenance planning and control through the standardized "core" data base. It is not intended to satisfy the more detailed planning and controlling requirements of first-line supervisors. These types or requirements are often unique to each installation and require a level of detail not intended for IFS-M. Consequently, predictive maintenance models such as PAVER, RAILER and ROOFER are being introduced.

Routine in-house maintenance

91. Components of IFS-M, PAVER and other support systems used by DEH do not encompass the routine day-to-day maintenance requirements for pavements. Frequently, individual job orders do not reflect resource requirements to accomplish the work. Short-term or job evaluation reports comparing inconsistent resource estimates with actual resource usage often have little meaning to field supervisory maintenance personnel.

92. The absence of an annual work program for routine pavement maintenance precludes having evaluation reports which indicate longer-term cumulative progress toward annual work objectives.

Contract maintenance

93. The absence of structured, organized quantitative information for routine pavement (and other) maintenance also impacts contracting such activities. The scopes of selected current contracts were reviewed. The scope mixed inventory, some quantitative frequency and qualitative considerations for routine maintenance activities. Annual work and resource estimates were not systematically included. Consequently, the contractor and the installation staff are faced with significant uncertainty with regard to work and required resources.

Recommendations

94. The planning guidelines developed as a result of this project characterize routine pavement maintenance activities as whole jobs of work having a single measurable output performed by a crew functioning as a team according to a specified work procedure or method. This total or holistic approach to defining the activities best reflects what actually takes place in the field.

95. It is recommended that these guidelines be used as a basis for estimating resource requirements for individual routine pavement maintenance jobs. In practice, this estimating technique is simple, efficient and provides sufficient accuracy for management control.

96. It is also recommended that the planning guidelines be issued to first-line supervisors as a guide to mobilizing crews to perform the work. This should improve efficiency in daily crew mobilization, as well as, the setting of short-term schedules.

Application of maintenance management in-house

97. The principles of maintenance management are directly applicable to the US Army pavement systems. Maintenance items, work activities and planning guidelines were identified and developed for routine pavement maintenance during Phase 1. To further demonstrate their management utility for an army installation, these planning guidelines and other planning values were applied

to the pavement system of the Sierra Army Depot to establish an annual work program and performance budget.

98. Based on information from the six installations visited and existing information systems supporting routine maintenance, there is potential for improved work management procedures for routine and cyclic pavement maintenance which cover the full management cycle of planning, organizing, directing and controlling, particularly in support of the first-line supervisor.

99. Army installations with implemented PAVER systems have a complete inventory and condition assessment of pavement surfaces. The PAVER condition data can be used to develop planned work for pavement surface activities. Routine maintenance repairs identified from PAVER can also be used to estimate annual work quantities for selected activities and supplemented with results of this project.

100. In light of the above, it is recommended that a full-cycle routine pavement maintenance management system covering planning through controlling be developed and implemented at a minimum of two pilot test installations. The system should be characterized by the following:

a. Emphasis on information support for first-line supervisors.

b. Focus on work and work quantification.

c. Capacity to readily link annual work programs to resource estimates.

d. Utilization of inventory and work estimates from PAVER for those activities covered by PAVER.

e. Capability to report routine history by pavement section to PAVER.

f. State-of-the-art microcomputer operation sufficiently generic to accept nonpavement routine maintenance activities in the future.

Such system would be consistent with the new operating environment planned for IFS-M. It would focus on efficiencies at the level where the work is performed and information support for first-line supervisors. Routine maintenance is primarily a decentralized activity. The opportunity for efficiencies occur at the working level. The same system should also be capable of supporting contract maintenance.

Contract maintenance

101. Maintenance management systems are applicable to maintenance performed by in-house personnel, by private contractor or both. The workload

planning component can be used to quantify the maintenance workload included in commercial activities as well.

102. It is recommended that programs (scopes) for routine maintenance contracts (initially for the pavement portions) include:

a. Annual estimates of work by month by activity.

b. Annual resource estimates by type by month.

The objective would not be to absolutely tie the contractors' hands, but to quantify the maintenance, thereby reducing the uncertainty associated with these types of maintenance operations. The quantification of scope and resources and distribution throughout the year (identifying peaks and valleys) should result in both lower bids and higher profits for contractors through improved resource utilization.

103. It is recommended that the same full-cycle management system support contract maintenance. The management functions supported under contracting are indicated in Figure 17. Although less overall management functions are required under contracting, certain functions should remain exclusively with the installation staff and others performed jointly to keep the contractor on tract. The demonstration at the Sierra Army Depot is indicative of the kind of planning that is equally applicable to contract maintenance.

BIBLIOGRAPHY

American Public Works Association. 1985. "Street and Highway Maintenance Manual," Chicago, IL.

Departments of the Army, the Navy, and the Air Force. 1984. "Engineered Performance Standards for Real Property Maintenance Activities, Roads, Grounds, Pest Control and Refuse Collection Handbook," TB 420-22/ NAVFAC P-712.0/AFM 88-51, Washington, DC.

Department of the Interior, National Park Service. 1987. "Maintenance Management, Operations Manual," Part 1 and 2, Washington, DC.

Headquarters, Department of the Army. 1972. "Engineered Performance Standards, Public Works Maintenance, General Handbook," TB 420-2/NAVDOCKS P-701.0, Washington, DC.

Headquarters, Department of the Army. 1978. "Facilities Engineering Resources Management System," Department of the Army Pamphlet 420-4, Washington, DC.

Hillsborough County, Road and Bridge Department. 1983. "Maintenance Management System, Field Operations Manual," Tampa, FL.

Iowa Department of Transportation, Highway Division. 1984. "Standards for Maintenance Activities, Ames, IA.

Joint Departments of the Army, the Navy and the Air Force, USA. "Maintenance and Repair of Surface Areas," Technical Manual TM 5-624/NAVFAC MO-102/ AFM 85, Washington, DC.

Tennessee Department of Highways, Maintenance Division. 1971. "Maintenance Field Operations Manual," Nashville, TN.

US Department of Transportation, Federal Highway Administration. 1985. "Roads and Streets Maintenance Management System," Washington, DC.

APPENDIX A: MAINTENANCE WORK ACTIVITY DEFINITIONS

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System

BITUMINOUS PAVEMENT

1110 Pothole Patching

Patching small areas (25 sq. ft. or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Bituminous Lane Mile

1120 Partial-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement and to eliminate safety hazards.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Bituminous Lane Mile

1130 Full-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

Work Unit: Tons Material
Inventory Unit: Bituminous Lane Mile

1140 Surface Treatment Patch

Patching small areas (25 sq. ft. or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1150 Surface Treatment

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1160 Skid Resistance Treatment

Placement of porous friction surface materials on bituminous surface to increase skid resistance and reduce hydroplaning on pavement surfaces.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1170 Crack Sealing

Placement of crack sealant into cracks on bituminous surfaces to prevent water entry and related damage to the surfacing and base materials.

Work Unit: Gallons Sealant
Inventory Unit: Bituminous Lane Mile

1180 Treat Bleeding Asphalt

Placement of hot sand or aggregate on bleeding or flushing bituminous surfaces to absorb the film of bituminous material on the surface and to restore surface friction.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1190 Treat Fuel Spillage

Treatment of areas subjected to moderate fuel spillage with fuel resistant sealers to reduce the leaching way of the asphalt binder and subsequent raveling of the surface aggregate.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

CONCRETE PAVEMENT

1310 Bituminous Patching of PCC Surface

Bituminous patching of small (25 sq. ft. or less) portland cement concrete (PCC) surface areas that require immediate repair to correct spalled areas, abrupt depressions and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Concrete Lane Mile

1320 Partial-Depth Patch of PCC Surface

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces excluding the base course to provide a smooth, structurally sound surface and to eliminate safety hazards.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1330 Full-Depth Patch of PCC Surface

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces and base courses as required to provide a smooth, structurally sound surface and to eliminate safety hazards.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1340 Epoxy Patching

Patching spalled areas and shallow surface defects in portland cement concrete pavements with epoxy grout, mortar and concrete materials to prevent water entry and further deterioration.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1350 Bituminous Undersealing

Injection of liquid bituminous material under portland cement concrete pavements to fill and prevent the enlarging of minor voids under the pavement surface.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1360 Crack/Joint Sealing

Placement of adhesive material into joints and cracks on portland cement concrete pavements to prevent the entry of water and foreign matter and related damage to the surfacing and base materials.

Work Unit: Linear Feet
Inventory Unit: Concrete Lane Mile

1370 Slab Replacement

Removal and replacement of entire portland cement concrete pavement slabs, including the base courses as required to provide a structurally sound surface capable of supporting the required loads.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1380 Slabjacking

Pumping of grout mixtures through holes cored in portland cement concrete pavements into void areas under the pavement to raise and realign the pavement slab by filling the void areas.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1390 Slab Grinding

Grinding of concrete portland cement pavements to level and realign faulted areas between slabs or cracks within the slab by grinding the high side.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

1400 Surface Grooving

Grooving portland cement concrete pavements by cutting a series of small grooves or cuts in the pavement surface to improve the surface skid resistance.

Work Unit: Square Yards
Inventory Unit: Concrete Lane Mile

OTHER SURFACES

1510 Blade Unpaved Surface

Blading, reshaping and smoothing unpaved surfaces, without adding material or widening, to restore crown, proper shape, drainage and smooth riding surface. Includes pulling and cleaning roadside ditches and sloping of shoulders as required.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1520 Add Gravel to Unpaved Surface

Repairing and stabilizing unpaved surfaces by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore crown, proper shape, drainage and a smooth riding surface.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1530 Cement/Lime Stabilization

Application of cement or lime mixtures to unpaved surface materials and mixing with water. Includes reshaping and compacting to provide proper cross-section, drainage and a smooth riding surface.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1540 Dust Control

Application of dust control materials on unpaved surfaces to control dust and to minimize detrimental effects on personnel, equipment and aircraft.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1550 Blade Troop Trails

Blading, reshaping and smoothing unpaved troop trails to remove vegetation and restore crown. Includes adding aggregate as necessary to maintain shape and integrity of trail.

Work Unit: Trail Miles
Inventory Unit: Troop Trail Miles

SHOULDERS

1710 Patch Paved Shoulders

Patching of paved shoulders with asphalt concrete material to correct abrupt depressions, edge failures and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Paved Shoulder Miles

1720 Seal Coating

Seal coating of paved shoulders with hot liquid asphalt and cover aggregate to correct extensive cracking and spalling, prevent further deterioration and to provide an impervious surface.

Work Unit: Square Yards
Inventory Unit: Paved Shoulder Miles

1730 Blade Unpaved Shoulders

Blading and reshaping unpaved or stabilized turf shoulders on paved roads to eliminate edge ruts, washouts, ridges, corrugations and high, overgrown shoulders. Includes major cutting and grading to restore proper shoulder slope for adequate drainage.

Work Unit: Shoulder Miles
Inventory Unit: Unpaved Shoulder Miles

1740 Add Gravel to Unpaved Shoulders

Repairing unpaved shoulders on paved roads by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore proper shoulder slope for adequate drainage.

Work Unit: Tons Material
Inventory Unit: Unpaved Shoulder Miles

ROADSIDE

2110 Roadway Sweeping

Sweeping paved roadway surfaces, including parking areas, intersections and curb and gutter to remove dirt, sand and other debris

Work Unit: Lane Miles
Inventory Unit: Paved Roadway Lane Miles

2120 Runway Sweeping

Sweeping paved runway surfaces, including taxiways and aircraft parking aprons to remove dirt, sand and other potential hazards to aircraft and personnel.

Work Unit: Lane Miles
Inventory Unit: Runway Lane Miles

2130 Magnet Sweeping

Magnet sweeping of paved roadways and runways to remove metal debris from surface to allow safe operation of equipment and aircraft.

Work Unit: Lane Miles
Inventory Unit: Paved Surface Lane Miles

2140 Machine Mowing

Tractor mowing of roadsides and designated grounds area to maintain an attractive roadside and grounds, provide adequate sight distance and control erosion and drainage.

Work Unit: Acres
Inventory Unit: Mowable Acres

2150 Hand Mowing/Trimming

Mowing and trimming areas, such as medians, steep slopes and other areas not accessible to tractors, with walk-behind mowers and other hand tools to maintain the vegetation and to control erosion and drainage.

Work Unit: Person Hours
Inventory Unit: Mowable Acres

2160 Spraying/Weed Control

Application of chemicals to vegetation and soil to eliminate undesirable growth or control growth in areas inaccessible to mowers, such as around guardrails, signs, fences, bridge ends, drainage ditches and other designated areas.

Work Unit: Person Hours
Inventory Unit: Mowable Acres

2170 Reseeding and Sodding

Reseeding and sodding of roadsides and grounds areas to restore vegetation for erosion control and appearance.

Work Unit: Square Yards
Inventory Unit: Mowable Acres

2180 Erosion Control

Repair of erosion and failures on slopes to restore stability and the removal and disposal of eroded material.

Work Unit: Person Hours
Inventory Unit: Mowable Acres

2190 Litter Pickup

Pickup and disposal of litter, trash and other debris on roadsides, parking areas and other designated areas for aesthetic value, and to remove unsightly or hazardous objects that may obstruct drainage or damage mowing equipment or personnel.

Work Unit: Bags Litter
Inventory Unit: Grounds Acres

2200 Brush/Tree Cutting

Cutting and removing brush and trees within the right-of-way and other areas to restore sight distances, eliminate traffic hazards and remove encroaching vegetation.

Work Unit: Person Hours
Inventory Unit: Grounds Acres

2210 Repair Fences

Straightening and repair of broken or damaged fencing around government facilities to provide safety and security.

Work Unit: Linear Feet
Inventory Unit: Linear Feet Fence

2220 Clean Grit Chambers

Cleaning and removal of dirt, gravel and other debris from grit chambers of motor pool washracks.

Work Unit: Person Hours
Inventory Unit: Number Wash Racks

2230 Remove Roadway Debris

Removal of roadway debris due to vehicle accidents and storm damage to provide safe use of the roadway.

Work Unit: Person Hours
Inventory Unit: Roadway Miles

DRAINAGE

3110 Clean/Reshape Ditches

Cleaning and reshaping of roadside ditches along paved surfaces. Includes the removal, hauling and disposal of excess material to restore the original grade line and to ensure adequate drainage.

Work Unit: Ditch Miles
Inventory Unit: Unpaved Ditch Miles

3120 Clean Culverts/Inlets

Cleaning and removal of debris and silt as required from box culverts, drain pipe culverts, inlets, and storm sewers to maintain adequate drainage and prevent flooding.

Work Unit: Number Culverts/Inlets
Inventory Unit: Number Culverts/Inlets

3130 Repair/Replace Culverts

Repair or replacement of pipe culverts, drop inlets, catch basins and manholes to provide proper drainage. Includes the repair of headwalls and sand bagging of culvert ends to prevent erosion and washouts.

Work Unit: Number Culverts/Inlets
Inventory Unit: Number Culverts/Inlets

3140 Place Riprap

Placing or replacing riprap on embankments and around bridges and drainage structures to prevent erosion and other failures.

Work Unit: Person Hours
Inventory Unit: Unpaved Ditch Miles

3150 Clean/Clear Canals

The machine cleaning and reshaping of canals and non-roadway drainage ditches including the removal, hauling and disposal of excess material and sludge to restore the original grade line and to ensure adequate drainage at all times.

Work Unit: Linear Feet
Inventory Unit: Canal Miles

BRIDGE SURFACE

4110 Clean Bridge Surface

Cleaning of bridge decks and bearing surfaces to remove sand and other debris, including the cleaning of expansion joints, drain holes and curbs.

Work Unit: Square Yards
Inventory Unit: Square Yards Bridge Deck

4120 Repair Timber Deck

Repair and replacement of timber deck components to restore or preserve structural stability and smooth riding surface.

Work Unit: Square Yards
Inventory Unit: Square Yards Timber Deck

4130 Repair Bridge Deck

Repair and patching of portland cement concrete and asphalt concrete bridge deck surfaces to maintain or restore structural stability and smooth riding surface.

Work Unit: Square Yards
Inventory Unit: Square Yards Non-Timber Deck

TRAFFIC SERVICES

5110 Traffic Line Striping

Striping the centerline, edge and lane markings on paved surfaces for traffic, parking and pedestrian control.

Work Unit: Linear Feet
Inventory Unit: Traffic Line Miles

5120 Repair Signs

Repair, replacement and straightening of traffic signs, sign posts, delineators and other signs damaged by accident, vandalism, or deterioration to restore and maintain adequate control and guidance of traffic.

Work Unit: Number Signs
Inventory Unit: Number Traffic Signs

5130 Repair Guardrail

Repair of damaged or deteriorated guardrail/guiderail sections and posts to provide save driving conditions.

Work Unit: Linear Feet
Inventory Unit: Linear Feet Guardrail

5140 Repair Lights

Routine servicing, maintenance and repair of roadway lighting, tunnel or parking area lights to provide adequate lighting to high density vehicular use and parking areas.

Work Unit: Number Lights
Inventory Unit: Number Lights

5150 Repair Signals

Routine servicing, maintenance and repair of traffic signals and associated equipment to correct or prevent signal malfunction and to return signal to service.

Work Unit: Number Signals
Inventory Unit: Number Signals

SNOW AND ICE CONTROL

6110 Plow Roadways

Plowing of snow from roadways and parking areas to provide access and reduce hazardous driving conditions.

Work Unit: Roadway Miles
Inventory Unit: Roadway Miles

6120 Plow Runways

Plowing of snow from runways, taxiways, heliports and aircraft parking aprons to provide for safe aircraft operations and to reduce hazardous operating conditions.

Work Unit: Person Hours
Inventory Unit: Runway Lane Miles

6130 Rotary Snow Removal

Removal of heavy snow accumulations from runways and other areas when it is required to remove the snow from the area being plowed or to load the snow into trucks for disposal.

Work Unit: Person Hours
Inventory Unit: Paved Surface Lane Miles

6140 Load/Haul Snow

Loading and hauling snow from windrowed snow, rotary plow operations or other areas when the snow must be hauled to a disposal site.

Work Unit: Person Hours
Inventory Unit: Paved Surface Lane Miles

6150 Sweep Snow from Runways

Sweeping runways to remove snow and slush from the pavement surface throughout the snowfall duration to maintain the center of the runway in a bare pavement

Work Unit: Person Hours
Inventory Unit: Runway Lane Miles

6160 Apply Chemicals/Abrasives for Ice Control

Application of approved chemicals and/or abrasives to runways, taxiways, roadways, parking areas and hazardous locations to remove ice and provide for safe vehicle and aircraft operations.

Work Unit: Person Hours
Inventory Unit: Paved Surface Lane Miles

6170 Clear Snow and Ice from Runway Lights

Clearing snow and ice from runway edge lights to maintain visibility and provide runway clearance for aircraft movement and safe operations.

Work Unit:	Number Lights
Inventory Unit:	Number Runway Lights

6180 Clear Walkways

Removal of snow and ice from sidewalks and other walkways to provide safe passage and use for personnel.

Work Unit:	Linear Feet
Inventory Unit:	Linear Feet Sidewalk

6190 Install/Remove Snow Fence

Installation and removal of snow fences at selected locations to minimize and reduce the effect of snowdrifts on roadways and runways.

Work Unit:	Linear Feet
Inventory Unit:	Number Locations

6200 Install/Remove Snow Markers

Installation and removal of snow markers to identify the location of airfield lighting systems and other potential snow plowing obstacles.

Work Unit:	Number Markers
Inventory Unit:	Number Locations

APPENDIX B: PLANNING GUIDELINES

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System

LIST OF PLANNING GUIDELINES

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Pothole Patching	**CODE**	1110

DESCRIPTION

Patching small areas (25 sq. ft, or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

MAINTENANCE ITEM Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

Perform when potholes and other hazards are identified. Schedule the work by geographical area, except for emergencies. Hot-mix asphalt concrete is the preferred patching material when available.

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Vehicle Operator	1
Laborer	2

EQUIPMENT	
Dump Truck (5CY)	1
Vibratory Tamper	1
Heater-Blower	1
Saw or Air Hammer	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

DAILY PRODUCTION

3 - 5 Tons Asphalt Concrete

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-37, 38, par. 3-5.6.7.1-3.

WORK ACTIVITY	Pothole Patching	CODE	1110

RECOMMENDED WORK PROCEDURE

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

6.00000 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Partial-Depth Patch	**CODE**	1120

DESCRIPTION

Removal and replacement of large areas (more than 25 sq. ft) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

MAINTENANCE ITEM Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Remove all contaminated materials when patching fuel spill areas.

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT	
Dump Truck (5CY)	2
Loader/Backhoe	1
Roller and/or Tamper	1
Asphalt Kettle	1
Saw or Air Hammer	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

DAILY PRODUCTION

5 - 10 Tons Asphalt Concrete

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977

WORK ACTIVITY	Partial-Depth Patch	CODE	1120

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark limits of patch area - the edges of the patch should extend at least one foot into sound pavement.
3. Saw around area to be removed, or use jack hammer.
4. Remove deteriorated pavement and load into truck.
5. Compact base material as required.
6. Apply tack coat or prime to the area to be patched and around edge of existing pavement.
7. Place asphalt in layers not to exceed 2 inches.
8. Rake asphalt as required to smooth out any loose material and around corners and turnouts.
9. Compact each layer with roller and/or tamper.
10. Place and compact final layer level with the surrounding surface.
11. Roll out patched area and check with straight edge.
12. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

5.33333 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Full-Depth Patch	**CODE**	1130

DESCRIPTION

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

MAINTENANCE ITEM Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Perform when surface is badly alligatored or thermo cracked. Schedule the repair of identified failures by geographic area.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	3
Laborer	3

EQUIPMENT

Dump Truck (5CY)	3
Loader/Backhoe	1
Roller and/or Tamper	1
Asphalt Kettle	1
Saw or Air Hammer	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material
Base Material

DAILY PRODUCTION

10 - 15 Tons Material

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977.

WORK ACTIVITY	Full-Depth Patch	CODE	1130

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark limits of patch area - the edges of the patch should extent at least one foot into sound pavement.
3. Saw around area to be removed, or use jack hammer.
4. Remove deteriorated pavement and load into truck.
5. Replace base material as required and compact until even with bottom of existing pavement. (Hot mix may be used to replace base.)
6. Apply tack coat or prime to the area to be patched and around edge of existing pavement.
7. Place asphalt in layers not to exceed 2 inches.
8. Rake asphalt as required to smooth out any loose material and around corners and turnouts.
9. Compact each layer with roller and/or tamper.
10. Place and compact final layer level with the surrounding surface.
11. Roll out patched area and compact area to a smooth surface matching surrounding area.
12. Check surface with straight edge.
13. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

4.48000 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Surface Treatment Patch	**CODE**	1140

DESCRIPTION

Patching small areas (25 sq. ft or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

MAINTENANCE ITEM — Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	2
Laborer	3

EQUIPMENT

Dump Truck (5CY)	2
Roller, Rubber Tire	1
Asphalt Distributor	1

MATERIAL

Liquid Asphalt
Seal Aggregate

DAILY PRODUCTION

200 - 400 Square Yards

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. pg. 3-1, par. 3-2.2, pg. 3-34, par. 3-5.6.4.1.
3. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, pg. 2-5, par. 2-11.
4. Pavement surface should be dry.

WORK ACTIVITY	Surface Treatment Patch	CODE	1140

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark limits of area to be patched.
3. Broom marked area with hand broom to remove dirt and loose material.
4. Apply liquid asphalt with hand spray and stay within the marked area.
5. Spread seal aggregate in a uniform layer over the sprayed asphalt. Broom excess aggregate to provide complete coverage.
6. Roll the patched area with at least three passes.
7. Repeat steps 4, 5, and 6 until the patched area is even with the adjacent pavement. Limited to 2 applications.
8. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

0.16000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Surface Treatment	**CODE**	1150

DESCRIPTION

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

MAINTENANCE ITEM Bituminous Surface Lane Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X							X	X	X	X	X

Placement of seal coat surfacing to seal cracks, correct minor surface depressions and to provide a new wearing surface

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	3
Vehicle Operator	4
Maintenance Worker	2
Laborer	4

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Dump Truck (10CY)	2
Distributor	1
Chip Spreader	1
Power Rotary Broom	1
Roller, Rubber Tire	2

MATERIAL

Liquid Asphalt
Seal Aggregate

DAILY PRODUCTION

30,000 - 45,000 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987. Pg. 2-5, par. 2-11.
2. TM 5-624, Chapter 3, Bituminous Pavement, March 1977. Pg. 3-1, Par. 3-2.2.
3. Control traffic at speeds no greater than 15 mph for 2-4 hours.

WORK ACTIVITY	Surface Treatment	CODE	1150

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Close road/lane to traffic.
3. Sweep and clean loose debris from pavement.
4. Apply heated liquid asphalt material with properly calibrated distributor to one lane at a time.
5. Spread aggregate immediately after application of liquid asphalt with mechanical spreader.
6. Hand broom aggregates before liquid asphalt cools where necessary to ensure all bituminous material is covered.
7. Roll sealed area with rubber tire roller.
8. Remove excess stone from pavement using rotary sweeper with minimum downward pressure.
9. Clean area and remove traffic control devices.

Precautions

1. Distributor must be properly calibrated.
2. Cover stone must be correct gradation.
3. Application rates for asphalt and stone must be correct for conditions. (Adjust for emulsions and/or surface conditions)
4. Apply cover stone immediately after application of liquid asphalt. Roll with rubber tired roller.

ENGINEERED PERFORMANCE STANDARD

0.00299 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Skid Resistance Treatment	**CODE**	1160

DESCRIPTION

Placement of porous friction surface materials on bituminous surface to increase skid resistance and reduce hydroplaning on pavement surfaces.

MAINTENANCE ITEM — Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X							X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	3
Vehicle Operator	4
Maintenance Worker	2
Laborer	4

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Dump Truck (10CY)	4
Distributor	1
Paver, Asphalt	1
Power Broom	1
Roller, Non-Vibratory/Steel Wheel	2

MATERIAL

Porous Friction Asphalt
Liquid Asphalt

DAILY PRODUCTION

15,000 - 20,000 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, pg. 6-22, par. 6-3.
2. NAV FAC DM-5

WORK ACTIVITY	Skid Resistance Treatment	CODE	1160

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Close road/lane to traffic.
3. Sweep loose debris from pavement.
4. Apply tack asphalt to one lane at a time.
5. Apply hot porous friction asphalt with paving machine.
6. Begin rolling as soon as material will support roller.
7. Roll until aggregate is seated, approximately 1 or 2 passes.
8. Clean area and remove traffic control devices.

Precautions

1. Use proper mix design.
2. Aggregate must be clean.
3. Hard durable aggregates of the proper size, usually square and uniform, must be used.

ENGINEERED PERFORMANCE STANDARD

0.00640 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Crack Sealing	**CODE**	1170

DESCRIPTION

Placement of crack sealant into cracks on bituminous surfaces to prevent water entry and related damage to the surfacing and base materials.

MAINTENANCE ITEM — Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X				X	X	X				

Perform annually in spring and late fall on all facilities where cracks 1/8" or wider are identified.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	2
Laborer	2

EQUIPMENT

Dump Truck (5CY)	2
Air Compressor	1
Crack Filler/Asphalt Kettle	1
Router or Grinder	1
Sand Blaster	1

MATERIAL

Crack Sealant
Sand

DAILY PRODUCTION

100 - 300 Gallons Sealant

REFERENCES - METHODS & SAFETY

1. AFM-88-6, Chapter 7
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-27, par. 3-54, pg. 3-33, par. 3-5.6.2.

WORK ACTIVITY	Crack Sealing	CODE	1170

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Rout, grind or sandblast cracks.
3. Clean cracks with air compressor.
4. Seal cracks. Apply sealant to within 1/4 inch of surface.
5. Apply sand as required to prevent tracking.
6. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.16000 Hours per Gallon

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Treat Bleeding Asphalt	**CODE**	1180

DESCRIPTION

Placement of hot sand or aggregate on bleeding or flushing bituminous surfaces to absorb the film of bituminous material on the surface and to restore surface friction.

MAINTENANCE ITEM	Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
									X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Spreader Box	2
Rubber Tire Roller	1
Power Broom	1
Front End Loader	1

MATERIAL

Sand
Seal Aggregate

DAILY PRODUCTION

500 - 1,000 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-40, par. 3-5.6.9.2.

WORK ACTIVITY	Treat Bleeding Asphalt	CODE	1180

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark limits of area to be treated.
3. Heat sand in mixing plant or by other uniform heating method.
4. Spread hot sand or aggregate on the bleeding area to blot the asphalt.
5. Roll the area immediately with a rubber-tired roller.
6. After the sand or aggregate has cooled, broom off excess material. Repeat steps 3-5 if necessary.
7. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.06400 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Treat Fuel Spillage	**CODE**	1190

DESCRIPTION

Treatment of areas subjected to moderate fuel spillage with fuel resistant sealers to reduce the leaching away of the asphalt binder and subsequent raveling of the surface aggregate.

MAINTENANCE ITEM — Bituminous Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

Damaged bituminous areas must be repaired before treatment. New areas and permanent repairs are made with portland cement concrete.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Mixing Drum & Mixer	1
Squeegee	1

MATERIAL

Fuel Resistant Sealer
Fine Aggregate

DAILY PRODUCTION

300 - 500 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-41, par. 3-5.6.12.

WORK ACTIVITY	Treat Fuel Spillage	CODE	1190

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Clean and sweep area.
3. Mix fuel resistant sealer according to manufacturers instructions.
4. Treat with fuel resistant sealer.
5. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.06000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Bituminous Patching of PCC Surface	CODE	1310

DESCRIPTION

Bituminous patching of small (25 sq. ft or less) portland cement concrete (PCC) surface areas that require immediate repair to correct spalled areas, abrupt depressions and other potential surface hazards to provide a smooth paved surface.

MAINTENANCE ITEM Concrete Surface Lane Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Vibratory Tamper	1
Concrete Saw	1
Jack Hammer	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

DAILY PRODUCTION

3 - 5 Tons Asphalt Concrete

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-37, par. 3-5.6.7.1-3.
3. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-51, par. 4-10.6.2.
4. Dispose of removed concrete pavement at approved site.

WORK ACTIVITY	Bituminous Patching	CODE	1310

RECOMMENDED WORK PROCEDURE

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed and saw or jack hammer around the area.
3. Remove all loose debris and broken concrete from area to be patched.
4. Square the edges with saw or jack hammer to provide a vertical face on the area to be patched.
5. Make sure the area is as dry as possible.
6. Spray tack lightly on bottom and sides.
7. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
8. Check with straight edge to make sure patch is level with surrounding surface. Do not make a bump out of a hole.
9. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

6.00000 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Partial-Depth Patch of PCC Surface	**CODE**	1320

DESCRIPTION

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces excluding the base course to provide a smooth, structurally sound surface and to eliminate safety hazards.

MAINTENANCE ITEM	Concrete Surface Lane Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT	
Pickup	1
Dump Truck (5CY)	2
Loader/Backhoe	1
Air Compressor	1
Concrete Saw	1
Concrete Mixer	1
Jack Hammer	1

MATERIAL

Ready Mix Concrete
Cement
Aggregate
Sand
Bonding Grout

DAILY PRODUCTION

25 - 35 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-47, par. 4-10.4.
2. Ready Mix concrete may be used when available.
3. High early strength PCC may be used to return pavement to service within 24 - 48 hours.

WORK ACTIVITY	Partial-Depth Patch	CODE	1320

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark area to be removed - at least 2 inches beyond the damaged area.
3. Saw along marked lines to a minimum depth of 2 inches.
4. Breakout the sawed area with air jack hammer to a depth of sound concrete.
5. Load the broken up concrete pavement into truck for disposal at approved site.
6. Use the air compressor to blow out dust and loose debris from the area.
7. Form joint if patch is along a joint.
8. Treat the bottom and sawed edges with a bonding grout mixture.
9. Place and vibrate or tamp the concrete mixture before the grout begins to dry.
10. Finish the concrete surface flush with the adjacent surface and broom finish to matching texture.
11. Cover with wet burlap or apply curing compound.
12. Set up traffic control devices to protect area.
13. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

1.60000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Full-Depth Patch of PCC Surface	**CODE**	1330

DESCRIPTION

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces and base courses as required to provide a smooth, structurally sound surface and to eliminate safety hazards.

MAINTENANCE ITEM — Concrete Surface Lane Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	3

EQUIPMENT	
Pickup	1
Dump Truck (5CY)	2
Loader/Backhoe	1
Air Compressor	1
Concrete Saw	1
Concrete Mixer	1
Drill	1

MATERIAL

Cement	Ready Mix Concrete
Aggregate	Dowels/Reinforcing Steel
Sand	
Bonding Grout	
Base Aggregate	

DAILY PRODUCTION

20 - 30 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977. Pg. 4-47, par. 4-10.4.
2. Military Construction Guide Specification 02515.
3. Air-entrained concrete will be used for all patching.
4. Remove/replace only damaged base areas.

WORK ACTIVITY	Full-Depth Patch	CODE	1330

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark area to be removed - at least 6 inches beyond the damaged area.
3. Saw along marked area at a depth to provide for removal of full depth.
4. Breakout the sawed area with air hammer down to base material.
5. Remove the broken up concrete pavement and load into truck for disposal at approved site.
6. Remove and replace deteriorated base material if required and recompact.
7. Use the air compressor to blow out dust and loose debris from the area.
8. Form joint if patch is along a joint. Replacement joints will be doweled and built to specifications in reinforced pavements.
9. Treat the sides of the sawed areas with a bonding grout mixture.
10. Place the concrete mixture, vibrate or tamp, and screed off flush with the adjacent surface.
11. Float and finish the surface texture to match the existing pavement.
12. Cover new surface with wet burlap or apply curing compound.
13. Set up traffic control devices to protect area until concrete has cured.
14. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

2.24000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Epoxy Patching	**CODE**	1340

DESCRIPTION

Patching spalled areas and shallow surface defects in portland cement concrete pavements with epoxy grout, mortars and concrete materials to prevent water entry and further deterioration.

MAINTENANCE ITEM Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X					X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT	
Pickup	1
Dump Truck (5CY)	1
Loader/Backhoe	1
Air Compressor	1
Concrete Saw	1
Grout Mixer	1

MATERIAL

Epoxy Mix
Sand
Aggregate

DAILY PRODUCTION

15 - 25 Square Yards

REFERENCES - METHODS & SAFETY

1. ASTM C-881
2. MMM-A-001993
3. TM 5-822-9, Repair of Rigid Pavements using Epoxy Resin Grouts, Mortars and Concrete, January 1968.
4. TM 5-624, Chapter 4, Concrete Pavements, March 1977. Pg. 4-34, par. 4-7.4.

WORK ACTIVITY	Epoxy Patching	CODE	1340

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark area to be removed - at least 2 inches beyond the damaged area.
3. Saw along marked lines to a minimum depth of 2 inches.
4. Breakout the sawed area with air hammer to a depth of sound concrete.
5. Load the broken up concrete pavement into truck for disposal at approved site.
6. Use the air compressor to blow out dust and loose debris from the area.
7. Mix the epoxy resin, sand and aggregate in accordance with manufacturers instructions.
8. Treat the bottom and sawed edges with a the epoxy resin.
9. Place the epoxy mixture and tamp immediately before set-up begins.
10. Finish the concrete surface flush with the adjacent surface and broom finish to match existing texture.
11. Protect the patched area until mix has set firmly, usually 4 to 6 hours depending on air temperature. Curing time can be shortened by use of infrared heater.
12. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

2.40000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Bituminous Undersealing	**CODE**	1350

DESCRIPTION

Injection of liquid bituminous material under portland cement concrete pavements to fill and prevent the enlarging of minor voids under the pavement surface.

MAINTENANCE ITEM	Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Use of asphalt to fill voids greater than 1 inch in depth is not recommended.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	1
Distributor	1
Air Compressor	1
Concrete Drill	1
Water Tank	1

MATERIAL

Liquid Asphalt (Underseal Mixture)
Hardwood Plugs

DAILY PRODUCTION

80 - 120 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-43, par. 4-9.

WORK ACTIVITY	Bituminous Undersealing	CODE	1350

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark locations for drilling pavement.
3. Drill holes through pavement thickness at designated locations.
4. Insert air hose nozzle into holes and force all water from beneath the slab.
5. Insert asphalt hose nozzle into drilled hole and pump heated asphalt beneath the slab.
6. Remove nozzle from hole when pumping is completed and plug hole tightly with wooden plugs.
7. While pumping, spray water on adjacent pavement to prevent discoloration of the surface and to chill/harden asphalt seeping through cracks or joints.
8. Repeat steps 4-7 for remaining holes.
9. Check pavement elevation while pumping to avoid making a bump.
10. Clean area and remove traffic control devices.

Precautions

Follow all safety procedures while working with hot liquid asphalt under high pressures and when in contact with water as foaming will occur.

ENGINEERED PERFORMANCE STANDARD

0.48000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Crack/Joint Filling	**CODE**	1360

DESCRIPTION

Placement of adhesive material into joints and cracks on portland cement concrete pavements to prevent the entry of water and foreign matter and related damage to the surfacing and base materials.

MAINTENANCE ITEM Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X				X	X	X				X

Perform in spring and fall when cracks and joints are 1/4 inch or wider.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Vehicle Operator	1
Maintenance Worker	2
Laborers	2

EQUIPMENT

Dump Truck (5CY)	2
Pickup	1
Air Compressor	1
Asphalt Kettle	1
Router	1

MATERIAL

Joint Filler Material

DAILY PRODUCTION

8,000 - 12,000 Linear Feet

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-21, par. 4-6.

WORK ACTIVITY	Crack/Joint Filling	CODE	1360

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Completely remove old filler material from joint.
3. Rout joints and cracks as required to provide minimum depth of 3/4 inch.
4. Blow out debris and foreign material from joint with air compressor.
5. Apply new filler material to joint to within 1/4 inch of the pavement surface where subject to tracked vehicles and airfields; 1/8 inch for other surfaces.
6. Allow filler material to cure before permitting traffic.
7. Clean area and remove traffic control devices.

Precautions

1. Always use proper filler material for area treated - jet fuel resistant, blast resistant, etc.

ENGINEERED PERFORMANCE STANDARD

0.00480 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Slab Replacement	**CODE**	1370

DESCRIPTION

Removal and replacement of entire portland cement concrete pavement slabs, including the base courses as required to provide a structurally sound surface capable of supporting the required loads.

MAINTENANCE ITEM Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	3

EQUIPMENT	
Pickup	1
Dump Truck (5CY)	2
Loader/Backhoe	1
Air Compressor	1
Concrete Saw	1
Concrete Mixer	1

MATERIAL
Cement
Aggregate
Sand
Ready Mix Concrete
Base Aggregate

DAILY PRODUCTION
40 - 60 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-44, par. 4-10.
2. Military Construction Guide Specification 02515
3. Air-entrained concrete will be used for all patching.
4. Identify drainage problems and install drains as required.
5. High early strength PCC may be used to return pavement to service with 24-48 hours.
6. Check treatment of keyed joints.

WORK ACTIVITY	Slab Replacement	CODE	1370

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark area to be removed.
3. Breakout the slab with air hammer down to base material.
4. Remove the broken up concrete pavement and load into truck for disposal at approved site.
5. Remove and replace deteriorated base material and recompact.
6. Use air compressor to blow out dust and loose debris from area.
7. Set forms along pavement edge.
8. Form joint if patch is along joint. Replacement joints will be doweled and built to specifications in reinforced pavements.
9. Place reinforcement material.
10. Place the concrete mixture, vibrate or tamp, and screed off flush with the adjacent surface.
11. Float and finish the surface texture to match the existing pavement.
12. Cover new surface with wet burlap or apply curing compound.
13. Set up traffic control devices to protect area until concrete has cured.
14. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD
1.12000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Slabjacking	**CODE**	1380

DESCRIPTION

Pumping of grout mixtures through holes cored in portland cement concrete pavements into void areas under the pavement to raise and realign the pavement slab by filling the void areas.

MAINTENANCE ITEM Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X					X	X	X			X

Do not schedule work during hot weather due to internal pressure in slab.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	2
Vehicle Operator	2
Laborer	3

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Grout Pumper	1
Concrete Mixer	1
Concrete Drill	1
Water Truck	1

MATERIAL

Grout Mixture
Wooden Plugs

DAILY PRODUCTION

200 - 300 Square Yards

REFERENCES - METHODS & SAFETY

1. AFM 91-23
2. TM 5-624, Chapter 4, Concrete Pavements, March 1977, Pg. 4-3, par. 4-8.

WORK ACTIVITY	Slabjacking	CODE	1380

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark locations for drilling pavement.
3. Drill holes 1-1/4 to 1-1/2 inch diameter through pavement thickness at designated locations.
4. Use straight edge or string line to establish desired elevation of pavement.
5. Insert grout hose nozzle into hole and pump grout mixture into holes at alternate locations until all voids are filled and the slab has been raised to the desired elevation.
6. Plug holes with hardwood plugs until grout has set. Remove plugs and fill holes with stiff mortar mixture.
7. Check pavement elevation while pumping to avoid making a bump.
8. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.25600 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Slab Grinding	**CODE**	1390

DESCRIPTION

Grinding of portland cement concrete pavements to level and realign faulted areas between slabs or cracks within the slab by grinding the high side.

MAINTENANCE ITEM	Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X							X	X	X	X	X

Perform grinding where there is faulting between slabs or cracks within a slab.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Grinding Machine	1
Water Truck	1
Power Broom	1

MATERIAL

DAILY PRODUCTION

150 - 200 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements.

WORK ACTIVITY	Slab Grinding	CODE	1390

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark locations for grinding.
3. Adjust grinding machine to cut specified depth.
4. Grind pavement surface in direction of traffic, keeping parallel to pavement edge.
5. Haul waste material to designated disposal/stockpile area.
6. Repeat grinding operation until specified depth is obtained.
7. Sweep ground surface area to remove debris and loose material.
8. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.27429 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Surface Grooving	**CODE**	1400

DESCRIPTION

Grooving portland cement concrete pavements by cutting a series of small grooves or cuts in the pavement surface to improve the surface skid resistance.

MAINTENANCE ITEM	Concrete Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X							X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Grooving Machine	1
Water Truck	1
Power Broom	1

MATERIAL

DAILY PRODUCTION

300 - 400 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements.
2. Use longitudinal grooves on roadways.
3. Grooving of airfield pavements is done in the transverse direction.

WORK ACTIVITY	Surface Grooving	CODE	1400

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark locations for grooving.
3. Adjust machine for proper depth and width of grooves. Depth and width of grooves typically are 1/4 by 1/4 inch and spaced 1 1/4 inches apart.
4. Groove roadways longitudinally and airfields in the transverse direction.
5. Haul waste material to designated disposal area.
6. Sweep grooved area to remove debris and loose material.
7. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.12800 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Blade Unpaved Surface	**CODE**	1510

DESCRIPTION

Blading, reshaping and smoothing unpaved surfaces, without adding material or widening, to restore crown, proper shape, drainage and smooth riding surface. Includes pulling and cleaning roadside ditches and sloping of shoulders as required.

MAINTENANCE ITEM	Unpaved Surface Road Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Blade when corrugations, ruts, or chuckholes cause an uncomfortable ride or unsafe conditions. Schedule most blading when adequate moisture conditions prevail to ensure proper compaction.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Laborer	1

EQUIPMENT

Motor Grader	1
Pickup	1

MATERIAL

DAILY PRODUCTION

4 - 6 Road Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-4, par. 5-5.3.

WORK ACTIVITY	Blade Unpaved Surface	CODE	1510

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Blade surface by pulling material from side to center of road.
3. Blade material to level surface and provide a slight crown for drainage.
4. Ensure that windrows have been bladed out and no bumps or excess materials are left in driveways.
5. Remove any large rocks or other objects that would be hazardous to traffic.
6. Remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

3.20000 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Add Gravel to Unpaved Surface	**CODE**	1520

DESCRIPTION

Repairing and stabilizing unpaved surfaces by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore crown, proper shape, drainage and a smooth riding surface.

MAINTENANCE ITEM Unpaved Surface Road Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Perform when ruts, potholes, washouts and corrugations cause an uncomfortable and unsafe riding condition and there is insufficient surface material on the roadway.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	2
Vehicle Operator	3
Laborer	1

EQUIPMENT

Motor Grader	1
Dump Truck (5CY)	2
Water Truck	1
Roller	1

MATERIAL

Aggregate/Gravel

DAILY PRODUCTION

0.5 - 1.0 Road Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-4, par. 5.5.3.

WORK ACTIVITY	Add Gravel to Unpaved Surface	CODE	1520

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Blade existing surface by pulling material from the two side ditches.
3. Cut high shoulders, as necessary.
4. Cut the roadway surface to bring up the larger aggregate to provide a better mixture for compaction.
5. Add additional aggregate material and spread with the grader.
6. Blade all material to a level surface with a slight crown for drainage.
7. Compact with roller or truck tires.
8. Ensure that windrows are removed and no excess material is left in driveways.
9. Remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

64.00000 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Cement/Lime Stabilization	**CODE**	1530

DESCRIPTION

Application of cement or lime mixtures to unpaved surface materials and mixing with water. Includes reshaping and compacting to provide proper cross-section, drainage and a smooth riding surface.

MAINTENANCE ITEM Unpaved Surface Road Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Foreman	1
Equipment Operator	1
Vehicle Operator	4
Laborer	1

EQUIPMENT	
Pickup	1
Motor Grader	1
Dump Truck (5CY)	2
Water Truck	1
Roller	1
Pulvimixer	1

MATERIAL

Cement
Lime

DAILY PRODUCTION

0.5 - 1.0 Road Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-6, par. 5-6.
2. TM 5-822-4, soil stabilization for Roads and Streets, June 1969.
3. See Figure 5-2, pg. 5-8, TM 5-624, for selection of lime or cement.

WORK ACTIVITY	Cement/Lime Stabilization	CODE	1530

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Blade existing surface by pulling material from the two side ditches.
3. Cut the roadway surface to bring up the larger pieces of aggregate.
4. Remove unsuitable materials.
5. Add additional stabilizing material, spread with the grader and mix thoroughly with pulvimixer.
6. Add water to obtain proper moisture content.
7. Blade all material to a level surface with a slight crown for drainage.
8. Roll surface and compact.
9. Ensure that windrows are removed and no excess material is left in driveways.
10. Remove traffic control devices.

Precautions

1. Careful control of proportions, moisture content and compaction are important.
2. Soils and aggregates with a high silt and clay content can not be used for cement stabilization.
3. Quicklime can cause burns and irritations to workers and should be used with caution.

ENGINEERED PERFORMANCE STANDARD

74.66666 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Dust Control	**CODE**	1540

DESCRIPTION

Application of dust control materials on unpaved surfaces to control dust and to minimize detrimental effects on personnel, equipment and aircraft.

MAINTENANCE ITEM Unpaved Surface Road Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
									X	X	X	

Perform in summer months on unpaved surfaces with high vehicular traffic.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Maintenance Worker	1

EQUIPMENT

Distributor or Water Truck	1

MATERIAL

Dust Palliatives

DAILY PRODUCTION

4 - 6 Road Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-21, par. 5-7.
2.TM 5-830-3.

WORK ACTIVITY	Dust Control	CODE	1540

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Mix palliatives *(according to manufacturers direction) in tank and drive to site.
3. Prewet surface to be treated.
4. Apply palliatives at designated rate per square yard.
5. Remove traffic control devices.

*NOTE: Some palliatives are placed dry and mixed into the surface with a motor grader.

ENGINEERED PERFORMANCE STANDARD

3.20000 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Blade Troop Trails	**CODE**	1550

DESCRIPTION

Blading, reshaping and smoothing unpaved troop trails to remove vegetation and restore crown. Includes adding aggregate as necessary to maintain shape and integrity of trail.

MAINTENANCE ITEM Troop Trail Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Schedule blading when adequate moisture conditions prevail to ensure proper compaction.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	1

EQUIPMENT

Motor Grader	1
Dump Truck (5CY)	1

MATERIAL

Aggregate

DAILY PRODUCTION

5 - 7 Trail Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-1, par. 5-4.

WORK ACTIVITY	Blade Troop Trails	CODE	1550

RECOMMENDED WORK PROCEDURE

1. Blade surface by pulling material from side to center of trail.
2. Add additional aggregate as required and spread with the grader.
3. Blade material to level surface and provide a slight crown for drainage.
4. Remove any large rocks and other hazardous objects.
5. Ensure that windrows are bladed out and turn-outs are not blocked.

ENGINEERED PERFORMANCE STANDARD

2.66666 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Patch Paved Shoulders	**CODE**	1710

DESCRIPTION

Patching of paved shoulders with asphalt concrete material to correct abrupt depressions, edge failures and other potential surface hazards to provide a smooth paved surface.

MAINTENANCE ITEM Paved Shoulder Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

Perform when edge failures and dropoffs are identified.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Vibratory Tamper	1
Saw/Jack Hammer	1
Heater-Blower	1
Straight Edge	1

MATERIAL

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

DAILY PRODUCTION

3 - 5 Tons Asphalt Concrete

REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980.
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-37,38, par. 3-5.6.7.1-3.

WORK ACTIVITY	Patch Paved Shoulders	CODE	1710

RECOMMENDED WORK PROCEDURE

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

6.00000 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Seal Coating	CODE	1720

DESCRIPTION

Seal coating of paved shoulders with hot liquid asphalt and cover aggregate to correct extensive cracking and spalling, prevent further deterioration and to provide an impervious surface.

MAINTENANCE ITEM Paved Shoulder Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	3
Vehicle Operator	2
Laborer	3

EQUIPMENT

Dump Truck (5CY)	2
Roller, Rubber Tire	1
Asphalt Distributor	1
Chip Spreader	1

MATERIAL

Liquid Asphalt
Seal Aggregate

DAILY PRODUCTION

5,000 - 10,000 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-1, par. 3-2.2, pg. 3-34, par. 3-5.6.4.1.
2. TR M-294, September 1980.
3. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, Pg. 2-5, par. 2-11.

WORK ACTIVITY	Seal Coating	CODE	1720

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Mark limits of area to be sealed.
3. Broom marked area with hand broom to remove dirt and loose material.
4. Apply liquid asphalt with calibrated distributor and stay within the marked area.
5. Spread seal aggregate in a uniform layer immediately after asphalt is sprayed.
6. Roll the sealed area with rubber tired roller until aggregate is seated.
7. Clean area and remove signs and safety devices.

ENGINEERED PERFORMANCE STANDARD

0.00960 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Blade Unpaved Shoulders	**CODE**	1730

DESCRIPTION

Blading and reshaping unpaved or stabilized turf shoulders on paved roads to eliminate edge ruts, washouts, ridges, corrugations and high, overgrown shoulders. Includes major cutting and grading to restore proper shoulder slope for adequate drainage.

MAINTENANCE ITEM	Unpaved Shoulder Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
								X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	1

EQUIPMENT

Dump Truck (5CY)	1
Motor Grader	1

MATERIAL

DAILY PRODUCTION

6 - 10 Shoulder Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-3, par. 6-5.

WORK ACTIVITY	Blade Unpaved Shoulders	CODE	1730

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Cut excess material and pull ditches as necessary.
3. Pull windrow of excess material onto roadway edge.
4. Blade material back onto shoulder making sure all low spots are filled and add material as required.
5. Make extra passes as necessary to finish and compact shoulder and to provide proper slope and grade.
6. Remove loose material from pavement surface and clear driveways.
7. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

2.00000 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Add Gravel to Unpaved Shoulders	CODE	1740

DESCRIPTION

Repairing unpaved shoulders on paved roads by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore proper shoulder slope for adequate drainage.

MAINTENANCE ITEM

Unpaved Shoulder Mile

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	2
Vehicle Operator	3
Laborer	1

EQUIPMENT

Motor Grader	1
Dump Truck (5CY)	2
Water Truck	1
Roller	1

MATERIAL

Aggregate

DAILY PRODUCTION

125 - 175 Tons Material

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-3, par. 6-5.

WORK ACTIVITY	Add Gravel to Unpaved Shoulders	CODE	1740

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Blade existing shoulders by pulling material from the two side ditches.
3. Cut high shoulders, as necessary.
4. Cut the shoulder surface to bring up the larger pieces of aggregate.
5. Add additional stabilizing material and spread with the grader.
6. Blade out all material to a level surface with a slight slope for drainage.
7. Compact with roller or truck tires.
8. Ensure that windrows are removed and no excess material is left in driveways.
9. Remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

0.32000 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Roadway Sweeping	**CODE**	2110

DESCRIPTION

Sweeping paved roadway surfaces, including parking areas, intersections and curb and gutter to remove dirt, sand and other debris.

MAINTENANCE ITEM	Paved Roadway Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS		**REFERENCES - METHODS & SAFETY**
PERSONNEL	**QUANTITY**	
Equipment Operator	1	1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.1.2. 2.Use signs and traffic control as required.
EQUIPMENT		
Mechanical Sweeper	1	
MATERIAL		
DAILY PRODUCTION		
14 - 20 Lane Miles		

WORK ACTIVITY	Roadway Sweeping	CODE	2110

RECOMMENDED WORK PROCEDURE

1. Inspect equipment and make adjustments as necessary -- check brooms for effectiveness.
2. Fill sweeper with water.
3. Sweep designated areas as directed.
4. Materials collected by sweepers shall be dumped at approved sites.

ENGINEERED PERFORMANCE STANDARD

0.47059 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Runway Sweeping	**CODE**	2120

DESCRIPTION

Sweeping paved runway surfaces, including taxiways and aircraft parking aprons to remove dirt, sand and other potential hazards to aircraft and personnel.

MAINTENANCE ITEM Runway Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	1

EQUIPMENT

Pickup	1
Mechanical Sweeper	1
Radio	1

MATERIAL

DAILY PRODUCTION

14 - 20 Lane Miles

REFERENCES - METHODS & SAFETY

1. Perform sweeping during periods of low or non-operation by aircraft.
2. TM 5-624, Chapter 12, Preventive Maintenance, March 1977.

WORK ACTIVITY	Runway Sweeping	CODE	2120

RECOMMENDED WORK PROCEDURE

1. Obtain clearance for sweeping runway and taxiway areas.
2. Inspect equipment and make adjustments as necessary -- check brooms for effectiveness.
3. Check operation of radio.
3. Sweep designated areas as directed.
4. Dump materials at approved sites.
5. Notify control tower when sweeping is complete.

ENGINEERED PERFORMANCE STANDARD

0.94118 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Magnet Sweeping	**CODE**	2130

DESCRIPTION

Magnet sweeping of paved roadways and runways to remove metal debris from surface to allow safe operation of equipment and aircraft.

MAINTENANCE ITEM	Paved Surface Lane Mile

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	1
Laborer	1

EQUIPMENT	
Dump Truck (5CY)	1
Road Magnet	1
Radio	1

MATERIAL

DAILY PRODUCTION

14 - 20 Lane Miles

REFERENCES - METHODS & SAFETY

WORK ACTIVITY	Magnet Sweeping	CODE	2130

RECOMMENDED WORK PROCEDURE

1. Inspect road magnet and adjust as required.
2. Test for adequate magnetic power.
3. Travel designated roadways and runways with magnet operating to remove all ferrous and magnetic materials.
4. Stop periodically to remove accumulated material and load into vehicle.
5. Dump materials as designated locations.

Note:

For sweeping runway and taxiway areas clearance must be obtained before starting work. Radio communications must be established.

ENGINEERED PERFORMANCE STANDARD

0.94118 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Machine Mowing	**CODE**	2140

DESCRIPTION

Tractor mowing of roadsides and designated grounds area to maintain an attractive roadside and grounds, provide adequate sight distance and control erosion and drainage.

MAINTENANCE ITEM Mowable Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Schedule this activity in accordance with mowing policy.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Laborer	1

EQUIPMENT

Pickup	1
Tractor Mower	1
Trimmer	1

MATERIAL

DAILY PRODUCTION

6 - 8 Acres

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.

WORK ACTIVITY	Machine Mowing	CODE	2140

RECOMMENDED WORK PROCEDURE

1. Check mower before leaving storage site.
2. Transport mower to worksite -- place signs and other warning devices.
3. Mow designated areas and try to keep mowed grass and weeds out of storm sewers and driveway culverts.
4. Maintenance worker places/moves warning devices and performs hand trimming as required.
5. Remove signs and other warning devices.

ENGINEERED PERFORMANCE STANDARD

2.28571 Hours per Acre

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Hand Mowing/Trimming	**CODE**	2150

DESCRIPTION

Mowing and trimming areas, such as medians, steep slopes and other areas not accessible to tractors, with walk-behind mowers and other hand tools to maintain the vegetation and to control erosion and drainage.

MAINTENANCE ITEM	Mowable Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Hand mowed areas should be scheduled in conjunction with tractor mowing to provide a uniform appearance.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Pickup	1
Equipment Trailer	1
Riding Mower	2
Weed Trimmer	1

MATERIAL

DAILY PRODUCTION

24 Person Hours

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.

WORK ACTIVITY	Hand Mowing/Trimming	CODE	2150

RECOMMENDED WORK PROCEDURE

1. Check mower before leaving storage site.
2. Place signs and other warning devices. Use safety cones behind trailer for loading and unloading equipment.
3. Mow grass and weeds in designated areas.
4. Edge along median curbs, if needed.
5. Use trimmer or chemical growth retardant in tight areas.
6. Clean adjacent road and sidewalk of grass and weed clippings. Be careful not to clog up any drainage structures.
7. Remove signs and other warning devices.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Spraying/Weed Control	**CODE**	2160

DESCRIPTION

Application of chemicals to vegetation and soil to eliminate undesirable growth or control growth in areas inaccessible to mowers, such as around guardrails, signs, fences, bridge ends, drainage ditches and other designated areas.

MAINTENANCE ITEM Mowable Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
							X	X	X	X	X	X

Apply growth retardants and sterilizers to the designated areas in the early spring and through the growing season.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Maintenance Worker	2

EQUIPMENT

Spray Truck	1

MATERIAL

Weed Control Chemicals

DAILY PRODUCTION

16 Person Hours

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.2.
2. Application of chemicals must be in accordance with E.P.A. regulations by a certified spray equipment operator.

WORK ACTIVITY	Spraying/Weed Control	CODE	2160

RECOMMENDED WORK PROCEDURE

1. Be sure warning lights are properly working.
2. Check equipment calibration and fill tank with water and proper amount of chemicals per manufacturer specifications.
3. Spray assigned work location. Pay particular attention to proper application and safety equipment, e.g., goggles, gloves, etc.
4. Clean equipment thoroughly.
5. Return unused chemicals to proper storage.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Reseeding and Sodding	**CODE**	2170

DESCRIPTION

Reseeding and sodding of roadsides and grounds areas to restore vegetation for erosion control and appearance.

MAINTENANCE ITEM Mowable Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Maintenance Worker	2
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Stake Truck	1
Mulcher/Hydroseeder	1
Tractor/Cultivator/Seeder	1
Water Truck	1

MATERIAL

Grass Seed
Straw
Sod

DAILY PRODUCTION

200 - 300 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.2.

WORK ACTIVITY	Reseeding and Sodding	CODE	2170

RECOMMENDED WORK PROCEDURE

RESEEDING

1. Place signs and other warning devices.
2. Prepare soil by loosening, raking, leveling, or filling.
3. Sow/broadcast seed uniformly over area to be seeded.
4. Rack seed into soil in smaller areas.
5. Mulch seeded areas with straw.
6. Water seeded areas thoroughly.
7. Clean pavement of dirt and debris.
8. Remove signs and other warning devices.

SODDING

1. Delineate area to be replaced and measure.
2. Obtain equivalent amounts of rolled sod - provide for 5 percent wastage/overage.
3. Completely remove and haul off existing turf.
4. Grade uncovered area as required.
5. Unroll sod, lay out.
6. Irrigate area constantly for an extended period, as required by local conditions.

ENGINEERED PERFORMANCE STANDARD

0.19200 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Erosion Control	**CODE**	2180

DESCRIPTION

Repair of erosion and failures on slopes to restore stability and the removal and disposal of eroded material.

MAINTENANCE ITEM Mowable Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X					X	X	X				X

Schedule this work as required and when possible in the spring and fall when moisture and temperature conditions are most favorable.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	2
Loader	1
Hydroseeder	1

MATERIAL

Fertilizer/Lime
Mulch/Straw
Grass Seed

DAILY PRODUCTION

48 Person Hours

REFERENCES - METHODS & SAFETY

1. TM 5-820-1,2,3,4, Drainage and Erosion Control.

WORK ACTIVITY	Erosion Control	CODE	2180

RECOMMENDED WORK PROCEDURE

1. Place signs and other warning devices.
2. Haul necessary material to job site.
3. Reshape slope and remove excess material from backslope and ditches.
4. Prepare ground and place fabric or other stabilizing material as required.
5. Apply lime, fertilizer, and seed.
6. Place mulch cover on seeded areas.
7. Remove signs and other warning devices.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Litter Pickup	**CODE**	2190

DESCRIPTION

Pickup and disposal of litter, trash and other debris on roadsides, parking areas and other designated areas for aesthetic value, and to remove unsightly or hazardous objects that may obstruct drainage or damage mowing equipment or personnel.

MAINTENANCE ITEM Grounds Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

Schedule and perform work identified as a result of routine road inspections. Litter barrels are to be emptied on a weekly basis.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1

MATERIAL

Plastic Litter Bags

DAILY PRODUCTION

50 - 100 Bags Litter

REFERENCES - METHODS & SAFETY

WORK ACTIVITY	Litter Pickup	CODE	2190

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as warranted.
2. Drive slowly along the shoulder or traveled way in a dump truck equipped with a flashing light.
3. Proceed in a manner to assure maximum safety and minimum obstruction to traffic.
4. Stop off roadway, as necessary, to collect litter visible from traveled way or to empty litter barrels.
5. Dispose of litter at designated dumping areas.
6. Haul dead animals to designated dumping areas or bury on the right-of-way, if possible.

ENGINEERED PERFORMANCE STANDARD

0.32000 Hours per Bag

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Brush and Tree Cutting	**CODE**	2200

DESCRIPTION

Cutting and removing brush and trees within the right-of-way and other areas to restore sight distances, eliminate traffic hazards and remove encroaching vegetation.

MAINTENANCE ITEM Grounds Acres

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X						

Remove brush, trees, and branches from the right-of-way where growth interferes with clear vision, obstructs traffic signs or signals, or creates other traffic hazards.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	1-2
Laborer	2

EQUIPMENT

Pickup	1
Dump Truck (5CY)	1
Chipper	1
Bucket Truck	0-1
Chain Saw	1
Stump Grinder	1

MATERIAL

Tree Dressing

DAILY PRODUCTION

6 Person Hours

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.3.
2. Follow safety procedures and wear approved safety equipment, e.g., hat, goggles, chaps, shoes, etc.
3. Use caution when cutting overhead branches and when near powerlines.

WORK ACTIVITY	Brush and Tree Cutting	CODE	2200

RECOMMENDED WORK PROCEDURE

1. Place signs and other safety devices.
2. Cut brush, trees and tree branches on right-of-way.
3. Cut stumps flush to the ground.
4. Treat cut branches with tree dressing.
5. Chip brush and small branches and dispose on the right-of-way to a maximum depth of one inch if possible.
6. Haul all brush and trunks not chipped to a disposal area.
7. Grind stumps flush with ground surface.
8. Clear roadway of debris.
9. Remove signs and other safety devices.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Fences	**CODE**	2210

DESCRIPTION

Straightening and repair of broken or damaged fencing around government facilities to provide safety and security.

MAINTENANCE ITEM Fence Linear Feet

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Stake Truck	1
Post Hole Digger	1
Fence Stretcher	1
Fence Tools	

MATERIAL

Fence Posts
Fence Rails
Fencing
Fence Hardware

DAILY PRODUCTION

150 - 200 Linear Feet

REFERENCES - METHODS & SAFETY

WORK ACTIVITY	Repair Fences	CODE	2210

RECOMMENDED WORK PROCEDURE

1. Remove damaged fence sections.
2. Lay out fence line and location.
3. Dig post holes, place posts and tamp, or place in concrete.
4. Install rails or fencing and pull tight.
5. Install appropriate gates and locks.
6. Clean work area.

ENGINEERED PERFORMANCE STANDARD

0.13714 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clean Grit Chambers	**CODE**	2220

DESCRIPTION

Cleaning and removal of dirt, gravel and other debris from grit chambers of motor pool washracks.

MAINTENANCE ITEM	Number Wash Racks

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL — **QUANTITY**

Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1

MATERIAL

DAILY PRODUCTION

24 Person Hours

REFERENCES - METHODS & SAFETY

1. Use only approved disposal sites for debris.

WORK ACTIVITY	Clean Grit Chambers	CODE	2220

RECOMMENDED WORK PROCEDURE

1. Schedule cleaning during periods when wash rack is not in use.
2. Use hand shovels and brooms to remove debris from the grit chamber of washrack.
3. Hose chamber down to ensure drains are functioning properly.
4. Remove, clean and replace all screens over drains.
5. Load debris into truck and dispose of at designated site when truck is full or at end of shift.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Remove Roadway Debris	**CODE**	2230

DESCRIPTION

Removal of roadway debris due to vehicle accidents and storm damage to provide safe use of the roadway.

MAINTENANCE ITEM Roadway Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	1

EQUIPMENT

Dump Truck (5CY)	1
Chain Saw	1

MATERIAL

DAILY PRODUCTION

16 Person Hours

REFERENCES - METHODS & SAFETY

1. Respond immediately to vehicle accidents and other hazardous debris on the pavement surface.

WORK ACTIVITY	Remove Roadway Debris	CODE	2230

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required to protect vehicular traffic and pedestrians.

VEHICLE ACCIDENTS

2. Remove debris remaining after tow trucks have removed damaged vehicles from accident scene.

3. Sweep roadway surface as required to remove glass and other hazards.

4. Spread sand or other absorbent material over fuel or oil spills.

5. Straighten damaged sign posts and notify supervisor if replacements are required.

6. Remove traffic control devices.

OTHER DEBRIS

2. Assess extent of debris to be removed.

3. Radio supervisor if additional equipment or personnel are required for major removals, e.g., large trees, boulders.

4. Remove small trees, branches and other debris that does not require additional equipment or personnel.

5. Load debris into truck for disposal at designated site. Trim overhanging material off trucks before transporting.

6. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clean/Reshape Ditches	**CODE**	3110

DESCRIPTION

Cleaning and reshaping of roadside ditches along paved surfaces. Includes the removal, hauling and disposal of excess material to restore the original grade line and to ensure adequate drainage.

MAINTENANCE ITEM	Unpaved Ditch Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
						X	X	X	X			

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	2
Vehicle Operator	2
Laborer	1

EQUIPMENT	
Dump Truck (5CY)	2
Motor Grader	1
Loader/Backhoe	1

MATERIAL

DAILY PRODUCTION

1.0 - 1.5 Ditch Miles

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-7, par. 7-6.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion Control.

WORK ACTIVITY	Clean/Reshape Ditches	CODE	3110

RECOMMENDED WORK PROCEDURE

1. Place signs and traffic warning devices around work area.
2. Grade, cut, and shape ditch, removing excess material as required. Load excess material directly into dump trucks.
3. Clean out in front of driveway culverts by hand if necessary.
4. Haul excess material to pre-established dump site.
5. Remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

32.00000 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clean Culverts/Inlets	**CODE**	3120

DESCRIPTION

Cleaning and removal of debris and silt as required from box culverts, drain pipe culverts, inlets, and storm sewers to maintain adequate drainage and prevent flooding.

MAINTENANCE ITEM	Number Culverts/Inlets

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X						X	X	X	X	X	X

Clean annually in spring all culverts and storm sewers. Heavy emphasis after periods of heavy rainfall for problem locations.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Loader	1

MATERIAL

DAILY PRODUCTION

8 - 12 Culverts/Inlets

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-8, par. 7-7.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion Control.

WORK ACTIVITY	Clean Culverts/Inlets	CODE	3120

RECOMMENDED WORK PROCEDURE

1. Place safety signs and other warning devices as required.
2. Remove debris and silt from inlet and outlet openings to restore original gradeline.
3. Remove accessible silted material from pipe culvert.
4. Inspect structure for damage.
5. Notify the Supervisor if ditches require reshaping.
6. Clean up work area and remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

3.20000 Hours per Culvert

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair/Replace Culverts	**CODE**	3130

DESCRIPTION

Repair or replacement of pipe culverts, drop inlets, catchbasins and manholes to provide proper drainage. Includes the repair of headwalls and sand bagging of culvert ends to prevent erosion and washouts.

MAINTENANCE ITEM Number Culverts/Inlets

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X					X	X					X

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	1
Vehicle Operator	1
Laborer	2

EQUIPMENT	
Dump Truck (5CY)	1
Stake Truck	1
Backhoe	1
Vibratory Tamper	1

MATERIAL
Culvert Pipe Sections/Ends
Base Material
Concrete, Ready Mix

DAILY PRODUCTION

0.5 - 1.0 Culverts/Inlets

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-8, par. 7-7.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion

WORK ACTIVITY	Repair/Replace Culverts	CODE	3130

RECOMMENDED WORK PROCEDURE

CULVERTS

1. Place traffic control devices.
2. Cut surface, excavate material over existing pipe.
3. Remove and replace damaged sections of culvert as necessary.
4. Seal joints, ensure that pipe bedding is firm.
5. Backfill and tamp in 4 inch lifts.
6. Backfill to level grade.
7. Construct headwall when needed.
8. Clean area and remove traffic control devices.

INLETS, CATCHBASINS

1. Place traffic control devices.
2. Excavate as required. Break out and/or remove damaged structure or portion of structure. Haul debris to dump site.
3. Form and pour concrete to repair; use precast concrete slabs where possible; or rebuild using brick.
4. Backfill properly around work area after repairs have cured.
5. Restore area to original grade and condition. Notify supervisor of required pavement repairs.
6. Clean work area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

42.66667 Hours per Culvert

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Place Riprap	CODE	3140

DESCRIPTION

Placing or replacing riprap on embankments and around bridges and drainage structures to prevent erosion and other failures.

MAINTENANCE ITEM	Unpaved Ditch Miles

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
				X	X	X	X					

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Foreman	1
Equipment Operator	2
Vehicle Operator	2
Laborer	2

EQUIPMENT	
Pickup	1
Dump Truck (5CY)	2
Truck Crane	1
Concrete Mixer	1
Loader/Backhoe	1

MATERIAL

Rock/Riprap
Cement Mix

DAILY PRODUCTION

56 Person Hours

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg. 7-16, par. 7-8.2.1.
2. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-13, par. 8-5.3.1.

WORK ACTIVITY	Place Riprap	CODE	3140

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Inspect area and remove any debris.
3. Dump rock or riprap on top of embankment.
4. Place rock riprap in failed area with crane taking care not to damage surrounding riprap.
5. Place rock or broken concrete by hand to obtain uniform surface.
6. Mix grout/concrete using proper proportions.
7. Wash stone or broken concrete to remove all dirt and to moisten surface.
8. Place grout using brooms, shovels, and rods to force grout into all voids.
9. Cover grouted area with mats, wet, and keep wet for at least 4 days.
10. Check streambed in vicinity of work area and regrade, if required.
11. Clean up jobsite removing all debris and surplus material.
12. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clean/Clear Canals	**CODE**	3150

DESCRIPTION

The machine cleaning and reshaping of canals and non-roadway drainage ditches including the removal, hauling and disposal of excess material and sludge to restore the original grade line and to ensure adequate drainage at all times.

MAINTENANCE ITEM Canal Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X					X	X	X	X	X	X	X

Canals and drainage ditches should be cleaned and reshaped to minimize flooding and control storm water run-off.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	2

EQUIPMENT

Gradall	1
Dump Truck (5CY)	2

MATERIAL

DAILY PRODUCTION

300 - 500 Linear Feet

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg. 7-7, par. 7-6.
2. Check with utility companies for underground utility locations.

WORK ACTIVITY	Clean/Clear Canals	CODE	3150

RECOMMENDED WORK PROCEDURE

1. Place signs and warning devices around work area, especially when trucks are entering and leaving roadway.
2. Set grade stakes as required for proper grade.
3. Grade, cut and shape ditch removing excess material as required.
4. Waste excess material on ditch bank when possible, otherwise haul to designated disposal site.
5. Remove warning devices and signs.

ENGINEERED PERFORMANCE STANDARD

0.06000 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clean Bridge Surface	**CODE**	4110

DESCRIPTION

Cleaning of bridge decks and bearing surfaces to remove sand and other debris, including the cleaning of expansion joints, drain holes and curbs.

MAINTENANCE ITEM	Bridge Deck Square Yards

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X				X	X	X				

Perform bridge deck cleaning in fall and spring to remove accumulated debris and open drain holes.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Laborer	2

EQUIPMENT

Dump Truck (5CY)	1
Air Compressor	1
Arrow Board	1

MATERIAL

DAILY PRODUCTION

60 - 90 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridge Decks, March 1977

WORK ACTIVITY	Clean Bridge Surface	CODE	4110

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices, and use warning arrow board.
2. Use air compressor and brooms to clean bridge deck and expansion joints.
3. Clean drain holes.
4. Load debris into dump truck.
5. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.32000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Timber Deck	CODE	4120

DESCRIPTION

Repair and replacement of timber deck components to restore or preserve structural stability and smooth riding surface.

MAINTENANCE ITEM	Timber Deck Square Yards

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
							X	X	X	X	X	X

Repair damaged planks that risk motorist safety immediately; others should be scheduled.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Maintenance Worker	2
Laborer	2

EQUIPMENT

Pickup	1
Stake Truck	1

MATERIAL

Timber Planks
Nails/Bolts

DAILY PRODUCTION

20 - 40 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-6, par. 8-5.1 and par. 8.5.2.

WORK ACTIVITY	Repair Timber Deck	CODE	4120

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Remove all deteriorated material.
3. Repair or replace planks and timber decking.
4. Clean up work area.
5. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

1.33333 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Bridge Deck	**CODE**	4130

DESCRIPTION

Repair and patching of portland cement concrete and asphalt concrete bridge deck surfaces to maintain or restore structural stability and smooth riding surface.

MAINTENANCE ITEM	Non-Timber Deck Square Yards

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
							X	X	X	X	X	X

Repair serious failures immediately upon notification. Schedule shallow deck spalls and minor defects throughout the year.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Vehicle Operator	2
Maintenance Worker	2
Laborer	1

EQUIPMENT

Pickup	1
Dump Truck (5CY)	1
Stake Truck	1
Air Compressor	1
Concrete Saw	1
Concrete Mixer	1

MATERIAL

Ready Mix Concrete
Epoxy
Curing Compound

DAILY PRODUCTION

20 - 40 Square Yards

REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-13, par 8-5.3.

WORK ACTIVITY	Repair Bridge Deck	CODE	4130

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Remove all deteriorated material.
3. Clean concrete and steel in patch area.
4. Place forms where needed.
5. Cover entire area with bonding agent.
6. Place mix and level with adjacent concrete.
7. Apply curing compound, cover with wet burlap, wet sand, wet bags, or use other approved curing method.
8. Texture of patch should conform to surrounding area.
9. Clean up work area.
10. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

1.60000 Hours per Square Yard

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Traffic Line Striping	**CODE**	5110

DESCRIPTION

Striping the centerline, edge and lane markings on paved surfaces for traffic, parking and pedestrian control.

MAINTENANCE ITEM Traffic Line Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
							X	X	X	X	X	

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Vehicle Operator	2
Laborer	2

EQUIPMENT

Pickup	2
Stake Truck	1
Striping Machine	1
Arrow Board	1

MATERIAL

Yellow Traffic Paint
White Traffic Paint
Reflectorized Beads

DAILY PRODUCTION

50,000 - 75,000 Linear Feet

REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-2, par. 10-2.1 and par. 10-7.3.

WORK ACTIVITY	Traffic Line Striping	CODE	5110

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices.
2. Warning vehicle precedes striping machine to warn oncoming traffic.
3. Striping machine follows lead vehicle and sprays traffic lines.
4. Warning vehicle with arrow board follows to prevent traffic from driving on painted stripe.
5. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

0.00077 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Signs	CODE	5120

DESCRIPTION

Repair, replacement and straightening of traffic signs, sign posts, delineators and other signs damaged by accident, vandalism, or deterioration to restore and maintain adequate control and guidance of traffic.

MAINTENANCE ITEM Number Traffic Signs

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X	X	X	X	X	X	X	X	X	X	X	X

Periodic night inspections should be performed to check reflectivity and positioning of signs.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Maintenance Worker	1

EQUIPMENT

Pickup	1

MATERIAL

Signs
Posts, Sign

DAILY PRODUCTION

15 - 20 signs

REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-2, par. 10-2.2 and par. 10-7.

WORK ACTIVITY	Repair Signs	CODE	5120

RECOMMENDED WORK PROCEDURE

1. Identify installations requiring attention.
2. Replace signs which are difficult to read.
3. Stralghten or replace bent delineators or posts.
4. Check torque on all bolts on breakaway sign supports.

ENGINEERED PERFORMANCE STANDARD

0.91429 Hours per Sign

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Guardrail	**CODE**	5130

DESCRIPTION

Repair of damaged or deteriorated guardrail/guiderail sections and posts to provide safe driving conditions.

MAINTENANCE ITEM Linear Feet Guardrail

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Foreman	1
Equipment Operator	1
Maintenance Worker	1
Laborer	1

EQUIPMENT

Pickup	1
Stake Truck	1

MATERIAL

Guardrail Section
Guardrail Posts
Wooden Spacers

DAILY PRODUCTION

80 - 100 Linear Feet

REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-3, par. 10-3.

WORK ACTIVITY	Repair Guardrail	CODE	5130

RECOMMENDED WORK PROCEDURE

1. Place signs and traffic warning devices.
2. Remove all damaged rail and posts.
3. Re-align loose posts and compact the earth around the posts firmly.
4. Install new rail and tighten all hardware.
5. Clean work area of debris and load damaged sections into truck.
6. Remove signs and warning devices.

ENGINEERED PERFORMANCE STANDARD

0.35556 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Lights	**CODE**	5140

DESCRIPTION

Routine servicing, maintenance and repair of roadway lighting, tunnel or parking area lights to provide adequate lighting to high density vehicular use and parking areas.

MAINTENANCE ITEM Number Lights

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X	X	X	X	X	X	X	X	X	X	X	X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Maintenance Specialist	1
Vehicle Operator	1

EQUIPMENT

Bucket Truck	1

MATERIAL

Lamps
Luminaries
Gaskets
Cleaning Materials

DAILY PRODUCTION

12 - 16 Lights

REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977.

WORK ACTIVITY	Repair Lights	CODE	5140

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Replace burned out lamps.
3. Repair or replace faulty luminaries.
4. Clean lighting fixtures.
5. Inspect and service luminaire components.
6. Remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

1.14286 Hours per Light

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Repair Signals	**CODE**	5150

DESCRIPTION

Routine servicing, maintenance and repair of traffic signals and associated equipment to correct or prevent signal malfunction and to return signal to service.

MAINTENANCE ITEM Number Signals

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
	X	X	X	X	X	X	X	X	X	X	X	X

Schedule bulb replacement on a 12-month cycle.

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Traffic Control Technician	2

EQUIPMENT	
Bucket Truck	1

MATERIAL
Traffic Light Bulbs Traffic Light Lenses Other Electrical

DAILY PRODUCTION

6 - 10 Signals

REFERENCES - METHODS & SAFETY

1. Traffic Signal Manual of Installation and Maintenance Procedures, U.S. Department of Transportation.
2. Traffic Control Devices Handbook, U.S. Department of Transportation.
3. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-2, par. 10-2.3 and par. 10-7.4.

WORK ACTIVITY	Repair Signals	CODE	5150

RECOMMENDED WORK PROCEDURE

1. Place traffic control devices as required.
2. Inspect, clean and relamp signal heads.
3. Clean and replace lens, visors and reflectors as required.
4. Check signal heads to make sure they are properly fastened and aligned.
5. Clean and repair signal controller as required.
6. Determine cause of any signal malfunction and restore to service.
7. Report additional repairs required or replacement needs to supervisor.
8. Clean area and remove traffic control devices.

ENGINEERED PERFORMANCE STANDARD

2.00000 Hours per Signal

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Plow Roadways	CODE	6110

DESCRIPTION

Plowing of snow from roadways and parking areas to provide access and reduce hazardous driving conditions.

MAINTENANCE ITEM	Roadway Miles

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X						

Schedule plowing of snow on designated routes in accordance with snow control plan.

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Equipment Operator	1

EQUIPMENT	
Dump Truck (5CY)	1
Snow Plow	1

MATERIAL

DAILY PRODUCTION

30 - 40 Roadway Miles

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

WORK ACTIVITY	Plow Roadways	CODE	6110

RECOMMENDED WORK PROCEDURE

1. Initiate plowing on assigned routes.
2. Maintain adequate speed for plow to throw snow.
3. Plow main traveled ways first; as storm subsides extend to include shoulders.
4. Stop occasionally to allow traffic to clear.
5. Be careful of obstacles such as manholes or soft shoulders.

AT END OF SHIFT

6. Make sure equipment is in good operating condition. Arrange for needed repairs immediately.
7. Fill fuel tanks to reduce fuel tank condensation.

ENGINEERED PERFORMANCE STANDARD

0.22857 Hours per Mile

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Plow Runways	**CODE**	6120

DESCRIPTION

Plowing of snow from runways, taxiways, heliports and aircraft parking aprons to provide for safe aircraft operations and to reduce hazardous operating conditions.

MAINTENANCE ITEM Runway Lane Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
		X	X	X	X	X						

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	1

EQUIPMENT	
Dump Truck (5CY)	1
Snow Plow	1

MATERIAL

DAILY PRODUCTION

8 Person Hours

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

WORK ACTIVITY	Plow Runways	CODE	6120

RECOMMENDED WORK PROCEDURE

1. Initiate plowing of assigned areas.
2. Maintain adequate speed for plow to throw snow.
3. Coordinate plowing with other runway snow removal efforts.
4. Observe the location of snow markers and avoid damaging runway lights.
5. Maintain communications with snow operations supervisor.

AT END OF SHIFT

6. Make sure equipment is in good operating condition. Arrange for needed repairs immediately.
7. Fill fuel tanks to reduce fuel tank condensation.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Rotary Snow Removal	**CODE**	6130

DESCRIPTION

Removal of heavy snow accumulations from runways and other areas when it is required to remove the snow from the area being plowed or to load the snow into trucks for disposal.

MAINTENANCE ITEM Paved Surface Lane Miles

PLANNING CRITERIA	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
		X	X	X	X	X						

RESOURCE REQUIREMENTS

PERSONNEL	**QUANTITY**
Equipment Operator	1
Maintenance Worker	1

EQUIPMENT	
Rotary Snow Plow	1

MATERIAL

DAILY PRODUCTION

16 Person Hours

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-20, par. 11-4.3.1.1, par. 11-4.3.2.1 and par. 11-4.3.2.2.

WORK ACTIVITY	Rotary Snow Removal	CODE	6130

RECOMMENDED WORK PROCEDURE

1. Initiate rotary snow plow operations at designated locations.
2. Remove accumulated snow and blow into dump trucks or off the runway surface.
3. Remove snow from windrow or stockpiled area and blow into trucks for disposal.
4. Observe the location of snow markers and avoid damaging runway lights and other fixed structures.
5. At the end of shift, make sure equipment is in good operating condition. Arrange for needed repairs immediately.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Load/Haul Snow	CODE	6140

DESCRIPTION

Loading and hauling snow from windrowed snow, rotary plow operations or other areas when the snow must be hauled to a disposal site.

MAINTENANCE ITEM: Paved Surface Lane Miles

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X						

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1
Vehicle Operator	3

EQUIPMENT

Loader	1
Dump Truck (5CY)	3

MATERIAL

DAILY PRODUCTION

32 Person Hours

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

WORK ACTIVITY	Load/Haul Snow	CODE	6140

RECOMMENDED WORK PROCEDURE

1. Initiate loading and hauling snow operations at designated locations.
2. Use loader to load snow from windrow or stockpiled area.
3. Load snow into dump trucks for disposal at approved sites.
4. Snow may also be loaded directly into trucks from rotary snow plow operations.
5. Remove snow completely from area being cleared.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Sweep Snow from Runways	CODE	6150

DESCRIPTION

Sweeping runways to remove snow and slush from the pavement surface throughout the snowfall duration to maintain the center of the runway in a bare pavement condition.

MAINTENANCE ITEM Runway Lane Miles

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X						

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Equipment Operator	1

EQUIPMENT	
Mechanical Sweeper	1

MATERIAL

DAILY PRODUCTION

8 Person Hours

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

WORK ACTIVITY	Sweep Snow from Runways	CODE	6150

RECOMMENDED WORK PROCEDURE

1. Initiate runway sweeping as soon as snowfall begins.
2. Start sweeping on the windward side of the runway and move the snow across the runway with the wind.
3. After sweeping is started, it must be completed for the entire width of the runway to avoid leaving a windrow on the runway or obstructing the runway center line.
4. Two or more sweepers should be assigned to sweep in echelon in order to clear the runway faster and to minimize delays of aircraft operations.
5. During heavy snowfall, one sweeper should be assigned exclusively to cover the center line of the runway at all times.
6. During sweeping operations, a final pass will be made with the sweeper to remove the snow from the runway lights.
7. Continue runway sweeping until the snow stops and the runways are clear of all snow. Two or more shifts may be required.

ENGINEERED PERFORMANCE STANDARD

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Apply Chemicals/Abrasives for Ice Control	CODE	6160

DESCRIPTION

Application of approved chemicals and/or abrasives to runways, taxiways, roadways, parking areas and hazardous locations to remove ice and provide for safe vehicle and aircraft operations.

MAINTENANCE ITEM Paved Surface Lane

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X	X					

Perform this work on designated routes and runways in accordance with snow and ice control plan.

RESOURCE REQUIREMENTS

PERSONNEL	QUANTITY
Vehicle Operator	1

EQUIPMENT	
Dump Truck (5CY)	1
Chemical Spreader	1

MATERIAL

Abrasives
Chemicals
Urea

DAILY PRODUCTION

15 - 20 Tons

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. Sodium or calcium chlorides are NOT permitted on airfields due to their corrosion of aircraft metals.
3. Urea, isopropyl alcohol and ethylene glycol are approved anti-icing and deicing agents for airfields.
4. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
5. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-24, par. 11-5.

WORK ACTIVITY	Apply Chemicals/Abrasives for Ice Control	CODE	6160

RECOMMENDED WORK PROCEDURE

1. All spreaders are to be tested and calibrated before the snow season.
2. Initiate application of abrasives and/or chemicals as directed by snow control supervisor.
3. Drive near the centerline to apply the materials toward the center of the roadway or runway.
4. Treat only ice and dangerous spots during the storm.
5. Apply materials at specified application rate - DO NOT EXCEED.
6. DO NOT apply materials within 10 feet of railroad grade crossings.
7. At End of Shift make sure equipment is in good operating condition. Arrange for repairs immediately if needed.
8. Equipment should be cleaned after use to prevent corrosion.

ENGINEERED PERFORMANCE STANDARD

0.45714 Hours per Ton

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clear Snow and Ice from Runways Lights	**CODE**	6170

DESCRIPTION

Clearing snow and ice from runway edge lights to maintain visibility and provide runway clearance for aircraft movement and safe operations.

MAINTENANCE ITEM Number Runway Lights

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X	X					

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Equipment Operator	1

EQUIPMENT

Mechanical Sweeper	1
or	
Rotary Snow Blower	1

MATERIAL

DAILY PRODUCTION

100 - 150 Lights

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

WORK ACTIVITY	Clear Snow and Ice from Runway Lights	CODE	6170

RECOMMENDED WORK PROCEDURE

1. Initiate runway light clearing in conjunction with runway sweeping.
2. In-pavement runway lights must be cleared with sweeper or rubber snow plow blade.
3. During heavy snowfalls, it may be necessary to use the rotary snow blower to clear a path in front of the lights so that the sweeper air blast can be used to clear the snow from elevated runway lights.
4. Continue runway light clearing until the snowfall stops.

ENGINEERED PERFORMANCE STANDARD

0.06400 Hours per Light

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Clear Walkways	CODE	6180

DESCRIPTION

Removal of snow and ice from sidewalks and other walkways to provide safe passage and use for personnel.

MAINTENANCE ITEM — Linear Feet Sidewalk

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
		X	X	X	X	X	X					

Clear designated walkways in accordance with snow removal policy.

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Maintenance Worker	1
Laborer	1

EQUIPMENT

Small Tractor/Plow	1

MATERIAL

Abrasives
Chemicals

DAILY PRODUCTION

2,000 - 3,000 Linear Feet

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

WORK ACTIVITY	Clear Walkways	CODE	6180

RECOMMENDED WORK PROCEDURE

1. Visually inspect walkways and sidewalks to determine areas warranting work.
2. Sweep and shovel entry ways and handicap ramps as snow accumulates.
3. Use power equipment to remove snow and push to areas for removal.
4. Perform hand sweeping or ice removal as necessary on remaining ice and snow.
5. Treat icy areas with sand/abrasives.

ENGINEERED PERFORMANCE STANDARD

0.00640 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Install/Remove Snow Fence	**CODE**	6190

DESCRIPTION

Installation and removal of snow fences at selected locations to minimize and reduce the effect of snow drifts on roadways and runways.

MAINTENANCE ITEM Number Locations

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X	X						X				

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	1
Maintenance Worker	1
Laborer	1

EQUIPMENT

Stake Truck	1
Dump Truck (5CY)	1
Air Compressor	1

MATERIAL

Snow Fence
Metal Posts
Wire

DAILY PRODUCTION

750 - 1,000 Linear Feet

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.
4. Install snow fence at preselected locations.

WORK ACTIVITY	Install/Remove Snow Fence	CODE	6190

RECOMMENDED WORK PROCEDURE

INSTALL

1. Dig holes for terminal post.
2. Set post and tamp.
3. Brace post.
4. Attach 5 wires between post and tie.
5. Attach fence.

REMOVE

1. Remove wire and post.
2. Remove fence and roll tightly.
3. Load fence and posts into truck.

ENGINEERED PERFORMANCE STANDARD

0.02743 Hours per Linear Foot

PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

APPROVED	
EFFECTIVE	
SUPERSEDES	

WORK ACTIVITY	Install/Remove Snow Markers	CODE	6200

DESCRIPTION

Installation and removal of snow markers to identify the locations of airfield lighting systems and all potential snow plowing obstacles.

MAINTENANCE ITEM Number Locations

PLANNING CRITERIA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	X							X	X			X

RESOURCE REQUIREMENTS

PERSONNEL

	QUANTITY
Vehicle Operator	2
Laborer	2

EQUIPMENT

Stake Truck	1
Dump Truck (5CY)	1
Air Compressor	1

MATERIAL

Snow Markers

DAILY PRODUCTION

100 - 300 Markers

REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-6, par. 11-3.2.4.
4. Install markers at preselected locations.

WORK ACTIVITY	Install/remove Snow Markers	CODE	6200

RECOMMENDED WORK PROCEDURE

Place traffic control devices as required.

INSTALL

1. Locate previous placement.
2. Drill hole 15" to 18".
3. Place post.
4. Tamp and guy as necessary.
5. Attach to sign post when appropriate.

REMOVE

1. Remove guy or attachment to sign post.
2. Remove post and place in truck.

ENGINEERED PERFORMANCE STANDARD

0.16000 Hours per Marker

APPENDIX C: PERSONNEL, EQUIPMENT AND MATERIAL RESOURCE LIST

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

PERSONNEL RESOURCE LIST

CODE	CLASSIFICATION	MEASUREMENT UNIT
1110	Foreman	Hour
1120	Equipment Operator	Hour
1130	Vehicle Operator	Hour
1140	Traffic Control Technician	Hour
1150	Maintenance Worker	Hour
1160	Laborer	Hour

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

EQUIPMENT RESOURCE LIST

CODE	CLASSIFICATION	MEASUREMENT UNIT
3010	Pickup	Hour
3020	Pickup, Crewcab	Hour
3030	Stake Truck	Hour
3040	Dump Truck (5 CY)	Hour
3050	Dump Truck (10 CY)	Hour
3060	Bucket Truck	Hour
3070	Truck Crane	Hour
3080	Asphalt Distributor	Hour
3090	Spray Truck	Hour
3100	Water Truck	Hour
3200	Backhoe	Hour
3210	Front-end Loader	Hour
3220	Motor Grader	Hour
3230	Gradall	Hour
3240	Mechanical Sweeper	Hour
3250	Tractor	Hour
3260	Tractor Mower	Hour
3270	Roller, Steel Wheel	Hour
3280	Roller, Rubber Tire	Hour
3290	Power Rotary Broom	Hour
3300	Paver, Asphalt	Hour
3310	Grinding Machine	Hour
3320	Grooving Machine	Hour
4010	Air Compressor	Hour
4020	Air Hammer	Hour
4030	Arrow Board	Hour
4040	Asphalt Kettle	Hour
4050	Chain Saw	Hour
4060	Chemical Spreader	Hour
4070	Chipper	Hour
4080	Chip Spreader	Hour
4090	Concrete Drill	Hour
4100	Concrete Mixer	Hour
4110	Concrete Saw	Hour
4120	Crack Filler	Hour
4130	Cultivator	Hour
4140	Drill	Hour
4150	Equipment Trailer	Hour
4160	Grinder	Hour

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

EQUIPMENT RESOURCE LIST

CODE	CLASSIFICATION	MEASUREMENT UNIT
4170	Grout Mixer	Hour
4180	Grout Pumper	Hour
4190	Heater Blower	Hour
4200	Hydroseeder	Hour
4210	Mixing Drum	Hour
4220	Mulcher	Hour
4230	Post Hole Digger	Hour
4240	Pulvimixer	Hour
4250	Riding Mower	Hour
4260	Road Magnet	Hour
4270	Rotary Snow Plow	Hour
4280	Router	Hour
4290	Sand Blaster	Hour
4300	Seeder	Hour
4310	Snow Plow	Hour
4320	Spreader Box	Hour
4330	Striping Machine	Hour
4340	Vibratory Tamper	Hour
4350	Water Tank	Hour
4360	Weed Trimmer	Hour

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

MATERIAL RESOURCE LIST

CODE	CLASSIFICATION	MEASUREMENT UNIT
5010	Abrasives, Snow Removal	cubic yard
5020	Aggregate, Other	cubic yard
5030	Aggregate, Seal	cubic yard
5040	Asphalt, Liquid	gallon
5050	Asphalt, Porous Friction	ton
5060	Asphalt, Concrete Mix	ton
5070	Asphalt, Tack Material	gallon
5080	Base Material	cubic yard
5090	Cement	bag
5100	Chemicals, Snow Removal	ton
5110	Chemicals, Weed Control	gallon
5120	CMP End	each
5130	CMP Section	feet
5140	Concrete, Ready Mix	cubic yard
5150	Crack Sealant	gallon
5160	Curing Compound	gallon
5170	Dust Palliative	pound
5180	Epoxy Mix	gallon
5190	Fence Hardware	dollar
5200	Fence Post	each
5210	Fence Rail	each
5220	Fencing	square feet
5230	Fertilizer	pound
5240	Gasket	each
5250	Grass Seed	pound
5260	Grout Mixture	bag
5270	Guardrail End	each
5280	Guardrail Post	each
5290	Guardrail Section	each
5300	Guardrail Wooden Spacer	each
5310	Joint Filler	gallon
5320	Lamps, Roadway	each
5330	Lime	pound
5340	Luminaries	each
5350	Other Electrical	dollar
5360	Plastic Litter Bag	each
5370	Plugs Hardwood	each
5380	Post, Metal	each
5390	Post, Sign Wood	each
5400	RCP End	each

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

MATERIAL RESOURCE LIST

CODE	CLASSIFICATION	MEASUREMENT UNIT
5410	RCP Section	feet
5420	Reflectorized Beads	pound
5430	Rock, Riprap	cubic yard
5440	Sand	cubic yard
5450	Sealer, Fuel Resistant	gallon
5460	Sign, Traffic	each
5470	Snow Fence	feet
5480	Snow Marker	each
5490	Sod	square yard
5500	Straw	bale
5510	Timber Plank	linear feet
5520	Traffic Light Bulb	each
5530	Traffic Light Lens	each
5540	Traffic Paint, White	gallon
5550	Traffic Paint, Yellow	gallon
5560	Urea	pound

APPENDIX D: DEMONSTRATION MAINTENANCE MANAGEMENT PLANNING REPORTS

Sierra Army Depot

Roads and Grounds Branch

CODE	FEATURE	MEASRMNT UNITS	MGMT UNIT	TOTAL INVENTORY	CONDITIONS 1	2	3
1110	BITUMINOUS ROAD	MILES	ROAD	260.00	.00	.00	.00
1300	CONCRETE PAVEME	K SQ YDS	ROAD	200.00	.00	.00	.00
1310	RUNWAY/TAXIWAY	K SQ YDS	ROAD	150.00	.00	.00	.00
1500	UNPAVED ROAD	MILES	ROAD	300.00	.00	.00	.00
1600	TOTAL ROADWAY	MILE	ROAD	760.00	.00	.00	.00
1700	UNPAVED SHLDRS	MILES	ROAD	1,000.00	.00	.00	.00
1820	RR SWITCH	EA	ROAD	10.00	.00	.00	.00
1830	RR TRACK	MILES	ROAD	35.00	.00	.00	.00
2000	MNTND GROUNDS	ACRES	ROAD	400.00	.00	.00	.00
2100	MOWABLE ROADSID	ACRES	ROAD	400.00	.00	.00	.00
2140	MOWABLE LAWN	ACRE	ROAD	150.00	.00	.00	.00
2220	FENCE	LIN FT	ROAD	10,000.00	.00	.00	.00
5120	SIGNS	EA	ROAD	300.00	.00	.00	.00
7110	GARBAGE TRUCK	EA	ROAD	2.00	.00	.00	.00
7120	LANDFILL	ACRE	ROAD	40.00	.00	.00	.00
7130	LEACHATE WELLS	EA	ROAD	6.00	.00	.00	.00
9100	YEAR	EA	ROAD	1.00	.00	.00	.00

CODE	TYPE	NAME
A0001	I	A STREET
A001P	P	A STREET PARKING
A0021	I	B AVE.
A0031	I	C AVE.
A004P	P	C AVE PARKING
A0051	I	CALIFORNIA AVE.
A0061	I	CASCADE AVE
A0071	I	CIRCLE AVE
A0081	I	D AVE
A0091	I	D STREET
A0101	I	DAVID S. HALL AVE
A011P	P	DAVID S. HALL PARKING
A0121	I	DESERT AVE
A0131	I	E AVE
A014P	P	E AVE PARKING
A015P	P	EM BARRACKS PARKING
A016P	P	FIREHOUSE PARKING
A0171	I	H STREET
A018P	P	HEADQUARTERS PARKING
A0191	I	HEALTH CLINIC ACCESS
A020P	P	HEALTH CLINIC PARKING
A021	I	LASSEN AVE
A022	I	LINE AVE
A023	I	NEVADA AVE
A024	I	PLUMAS AVE
A025	I	SERVICE AVE
A026	I	SIERRA AVE
A027	I	SKEDADDLE AVE
A028	I	TAHOE AVE
A029	I	TUFA AVE
A030	P	T-7 PARKING
A031	I	T-26 ACCESS
A032	P	T-26 PARKING
A033	P	T-84 PARKING
A034	P	T-201 PARKING
A035	P	T-2069 PARKING
A036	P	YUBA AVE PARKING
A037	I	FIRST AVE
A038	I	SECOND AVE
A039	P	SECOND AVE PARKING
A040	I	FOURTH STREET
A045	I	B STREET
A046	A	BLDG P-130 APRON
A047	P	BLDG P-142 PARKING
A048	A	BLDG P-202 APRON
A049	P	BLDG P-203 PARKING
A050	P	BLDG P-205 PARKING
A051	P	BLDG P-206 PARKING
A052	P	BLDG P-207 PARKING
A053	P	BLDG P-208 PARKING
A054	P	BLDG P-209 PARKING
A055	P	BLDG P-210 PARKING
A056	I	BLDG P-211 ACCESS

CODE	TYPE	NAME
A057	P	BLDG P-211 PARKING
A058	P	BLDG T-55 PARKING
A059	A	BLDG T-81 APRON
A060	A	BLDG T-82 APRON
A061	I	BLDG T-141 ACCESS
A062	P	BLDG T-227 PARKING
A063	P	BLDG T-301 PARKING
A064	P	BLDG T-302 PARKING
A065	P	BLDG T-303 PARKING
A066	P	BLDG T-304 PARKING
A067	P	BLDG T-305 PARKING
A068	P	BLDG T-306 PARKING
A069	P	BLDG T-307 PARKING
A070	P	BLDG T-308 PARKING
A071	P	BLDG T-309 PARKING
A072	P	BLDG T-310 PARKING
A073	P	BLDG T-311 PARKING
A074	P	BLDG T-351 PARKING
A075	P	BLDG T-352 PARKING
A076	P	BLDG T-353 PARKING
A077	P	BLDG T-354 PARKING
A078	P	BLDG T-355 PARKING
A079	P	BLDG T-356 PARKING
A080	P	BLDG T-357 PARKING
A081	P	BLDG T-358 PARKING
A082	P	BLDG T-359 PARKING
A083	P	BLDG T-360 PARKING
A084	P	BLDG T-361 PARKING
A085	P	BLDG T-362 PARKING
A086	P	BLDG T-363 PARKING
A087	P	BLDG T-354 PARKING
A088	P	BLDG T-365 PARKING
A089	P	BLDG T-366 PARKING
A090	P	BLDG T-1218 PARKING
A091	I	C STREET
A092	P	CHAPEL PARKING
A093	I	DONNER AVE
A094	I	E STREET
A095	P	EQUESTRIAN STABLE PARKING
A096	I	EQUESTRIAN STABLE ROAD
A097	I	F STREET
A098	I	FLAGLER AVE
A099	I	G STREET
A100	I	MINERAL DUMP ROAD
A101	M	MOTOR POOL
A102	I	ORE STORAGE ROAD
A103	P	ORDINANCE TANKS PARKING
A104	I	RESERVOIR ACCESS ROAD
A105	I	STORAGE ACCESS ROAD
A106	A	WEIGH SCALE APRON
A107	I	WEST SEWAGE DISPOSAL ROAD
A108	A	X LINE LOADING APRON
A109	I	3RD AVE
A110	I	2ND AVE

CODE	TYPE	NAME
A111	I	3RD STREET
A112	I	4TH STREET
A113	I	5TH STREET
A114	I	6TH STREET
A115	I	7TH STREET
A116	I	8TH STREET
A117	I	9TH STREET
AZONE	Z	ZONE A
BZONE	Z	ZONE B
CZONE	Z	ZONE C
DEPOT	Z	ANY OTHER UNASSIGNED LOC
DZONE	Z	ZONE D
EZONE	Z	ZONE E
FZONE	Z	ZONE F
GZONE	Z	ZONE G
HZONE	Z	ZONE H
IZONE	Z	ZONE I
JZONE	Z	ZONE J
KZONE	Z	ZONE K
LZONE	Z	ZONE L
MZONE	M	ZONE M
NZONE	Z	ZONE N
0000	A	AIRFIELD PARKING APRON
0001	X	EAST AIRFIELD OVERRUN
0002	R	AIRFIELD RUNWAY
0003	T	AIRFIELD TAXIWAY
0004	X	WEST AIRFIELD OVERRUN
OZONE	Z	ZONE O-AMEDEE AIRFIELD

CODE	NAME	TYPE	COST	INVENTORY	AVAIL/UNITS
1110	MNT GEN FRMN-EW	L	15.02	1.00	100.0
1120	ENG EQUIP OP	L	14.86	3.00	100.0
1130	MOT VEH OP	L	10.60	3.00	100.0
1160	LABORER	L	8.67	3.00	100.0
1170	RR MNT OP	L	9.72	2.00	100.0
3010	PICKUP-2WD	E	1.50	2.00	100.0
3011	PICKUP-4WD	E	1.50	1.00	100.0
3040	DUMP TRUCKS-5YD	E	3.55	4.00	100.0
3051	BELLY DUMP-18YD	E	6.05	1.00	100.0
3061	GARBAGE TRUCK	E	12.00	1.00	100.0
3090	WATER DISTRIBUT	E	6.65	2.00	100.0
3200	BACKHOE	E	10.45	1.00	100.0
3210	FRONT LOADER	E	8.88	1.00	100.0
3211	FRONT LOADER	E	18.95	1.00	100.0
3220	ROAD GRADER	E	12.05	2.00	100.0
3250	TRACTOR	E	2.00	1.00	100.0
3260	TRACTOR MOWER	E	2.00	2.00	100.0
3270	ROLLER	E	12.05	1.00	100.0
3280	STREET SWEEPER	E	4.15	1.00	100.0
3281	TOWED SWEEPER	E	2.30	1.00	100.0
3282	RUNWAY SWEEPER	E	6.05	1.00	100.0
3283	SWEEPER W/MAGNT	E	6.05	1.00	100.0
3410	SCRAPER	E	39.60	1.00	100.0
3420	BULLDOZER	E	26.05	1.00	100.0
4180	RIDING MOWERS	E	4.15	2.00	100.0
4240	STRPNG MCHN-SP	E	1.70	1.00	100.0
4250	VIBRATORY TAMP	E	1.40	1.00	100.0
5010	ABRASV-SNW RMVL	M	30.00	.00	CU YD
5020	AGGREGATE-OTHER	M	10.00	.00	CU YD
5030	AGGREGATE-SEAL	M	15.00	.00	CU YD
5040	ASPHALT, LIQUID	M	5.00	.00	GALLON
5060	ASPHALT-PREMIX	M	45.00	.00	TON
5070	ASPHALT-TACK	M	5.00	.00	GALLON
5080	BASE MATERIAL	M	15.00	.00	CU YD
5090	CEMENT	M	9.00	.00	BAG
5110	CHEMICAL-WEED	M	7.00	.00	GALLON
5140	CONCRETE-REDIMX	M	70.00	.00	CU YD
5150	CRACK SEALANT	M	15.00	.00	GALLON
5160	CURING CMPD	M	20.00	.00	GALLON
5170	DUST PALLIATVS	M	5.00	.00	POUND
5180	EPOXY MIX	M	45.00	.00	GALLON
5190	FENCE HARDWARE	M	1.00	.00	DOLLAR
5220	FENCING	M	1.25	.00	SQ FT
5230	FERTILIZER	M	1.00	.00	POUNDS
5250	GRASS SEED	M	2.00	.00	POUND
5310	JOINT FILLER	M	12.00	.00	GALLON
5320	LAMPS, ROADWAY	M	50.00	.00	EACH
5330	LIME	M	.50	.00	POUND
5340	LUMINAIRIES	M	25.00	.00	EACH
5350	OTHER ELECTRICA	M	1.00	.00	DOLLAR
5360	PLAS LITTER BGS	M	3.00	.00	BOX(100)
5370	SIGN POST-MTL	M	20.00	.00	EACH
5380	SIGN POST-WOOD	M	15.00	.00	EACH

CODE	NAME	TYPE	COST	INVENTORY	AVAIL/UNITS
5430	SAND	M	7.00	.00	CU YD
5440	SIGNS-TRAFFIC	M	40.00	.00	EACH
5520	PAINT TRFC-YLLW	M	20.00	.00	GALLON
5530	PAINT TRFC-WHT	M	20.00	.00	GALLON
5600	MISC ROAD MTL	M	1.00	.00	DOLLAR
5610	MISC GRND MTL	M	1.00	.00	DOLLAR
5620	MISC TRAFFIC MT	M	1.00	.00	DOLLAR
5630	MISC RR MTL	M	1.00	.00	DOLLAR
6000	AUTOMOTIVE MTL	M	1.00	.00	DOLLAR
9000	CONTRACT	M	1.00	.00	DOLLAR
9999	LABOR 1	L	10.00	2.00	

DeLEUW, CATHER & Co. WORK PROGRAM AND BUDGET REPORT ¶Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

CODE	ACTIVITY NAME	FEATURE INVENTORY QUANTITY	UNIT	PLANNED SERVICE LEVEL	PCT OF DES	ANNUAL WORK QUANTITY	AVG DAILY PROD	CR SZ	PERSON DAYS	COST DISTRIBUTION LABOR	EQUIP	MAT/OTH	TOTAL COST
1195	GEN BIT PVMNT MAINT	260.0	MILES	1.92 PER HR	38	499	30.0	3	49	5666	1071	2490	9227
1395	GEN CONC PVT RPR	200.0	K SQ YDS	1.24 PER HRS	82	248	20.0	2	24	2389	186	7750	10325
1510	BLADE UNPVD SURFCS	300.0	MILES	2.50 ROAD MI	100	750	9.0	2	124	16793	12928	0	29721
1520	STAB UNPVD SRFC	300.0	MILES	.15 ROAD MI	60	45	4.0	4	45	5754	3876	3390	13020
1540	DUST CONTROL	300.0	MILES	.30 ROAD MI	60	90	6.0	1	15	1590	998	1875	4463
1730	BLADE UNPVD SHLDRS	1000.0	MILES	2.00 SHLDR MI	66	2000	20.0	1	100	14860	12050	0	26910
1820	MAINT RR SWITCH	10.0	EA	10.00 SWITCH	83	100	3.0	2	66	6474	500	999	7973
1830	REPAIR RR TRACK	35.0	MILES	.71 MILE	71	25	.5	2	99	9662	746	994	11402
2110	ROADWAY SWEEPING	260.0	MILES	2.00 ROAD MI	50	520	12.0	2	64	8729	3642	0	12371
2120	RUNWAY SWEEPING	150.0	K SQ YDS	15.00 K SQ YD	75	2250	150.0	1	15	1590	908	0	2498
2140	MACHINE MOWING	400.0	ACRES	4.00 ACRES	80	1600	15.0	1	106	11310	2134	0	13444
2150	HAND MOWING TRIMMING	400.0	ACRES	1.25 PER HRS	62	500	20.0	2	50	4335	2075	0	6410
2151	LAWN MOWING	150.0	ACRE	9.60 ACRES	80	1440	10.0	2	288	24970	11952	0	36922
2160	SPRAYING/WEED CONTRL	400.0	ACRES	.75 PER HRS	75	300	10.0	1	30	3180	600	4200	7980
2210	REPAIR FENCES	10000.0	LIN FT	.30 LIN FT	75	3000	300.0	3	30	2794	355	2250	5399
2230	REMOVE RDWY DEBRIS	760.0	MILE	1.92 PER HRS	96	1459	30.0	3	145	16587	6041	0	22628
2290	GEN GROUNDS MAINT	400.0	ACRES	.75 PER HRS	75	300	20.0	2	30	2891	225	300	3416
3190	GEN DRAINAGE MAINT	1.0	EA	200.00 PER HR	100	200	20.0	2	20	1927	355	300	2582
5120	REPAIR SIGNS	300.0	EA	.25 signs	83	75	5.0	2	30	2891	225	1200	4316
5190	GEN TRAFFIC SRVC MNT	1.0	EA	125.00 PER HRS	83	125	20.0	2	12	1214	95	315	1624
6290	GEN SNOW/ICE CONTROL	1.0	EA	150.00 PER HRS	100	150	30.0	3	15	1707	780	350	2837
7110	HAUL TRASH/GARBAGE	2.0	EA	150.00 TRUCK LD	75	300	3.0	1	100	14860	12000	0	26860
7120	MAINTAIN LANDFILL	40.0	ACRE	6.00 PER HRS	100	240	10.0	1	24	3566	7877	0	11443
9100	SUPERVISION	1.0	EA	1500.00 PER HR	100	1500	10.0	1	150	22530	2250	0	24780
9200	ADMIN/LV/TRNG	1.0	EA	4000.00 PER HR	100	4000	120.0	12	399	45571	0	0	45571
									TOTALS:	2037	233840	83869	26413	344122
									OVERHEAD	.0% OF LABOR			0
									OVERHEAD	.0% OF TOTAL			0
										TOTAL BUDGET			344122

DeLEUW, CATHER & Co. DEFERRED BUDGET ¶Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

ACTIVITY		FEATURE INVENTORY		DESIRED PROGRAM		PLANNED PROGRAM			DEFERRED BUDGET		
CODE	NAME	QUANTITY	UNIT	ANNUAL WORK QTY	COST	ANNUAL WORK QTY	COST	PCT	ANNUAL WORK QTY	COST	PCT
1195	GEN BIT PVMNT MAINT	260.0	MILES	1300.00 PER HR	24066	499.20 PER HR	9227	38	800.80 PER HR	14839	62
1395	GEN CONC PVT RPR	200.0	K SQ YDS	300.00 PER HRS	12491	248.00 PER HRS	10325	82	52.00 PER HRS	2166	18
1510	BLADE UNPVD SURFCS	300.0	MILES	750.00 ROAD MI	29721	750.00 ROAD MI	29721	100	0.00 ROAD MI	0	0
1520	STAB UNPVD SRFC	300.0	MILES	75.00 ROAD MI	21661	45.00 ROAD MI	13020	60	30.00 ROAD MI	8641	40
1540	DUST CONTROL	300.0	MILES	150.00 ROAD MI	7438	90.00 ROAD MI	4463	60	60.00 ROAD MI	2975	40
1730	BLADE UNPVD SHLDRS	1000.0	MILES	3000.00 SHLDR MI	40365	2000.00 SHLDR MI	26910	66	1000.00 SHLDR MI	13455	34
1820	MAINT RR SWITCH	10.0	EA	120.00 SWITCH	9576	100.00 SWITCH	7973	83	20.00 SWITCH	1603	17
1830	REPAIR RR TRACK	35.0	MILES	35.00 MILE	16058	24.85 MILE	11402	71	10.15 MILE	4656	29
2110	ROADWAY SWEEPING	260.0	MILES	1040.00 ROAD MI	24770	520.00 ROAD MI	12371	50	520.00 ROAD MI	12399	50
2120	RUNWAY SWEEPING	150.0	K SQ YDS	3000.00 K SQ YD	3330	2250.00 K SQ YD	2498	75	750.00 K SQ YD	832	25
2140	MACHINE MOWING	400.0	ACRES	2000.00 ACRES	16796	1600.00 ACRES	13444	80	400.00 ACRES	3352	20
2150	HAND MOWING TRIMMIN	400.0	ACRES	800.00 PER HRS	10256	500.00 PER HRS	6410	62	300.00 PER HRS	3846	38
2151	LAWN MOWING	150.0	ACRE	1800.00 ACRES	46152	1440.00 ACRES	36922	80	360.00 ACRES	9230	20
2160	SPRAYING/WEED CONTR	400.0	ACRES	400.00 PER HRS	10640	300.00 PER HRS	7980	75	100.00 PER HRS	2660	25
2210	REPAIR FENCES	10000.0	LIN FT	4000.00 LIN FT	7181	3000.00 LIN FT	5399	75	1000.00 LIN FT	1782	25
2230	REMOVE RDWY DEBRIS	760.0	MILE	1520.00 PER HRS	23606	1459.20 PER HRS	22628	96	60.80 PER HRS	978	4
2290	GEN GROUNDS MAINT	400.0	ACRES	400.00 PER HRS	4554	300.00 PER HRS	3416	75	100.00 PER HRS	1138	25
3190	GEN DRAINAGE MAINT	1.0	EA	200.00 PER HR	2582	200.00 PER HR	2582	100	0.00 PER HR	0	0
5120	REPAIR SIGNS	300.0	EA	90.00 signs	5179	75.00 signs	4316	83	15.00 signs	863	17
5190	GEN TRAFFIC SRVC MN	1.0	EA	150.00 PER HRS	1933	125.00 PER HRS	1624	83	25.00 PER HRS	309	17
6290	GEN SNOW/ICE CONTRO	1.0	EA	150.00 PER HRS	2837	150.00 PER HRS	2837	100	0.00 PER HRS	0	0
7110	HAUL TRASH/GARBAGE	2.0	EA	400.00 TRUCK LD	35804	300.00 TRUCK LD	26860	75	100.00 TRUCK LD	8944	25
7120	MAINTAIN LANDFILL	40.0	ACRE	240.00 PER HRS	11443	240.00 PER HRS	11443	100	0.00 PER HRS	0	0
9100	SUPERVISION	1.0	EA	1500.00 PER HR	24780	1500.00 PER HR	24780	100	0.00 PER HR	0	0
9200	ADMIN/LV/TRNG	1.0	EA	4000.00 PER HR	45571	4000.00 PER HR	45571	100	0.00 PER HR	0	0
	TOTALS:				438790		344122	78		94668	21

DeLEUW, CATHER & Co. LABOR REQUIREMENTS REPORT (SUMMARY) ¶Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

RESOURCE CODE	NAME	PERSON DAYS BY MONTH OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL NEED	TOTAL COST
1110	MNT GEN FRMN-EW	INVENTORY:		1.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:	15.3	15.3	15.3	15.5	15.5	15.4	15.4	15.2	15.1	15.1	15.1	15.1	183.3	27531
	AVG NO STAFF REQUIRED:	1.0	1.0	.9	.9	1.0	.9	1.0	.8	.9	1.0	.8	.9	.9	27531
1120	ENG EQUIP OP	INVENTORY:		3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:	45.4	45.5	45.4	46.3	46.1	45.6	47.2	45.5	45.1	44.0	43.6	43.6	543.3	80734
	AVG NO STAFF REQUIRED:	2.8	2.8	2.7	2.6	3.1	2.5	3.0	2.5	2.7	2.9	2.3	2.7	2.7	80734
1130	MOT VEH OP	INVENTORY:		3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:	42.4	30.5	30.3	30.7	30.2	43.3	47.3	48.6	48.3	46.8	46.4	46.4	491.3	52088
	AVG NO STAFF REQUIRED:	2.7	1.9	1.8	1.7	2.0	2.4	3.0	2.7	2.8	3.1	2.4	2.9	2.4	52088
1160	LABORER	INVENTORY:		3.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:	57.5	25.6	26.0	26.0	25.6	57.2	66.1	64.6	60.3	59.3	59.3	59.3	586.8	50875
	AVG NO STAFF REQUIRED:	3.6	1.6	1.5	1.4	1.7	3.2	4.1	3.6	3.5	4.0	3.1	3.7	2.9	50875
1170	RR MNT OP	INVENTORY:		2.00	AVAILABILITY		100								
	PERSON DAYS REQUIRED:	20.0	20.0	19.6	20.2	19.4	19.4	19.4	19.4	19.2	19.0	18.6	18.4	232.6	22608
	AVG NO STAFF REQUIRED:	1.3	1.3	1.2	1.1	1.3	1.1	1.2	1.1	1.1	1.3	1.0	1.2	1.1	22608

DeLEUW, CATHER & Co. EQUIPMENT REQUIREMENTS REPORT (SUMMARY) ¶Page: 1
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH
Date: 09/19/88

CODE	RESOURCE NAME		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL NEED	TOTAL COST
		EQUIPMENT HOURS BY MONTH														
3010	PICKUP-2WD	INVENTORY:		2.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		258.0	259.0	254.0	258.0	256.3	253.0	264.0	261.0	261.0	249.0	247.0	246.0	3066.3	4599
	AVG UNITS REQUIRED:		1.6	1.6	1.5	1.4	1.7	1.4	1.7	1.5	1.5	1.7	1.3	1.5	1.5	4599
3040	DUMP TRUCKS-5YD	INVENTORY:		4.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		88.0	89.0	95.0	93.0	91.0	89.0	89.0	77.0	77.0	77.0	75.0	75.0	1015.0	3603
	AVG UNITS REQUIRED:		.6	.6	.6	.5	.6	.5	.6	.4	.5	.5	.4	.5	.5	3603
3061	GARBAGE TRUCK	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		83.0	83.0	83.0	85.0	85.0	85.0	84.0	83.0	83.0	82.0	82.0	82.0	1000.0	12000
	AVG UNITS REQUIRED:		.5	.5	.5	.5	.6	.5	.5	.5	.5	.5	.4	.5	.4	12000
3090	WATER DISTRIBUT	INVENTORY:		2.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		78.5	78.5	71.5	74.0	74.5	72.0	81.0	77.0	77.0	72.0	70.0	70.0	896.0	5958
	AVG UNITS REQUIRED:		.5	.5	.4	.4	.5	.4	.5	.4	.5	.5	.4	.4	.4	5958
3210	FRONT LOADER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		42.0	42.0	42.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	486.0	4315
	AVG UNITS REQUIRED:		.3	.3	.2	.2	.3	.2	.3	.2	.2	.3	.2	.3	.2	4315
3220	ROAD GRADER	INVENTORY:		2.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		164.0	164.0	164.0	167.0	169.0	165.0	182.0	171.0	171.0	161.0	159.0	159.0	1996.0	24051
	AVG UNITS REQUIRED:		1.0	1.0	1.0	.9	1.1	.9	1.1	1.0	1.0	1.1	.8	1.0	.9	24051
3260	TRACTOR MOWER	INVENTORY:		2.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		120.0	.0	.0	.0	.0	137.0	160.0	190.0	190.0	190.0	190.0	190.0	1367.0	2734
	AVG UNITS REQUIRED:		.8	.0	.0	.0	.0	.8	1.0	1.1	1.1	1.3	1.0	1.2	.6	2734
3270	ROLLER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		11.0	11.0	11.0	11.0	10.0	9.0	9.0	9.0	9.0	9.0	7.0	7.0	113.0	1361
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	1361
30	STREET SWEEPER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		18.5	18.5	18.5	19.0	19.0	19.0	19.0	17.0	17.0	17.0	17.0	17.0	216.5	898
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	898
3282	RUNWAY SWEEPER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	150.0	907
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	907
3283	SWEEPER W/MAGNT	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		18.5	18.5	18.5	19.0	19.0	19.0	19.0	17.0	17.0	17.0	17.0	17.0	216.5	1309
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	1309
3410	SCRAPER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		10.0	10.0	10.0	10.5	10.5	10.5	10.5	10.0	9.5	9.5	9.5	9.5	120.0	4752
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	4752
3420	BULLDOZER	INVENTORY:		1.00	AVAILABILITY	100										
	EQUIP HOURS REQUIRED:		10.0	10.0	10.0	10.5	10.5	10.5	10.5	10.0	9.5	9.5	9.5	9.5	120.0	3126
	AVG UNITS REQUIRED:		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	3126

CODE	RESOURCE NAME	EQUIPMENT HOURS BY MONTH OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL NEED	TOTAL COST
4180	RIDING MOWERS	INVENTORY:		2.00	AVAILABILITY	100									
	EQUIP HOURS REQUIRED:	360.0	40.0	42.0	42.0	42.0	362.0	442.0	442.0	402.0	402.0	402.0	402.0	3380.0	14027
	AVG UNITS REQUIRED:	2.3	.3	.2	.2	.3	2.0	2.8	2.5	2.4	2.7	2.1	2.5	1.6	14027
4250	VIBRATORY TAMP	INVENTORY:		1.00	AVAILABILITY	100									
	EQUIP HOURS REQUIRED:	13.0	14.0	13.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	166.0	232
	AVG UNITS REQUIRED:	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	232

DeLEUW, CATHER & Co. MATERIAL/OTHER REQUIREMENTS REPORT (SUMMARY) ¶Page: 1
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH
Date: 09/19/88

CODE	RESOURCE NAME	MATERIAL/OTHER REQUIREMENTS BY MONTH OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL NEED	TOTAL COST
5080	BASE MATERIAL CU YD	22.0	22.0	22.0	22.0	20.0	18.0	18.0	18.0	18.0	18.0	14.0	14.0	226.0	3390
5110	CHEMICAL-WEED GALLON	60.0	.0	.0	.0	.0	60.0	80.0	80.0	80.0	80.0	80.0	80.0	600.0	4200
5140	CONCRETE-REDIMX CU YD	7.2	7.2	7.2	7.2	7.2	6.0	5.4	5.4	5.4	5.4	5.4	5.4	74.4	5208
5170	DUST PALLIATVS POUND	35.0	35.0	30.0	35.0	35.0	35.0	32.5	27.5	27.5	27.5	27.5	27.5	375.0	1875
5180	EPOXY MIX GALLON	4.8	4.8	4.8	4.8	4.8	4.0	3.6	3.6	3.6	3.6	3.6	3.6	49.6	2232
5190	FENCE HARDWARE DOLLAR	130.0	130.0	100.0	90.0	90.0	80.0	80.0	60.0	60.0	60.0	60.0	60.0	1000.0	1000
5220	FENCING SQ FT	130.0	130.0	100.0	90.0	90.0	80.0	80.0	60.0	60.0	60.0	60.0	60.0	1000.0	1250
5430	SAND CU YD	.0	.0	10.0	10.0	10.0	10.0	10.0	.0	.0	.0	.0	.0	50.0	350
5440	SIGNS-TRAFFIC EACH	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	2.0	2.0	2.0	30.0	1200
5600	MISC ROAD MTL DOLLAR	252.0	267.0	252.0	267.0	264.0	259.0	256.5	256.5	256.5	256.5	256.5	256.5	3100.0	3100
5610	MISC GRND MTL DOLLAR	26.0	26.0	24.0	26.0	26.0	26.0	26.0	24.0	24.0	24.0	24.0	24.0	300.0	300
5620	MISC TRAFFIC MT DOLLAR	30.0	30.0	30.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	315.0	315
5630	MISC RR MTL DOLLAR	174.0	174.0	170.0	174.0	165.0	165.0	165.0	165.0	165.0	162.0	158.0	156.0	1993.0	1993

DeLEUW, CATHER & Co. WORKLOAD DISTRIBUTION ¶Page: 1
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH
Date: 09/19/88

CODE	ACTIVITY NAME	PERSON DAYS PER MONTH OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	CR SZ	CREW DAYS
1195	GEN BIT PVMNT MAINT	3.9	4.2	3.9	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	49.8	3	16.6
1395	GEN CONC PVT RPR	2.4	2.4	2.4	2.4	2.4	2.0	1.8	1.8	1.8	1.8	1.8	1.8	24.8	2	12.4
1510	BLADE UNPVD SURFCS	10.5	10.5	9.0	9.0	9.5	9.0	12.0	12.0	12.0	10.5	10.5	10.5	125.0	2	83.3
1520	STAB UNPVD SRFC	4.4	4.4	4.4	4.4	4.0	3.6	3.6	3.6	3.6	3.6	2.8	2.8	45.2	4	11.3
1540	DUST CONTROL	1.4	1.4	1.2	1.4	1.4	1.4	1.3	1.1	1.1	1.1	1.1	1.1	15.0	1	15.0
1730	BLADE UNPVD SHLDRS	8.3	8.3	8.3	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.2	8.2	100.0	1	100.0
1820	MAINT RR SWITCH	6.0	6.0	6.0	6.0	5.4	5.4	5.4	5.4	5.4	5.2	5.2	5.2	66.6	2	33.3
1830	REPAIR RR TRACK	8.4	8.4	8.0	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.0	7.8	99.4	2	49.7
2110	ROADWAY SWEEPING	5.6	5.6	5.6	5.7	5.7	5.7	5.7	5.1	5.1	5.1	5.1	5.1	65.1	2	43.3
2120	RUNWAY SWEEPING	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	15.0	1	15.0
2140	MACHINE MOWING	9.0					10.7	12.0	15.0	15.0	15.0	15.0	15.0	106.7	1	106.7
2150	HAND MOWING TRIMMING	4.0	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	50.0	2	25.0
2151	LAWN MOWING	32.0					32.0	40.0	40.0	36.0	36.0	36.0	36.0	288.0	2	144.0
2160	SPRAYING/WEED CONTRL	3.0					3.0	4.0	4.0	4.0	4.0	4.0	4.0	30.0	1	30.0
2210	REPAIR FENCES	3.9	3.9	3.0	2.7	2.7	2.4	2.4	1.8	1.8	1.8	1.8	1.8	30.0	3	10.0
2230	REMOVE RDWY DEBRIS	12.6	12.6	12.6	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	145.8	3	48.6
2290	GEN GROUNDS MAINT	2.6	2.6	2.4	2.6	2.6	2.6	2.6	2.4	2.4	2.4	2.4	2.4	30.0	2	15.0
3190	GEN DRAINAGE MAINT	1.8	1.8	1.8	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	20.0	2	10.0
5120	REPAIR SIGNS	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	2.0	2.0	2.0	30.0	2	15.0
5190	GEN TRAFFIC SRVC MNT	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12.6	2	6.3
6290	GEN SNOW/ICE CONTROL			3.0	3.0	3.0	3.0	3.0						15.0	3	5.0
7110	HAUL TRASH/GARBAGE	8.3	8.3	8.3	8.5	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.2	100.0	1	100.0
7120	MAINTAIN LANDFILL	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	24.0	1	24.0
9100	SUPERVISION	12.5	12.5	12.5	12.6	12.7	12.6	12.6	12.4	12.4	12.4	12.4	12.4	150.0	1	150.0
9200	ADMIN/LV/TRNG	33.6	33.6	33.6	34.8	33.6	33.6	33.6	33.6	32.4	32.4	32.4	32.4	399.6	12	33.3

DeLEUW, CATHER & Co. WORK CALENDAR ¶Page: 1
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH
Date: 09/19/88

CODE	ACTIVITY NAME/ANNUAL WORK QTY	CR SZ	CREW DAYS - PLANNED OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL	AVG DAILY PRODUCTION
1195	GEN BIT PVMNT MAINT 499 PER HR	3	1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	16.6	30.0
1395	GEN CONC PVT RPR 248 PER HRS	2	1.2	1.2	1.2	1.2	1.2	1.0	.9	.9	.9	.9	.9	.9	12.4	20.0
1510	BLADE UNPVD SURFCS 750 ROAD MI	2	7.0	7.0	6.0	6.0	6.3	6.0	8.0	8.0	8.0	7.0	7.0	7.0	83.3	9.0
1520	STAB UNPVD SRFC 45 ROAD MI	4	1.1	1.1	1.1	1.1	1.0	.9	.9	.9	.9	.9	.7	.7	11.3	4.0
1540	DUST CONTROL 90 ROAD MI	1	1.4	1.4	1.2	1.4	1.4	1.4	1.3	1.1	1.1	1.1	1.1	1.1	15.0	6.0
1730	BLADE UNPVD SHLDRS 2000 SHLDR MI	1	8.3	8.3	8.3	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.2	8.2	100.0	20.0
1820	MAINT RR SWITCH 100 SWITCH	2	3.0	3.0	3.0	3.0	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	33.3	3.0
1830	REPAIR RR TRACK 25 MILE	2	4.2	4.2	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.0	3.9	49.7	.5
2110	ROADWAY SWEEPING 520 ROAD MI	2	3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.4	3.4	3.4	3.4	3.4	43.3	12.0
2120	RUNWAY SWEEPING 2250 K SQ YD	1	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	15.0	150.0
2140	MACHINE MOWING 1600 ACRES	1	9.0	.0	.0	.0	.0	10.7	12.0	15.0	15.0	15.0	15.0	15.0	106.7	15.0
2150	HAND MOWING TRIMMING 500 PER HRS	2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25.0	20.0
2151	LAWN MOWING 1440 ACRES	2	16.0	.0	.0	.0	.0	16.0	20.0	20.0	18.0	18.0	18.0	18.0	144.0	10.0
2160	SPRAYING/WEED CONTRL 300 PER HRS	1	3.0	.0	.0	.0	.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	30.0	10.0
2210	REPAIR FENCES 3000 LIN FT	3	1.3	1.3	1.0	.9	.9	.8	.8	.6	.6	.6	.6	.6	10.0	300.0
2230	REMOVE RDWY DEBRIS 1459 PER HRS	3	4.2	4.2	4.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	48.6	30.0
2290	GEN GROUNDS MAINT 300 PER HRS	2	1.3	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	15.0	20.0
3190	GEN DRAINAGE MAINT 200 PER HR	2	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8	10.0	20.0
5120	REPAIR SIGNS 75 signs	2	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	15.0	5.0
5190	GEN TRAFFIC SRVC MNT 125 PER HRS	2	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	6.3	20.0
6290	GEN SNOW/ICE CONTROL 150 PER HRS	3	.0	.0	1.0	1.0	1.0	1.0	1.0	.0	.0	.0	.0	.0	5.0	30.0
7110	HAUL TRASH/GARBAGE 300 TRUCK LD	1	8.3	8.3	8.3	8.5	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.2	100.0	3.0
7120	MAINTAIN LANDFILL 240 PER HRS	1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	24.0	10.0
9100	SUPERVISION 1500 PER HR	1	12.5	12.5	12.5	12.6	12.7	12.6	12.6	12.4	12.4	12.4	12.4	12.4	150.0	10.0
9200	ADMIN/LV/TRNG 4000 PER HR	12	2.8	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.7	33.3	120.0

CODE	ACTIVITY NAME	PERFORMANCE INDICATOR	CURRENT MONTH PERFORMANCE PLAN	ACTUAL	PCT	YEAR TO DATE PERFORMANCE PLAN	ACTUAL	PCT
1195	GEN BIT PVMNT MAINT	Person Days	4	12	300	29	28	97
	PER HR	Accomplishment	42.0	120.0	286	288.0	280.0	97
		Avg Daily Prod	30.0	30.0	100	30.0	30.0	100
		Total Cost	778	2223	286	5335	5335	100
		Unit Cost ($)	18.52	18.53	100	18.52	19.05	103
1395	GEN CONC PVT RPR	Person Days	2	16	800	16	16	100
	PER HRS	Accomplishment	18.0	160.0	889	158.0	160.0	101
		Avg Daily Prod	20.0	20.0	100	20.0	20.0	100
		Total Cost	750	4672	623	6579	4672	71
		Unit Cost ($)	41.67	29.20	70	41.64	29.20	70
1510	BLADE UNPVD SURFCS	Person Days	12	6	50	69	24	35
	ROAD MI	Accomplishment	72.0	35.0	49	416.7	145.0	35
		Avg Daily Prod	9.0	8.8	98	9.0	9.1	101
		Total Cost	2855	1481	52	16520	5443	33
		Unit Cost ($)	39.65	42.31	107	39.64	37.54	95
1520	STAB UNPVD SRFC	Person Days	4	0	0	29	0	0
	ROAD MI	Accomplishment	3.6	.0	0	28.8	.0	0
		Avg Daily Prod	4.0	.0	0	4.0	.0	0
		Total Cost	1037	0	0	8296	0	0
		Unit Cost ($)	288.06	.00	0	288.06	.00	0
1540	DUST CONTROL	Person Days	1	0	0	10	0	0
	ROAD MI	Accomplishment	7.8	.0	0	57.0	.0	0
		Avg Daily Prod	6.0	.0	0	6.0	.0	0
		Total Cost	387	0	0	2827	0	0
		Unit Cost ($)	49.62	.00	0	49.60	.00	0
1730	BLADE UNPVD SHLDRS	Person Days	8	4	50	59	14	24
	SHLDR MI	Accomplishment	166.0	70.0	42	1180.0	225.0	19
		Avg Daily Prod	20.0	17.5	88	20.0	16.1	81
		Total Cost	2233	1076	48	15877	3767	24
		Unit Cost ($)	13.45	15.37	114	13.46	16.74	124
1820	MAINT RR SWITCH	Person Days	5	0	0	40	0	0
	SWITCH	Accomplishment	8.1	.0	0	60.3	.0	0
		Avg Daily Prod	3.0	.0	0	3.0	.0	0
		Total Cost	647	0	0	4812	0	0
		Unit Cost ($)	79.88	.00	0	79.80	.00	0
1830	REPAIR RR TRACK	Person Days	8	0	0	58	0	0
	MILE	Accomplishment	2.1	.0	0	14.6	.0	0
		Avg Daily Prod	.5	.0	0	.5	.0	0
		Total Cost	963	0	0	6698	0	0
		Unit Cost ($)	458.57	.00	0	458.77	.00	0

CODE	ACTIVITY NAME	PERFORMANCE INDICATOR	CURRENT MONTH PERFORMANCE PLAN	ACTUAL	PCT	YEAR TO DATE PERFORMANCE PLAN	ACTUAL	PCT
2110	ROADWAY SWEEPING	Person Days	6	0	0	39	7	18
	ROAD MI	Accomplishment	45.6	.0	0	315.6	60.0	19
		Avg Daily Prod	12.0	.0	0	12.0	12.9	108
		Total Cost	1086	0	0	7514	1078	14
		Unit Cost ($)	23.82	.00	0	23.81	17.97	75
2120	RUNWAY SWEEPING	Person Days	1	0	0	9	0	0
	K SQ YD	Accomplishment	180.0	.0	0	1350.0	.0	0
		Avg Daily Prod	150.0	.0	0	150.0	.0	0
		Total Cost	200	0	0	1499	0	0
		Unit Cost ($)	1.11	.00	0	1.11	.00	0
2140	MACHINE MOWING	Person Days	12	8	67	32	16	50
	ACRES	Accomplishment	180.0	130.0	72	475.5	260.0	55
		Avg Daily Prod	15.0	16.3	109	15.0	16.3	109
		Total Cost	1512	1008	67	3994	2016	50
		Unit Cost ($)	8.40	7.75	92	8.40	7.75	92
2150	HAND MOWING TRIMMING	Person Days	4	0	0	29	0	0
	PER HRS	Accomplishment	42.0	.0	0	290.0	.0	0
		Avg Daily Prod	20.0	.0	0	20.0	.0	0
		Total Cost	538	0	0	3718	0	0
		Unit Cost ($)	12.81	.00	0	12.82	.00	0
2151	LAWN MOWING	Person Days	40	0	0	104	0	0
	ACRES	Accomplishment	200.0	.0	0	520.0	.0	0
		Avg Daily Prod	10.0	.0	0	10.0	.0	0
		Total Cost	5128	0	0	13333	0	0
		Unit Cost ($)	25.64	.00	0	25.64	.00	0
2160	SPRAYING/WEED CONTRL	Person Days	4	0	0	10	0	0
	PER HRS	Accomplishment	40.0	.0	0	100.0	.0	0
		Avg Daily Prod	10.0	.0	0	10.0	.0	0
		Total Cost	1064	0	0	2660	0	0
		Unit Cost ($)	26.60	.00	0	26.60	.00	0
2210	REPAIR FENCES	Person Days	2	0	0	21	0	0
	LIN FT	Accomplishment	240.0	.0	0	2100.0	.0	0
		Avg Daily Prod	300.0	.0	0	300.0	.0	0
		Total Cost	432	0	0	3780	0	0
		Unit Cost ($)	1.80	.00	0	1.80	.00	0
2230	REMOVE RDWY DEBRIS	Person Days	12	0	0	86	0	0
	PER HRS	Accomplishment	120.0	.0	0	858.0	.0	0
		Avg Daily Prod	30.0	.0	0	30.0	.0	0
		Total Cost	1862	0	0	13316	0	0
		Unit Cost ($)	15.52	.00	0	15.52	.00	0

CODE	ACTIVITY NAME	PERFORMANCE INDICATOR	CURRENT MONTH PERFORMANCE PLAN	ACTUAL	PCT	YEAR TO DATE PERFORMANCE PLAN	ACTUAL	PCT
2290	GEN GROUNDS MAINT	Person Days	3	0	0	18	0	0
	PER HRS	Accomplishment	26.0	.0	0	180.0	.0	0
		Avg Daily Prod	20.0	.0	0	20.0	.0	0
		Total Cost	297	0	0	2049	0	0
		Unit Cost ($)	11.42	.00	0	11.38	.00	0
3190	GEN DRAINAGE MAINT	Person Days	2	0	0	12	0	0
	PER HR	Accomplishment	16.0	.0	0	120.0	.0	0
		Avg Daily Prod	20.0	.0	0	20.0	.0	0
		Total Cost	206	0	0	1549	0	0
		Unit Cost ($)	12.88	.00	0	12.91	.00	0
5120	REPAIR SIGNS	Person Days	4	0	0	16	0	0
	signs	Accomplishment	10.0	.0	0	40.0	.0	0
		Avg Daily Prod	5.0	.0	0	5.0	.0	0
		Total Cost	575	0	0	2302	0	0
		Unit Cost ($)	57.50	.00	0	57.55	.00	0
5190	GEN TRAFFIC SRVC MNT	Person Days	1	0	0	8	0	0
	PER HRS	Accomplishment	10.0	.0	0	76.0	.0	0
		Avg Daily Prod	20.0	.0	0	20.0	.0	0
		Total Cost	129	0	0	979	0	0
		Unit Cost ($)	12.90	.00	0	12.88	.00	0
6290	GEN SNOW/ICE CONTROL	Person Days	3	0	0	15	59	393
	PER HRS	Accomplishment	30.0	.0	0	150.0	590.0	393
		Avg Daily Prod	30.0	.0	0	30.0	30.0	100
		Total Cost	567	0	0	2837	11286	398
		Unit Cost ($)	18.90	.00	0	18.91	19.13	101
7110	HAUL TRASH/GARBAGE	Person Days	8	0	0	59	0	0
	TRUCK LD	Accomplishment	25.2	.0	0	176.4	.0	0
		Avg Daily Prod	3.0	.0	0	3.0	.0	0
		Total Cost	2256	0	0	15794	0	0
		Unit Cost ($)	89.52	.00	0	89.54	.00	0
7120	MAINTAIN LANDFILL	Person Days	2	0	0	14	0	0
	PER HRS	Accomplishment	21.0	.0	0	144.0	.0	0
		Avg Daily Prod	10.0	.0	0	10.0	.0	0
		Total Cost	1001	0	0	6866	0	0
		Unit Cost ($)	47.67	.00	0	47.68	.00	0
9100	SUPERVISION	Person Days	13	16	123	88	59	67
	PER HR	Accomplishment	126.0	160.0	127	880.0	590.0	67
		Avg Daily Prod	10.0	10.0	100	10.0	10.0	100
		Total Cost	2082	2643	127	14538	9747	67
		Unit Cost ($)	16.52	16.52	100	16.52	16.52	100

CODE	ACTIVITY NAME	PERFORMANCE INDICATOR	CURRENT MONTH PERFORMANCE PLAN	ACTUAL	PCT	YEAR TO DATE PERFORMANCE PLAN	ACTUAL	PCT
9200	ADMIN/LV/TRNG	Person Days	34	0	0	236	0	0
	PER HR	Accomplishment	336.0	.0	0	2364.0	.0	0
		Avg Daily Prod	120.0	.0	0	120.0	.0	0
		Total Cost	3832	0	0	26959	0	0
		Unit Cost ($)	11.40	.00	0	11.40	.00	0
MANAGEMENT UNIT TOTALS:		Person Days	195	62	32	1106	223	20
		Total Cost	32417	13103	40	190631	43344	23

LOCATION/TYPE/ACTIVITY CODE	NAMES	MONTH ACCOMPLISHMENT QTY	UNIT	COST	YEAR TO DATE ACCOMPLISHMENT QTY	UNIT	COST	COST FROM DATE OF FIRST ENTRY
A001P	A STREET PARKING							
P								
1195	GEN BIT PVMNT MAINT	120	PER HR	2223	240	PER HR	4446	4446
			TOTALS:	2223			4446	4446
A005I	CALIFORNIA AVE.							
I								
1730	BLADE UNPVD SHLDRS	70	SHLDR MI	1076	225	SHLDR MI	3767	3767
2110	ROADWAY SWEEPING	0	ROAD MI	0	60	ROAD MI	1078	1078
			TOTALS:	1076			4845	4845
A018P	HEADQUARTERS PARKING							
P								
1195	GEN BIT PVMNT MAINT	0	PER HR	0	40	PER HR	888	888
			TOTALS:	0			888	888
A046	BLDG P-130 APRON							
A								
1395	GEN CONC PVT RPR	160	PER HRS	4672	160	PER HRS	4672	4672
			TOTALS:	4672			4672	4672
A096	EQUESTRIAN STABLE ROAD							
I								
1510	BLADE UNPVD SURFCS	35	ROAD MI	1481	70	ROAD MI	2962	2963
2140	MACHINE MOWING	130	ACRES	1008	260	ACRES	2016	2016
			TOTALS:	2489			4978	4979
A104	RESERVOIR ACCESS ROAD							
I								
1510	BLADE UNPVD SURFCS	0	ROAD MI	0	75	ROAD MI	2480	2480
			TOTALS:	0			2480	2480
DEPOT	ANY OTHER UNASSIGNED LOC							
2								
6290	GEN SNOW/ICE CONTROL	0	PER HRS	0	590	PER HRS	11286	11286
9100	SUPERVISION	160	PER HR	2643	590	PER HR	9746	9747
			TOTALS:	2643			21032	21033

LOCATION/TYPE/ACTIVITY CODE	NAMES			MONTH ACCOMPLISHMENT QTY	UNIT	COST	YEAR TO DATE ACCOMPLISHMENT QTY	UNIT	COST	COST FROM DATE OF FIRST ENTRY
1195	GEN BIT PVMNT MAINT									
A001P	A STREET PARKING	P		120	PER HR	2223	240	PER HR	4446	4446
A018P	HEADQUARTERS PARKING	P		0	PER HR	0	40	PER HR	888	888
			TOTALS:	120		2223	280		5334	5334
1395	GEN CONC PVT RPR									
A046	BLDG P-130 APRON	A		160	PER HRS	4672	160	PER HRS	4672	4672
			TOTALS:	160		4672	160		4672	4672
1510	BLADE UNPVD SURFCS									
A096	EQUESTRIAN STABLE ROAD	I		35	ROAD MI	1481	70	ROAD MI	2962	2963
A104	RESERVOIR ACCESS ROAD	I		0	ROAD MI	0	75	ROAD MI	2480	2480
			TOTALS:	35		1481	145		5442	5443
1730	BLADE UNPVD SHLDRS									
A005I	CALIFORNIA AVE.	I		70	SHLDR MI	1076	225	SHLDR MI	3767	3767
			TOTALS:	70		1076	225		3767	3767
2110	ROADWAY SWEEPING									
A005I	CALIFORNIA AVE.	I		0	ROAD MI	0	60	ROAD MI	1078	1078
			TOTALS:	0		0	60		1078	1078
2140	MACHINE MOWING									
A096	EQUESTRIAN STABLE ROAD	I		130	ACRES	1008	260	ACRES	2016	2016
			TOTALS:	130		1008	260		2016	2016
6290	GEN SNOW/ICE CONTROL									
DEPOT	ANY OTHER UNASSIGNED LOC	Z		0	PER HRS	0	590	PER HRS	11286	11286
			TOTALS:	0		0	590		11286	11286
9100	SUPERVISION									
DEPOT	ANY OTHER UNASSIGNED LOC	Z		160	PER HR	2643	590	PER HR	9746	9747
			TOTALS:	160		2643	590		9746	9747

LOCATION/TYPE/ACTIVITY CODE	NAMES	MONTH ACCOMPLISHMENT QTY	UNIT	COST	YEAR TO DATE ACCOMPLISHMENT QTY	UNIT	COST	COST FROM DATE OF FIRST ENTRY
A								
A046	BLDG P-130 APRON							
1395	GEN CONC PVT RPR	160	PER HRS	4672	160	PER HRS	4672	4672
			TOTALS:	4672			4672	4672
I								
A005I	CALIFORNIA AVE.							
1730	BLADE UNPVD SHLDRS	70	SHLDR MI	1076	225	SHLDR MI	3767	3767
2110	ROADWAY SWEEPING	0	ROAD MI	0	60	ROAD MI	1078	1078
A096	EQUESTRIAN STABLE ROAD							
1510	BLADE UNPVD SURFCS	35	ROAD MI	1481	70	ROAD MI	2962	2963
2140	MACHINE MOWING	130	ACRES	1008	260	ACRES	2016	2016
A104	RESERVOIR ACCESS ROAD							
1510	BLADE UNPVD SURFCS	0	ROAD MI	0	75	ROAD MI	2480	2480
			TOTALS:	3565			12303	12304
P								
A001P	A STREET PARKING							
1195	GEN BIT PVMNT MAINT	120	PER HR	2223	240	PER HR	4446	4446
A018P	HEADQUARTERS PARKING							
1195	GEN BIT PVMNT MAINT	0	PER HR	0	40	PER HR	888	888
			TOTALS:	2223			5334	5334
Z								
DEPOT	ANY OTHER UNASSIGNED LOC							
6290	GEN SNOW/ICE CONTROL	0	PER HRS	0	590	PER HRS	11286	11286
9100	SUPERVISION	160	PER HR	2643	590	PER HR	9746	9747
			TOTALS:	2643			21032	21033

Activity: 1195 GEN BIT PVMNT MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

			Desired	Planned
Feature Inv:	260.00 MILES			
Daily Prod:	30.00 PER HR			
Hours/Act Day:	10.0	Service Level:	5.00	1.92
Cost/Crew Day:	$ 556	Annual Work Quantity:	1,300.00	499.20
Cost/Unit of Work:	$ 18	Total Cost:	$ 24,066	$ 9,226
Standard Crew Size:	3.0	Labor:	$ 14,778	$ 5,666
Deviation Level:	20 %	Equipment:	$ 2,793	$ 1,071
		Material:	$ 6,495	$ 2,490
		Total Crew Days:	43.3	16.6
		Total Person Days:	129.9	49.8
		Cost/Unit of Inv:	$ 93	$ 35

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	16.6

'P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

LABOR (34/HR)		EQUIPMENT (6/HR)		MATERIAL (150/DAY)	
1120 ENG EQUIP OP	1.0	3010 PICKUP-2WD	1.0	5600 MISC ROAD MTL	150.0
1130 MOT VEH OP	1.0	3040 DUMP TRUCKS-5YD	1.0		
1160 LABORER	1.0	4250 VIBRATORY TAMP	1.0		

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

CODE	NAME	TOTAL	—1—	—2—	—3—
1110	BITUMINOUS ROAD MILES				
	INVY	260.00			
	SL	5.00			

TOTAL INVENTORY= 260.00 DES. EQUIV. SL.= 5.00 AWQD= 1,300.00
PLN. EQUIV. SL.= 1.92 AWQP= 499.20

Activity: 1395 GEN CONC PVT RPR
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	200.00 K SQ YDS			
Daily Prod:	20.00 PER HRS			
Hours/Act Day:	10.0	Service Level:	1.50	1.24
Cost/Crew Day:	$ 833	Annual Work Quantity:	300.00	248.00
Cost/Unit of Work:	$ 42	Total Cost:	$ 12,491	$ 10,325
Standard Crew Size:	2.0	Labor:	$ 2,891	$ 2,389
Deviation Level:	20 %	Equipment:	$ 225	$ 186
		Material:	$ 9,375	$ 7,750
		Total Crew Days:	15.0	12.4
		Total Person Days:	30.0	24.8
		Cost/Unit of Inv:	$ 62	$ 52

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.2	1.2	1.2	1.2	1.2	1.0	.9	.9	.9	.9	.9	.9	12.4

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (625/DAY)	
1130 MOT VEH OP	1.0	3010 PICKUP-2WD	1.0	5140 CONCRETE-REDIMX	6.0
1160 LABORER	1.0			5180 EPOXY MIX	4.0
				5600 MISC ROAD MTL	25.0

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	——1——	——2——	——3——
1300	CONCRETE PAVEME	K SQ YDS			
	INVY	200.00			
	SL	1.50			

TOTAL INVENTORY= 200.00 DES. EQUIV. SL.= 1.50 AWOD= 300.00
PLN. EQUIV. SL.= 1.24 AWOP= 248.00

Activity: 1510 BLADE UNPVD SURFCS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

			Desired	Planned
Feature Inv:	300.00 MILES			
Daily Prod:	9.00 ROAD MI			
Hours/Act Day:	10.0	Service Level:	2.50	2.50
Cost/Crew Day:	$ 357	Annual Work Quantity:	750.00	750.00
Cost/Unit of Work:	$ 40	Total Cost:	$ 29,721	$ 29,721
Standard Crew Size:	1.5	Labor:	$ 16,793	$ 16,793
Deviation Level:	20 %	Equipment:	$ 12,928	$ 12,928
		Material:	$ 0	$ 0
		Total Crew Days:	83.3	83.3
		Total Person Days:	125.0	125.0
		Cost/Unit of Inv:	$ 99	$ 99

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
7.0	7.0	6.0	6.0	6.3	6.0	8.0	8.0	8.0	7.0	7.0	7.0	83.3

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

LABOR (20/HR)		EQUIPMENT (16/HR)		MATERIAL (0/DAY)
1120 ENG EQUIP OP	1.0	3220 ROAD GRADER	1.0	
1130 MOT VEH OP	.5	3010 PICKUP-2WD	.1	
		3090 WATER DISTRIBUT	.5	

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

CODE	NAME	TOTAL		—1—	—2—	—3—
1500	UNPAVED ROAD		MILES			
	INVY	300.00				
	SL	2.50				

TOTAL INVENTORY= 300.00 DES. EQUIV. SL.= 2.50 AWQD= 750.00
PLN. EQUIV. SL.= 2.50 AWQP= 750.00

Activity: 1520 STAB UNPVD SRFC
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	300.00 MILES				
Daily Prod:	4.00 ROAD MI				
Hours/Act Day:	10.0	Service Level:		.25	.15
Cost/Crew Day:	$ 1152	Annual Work Quantity:		75.00	45.00
Cost/Unit of Work:	$ 289	Total Cost:	$	21,661	$ 13,020
Standard Crew Size:	4.0	Labor:	$	9,573	$ 5,754
Deviation Level:	20 %	Equipment:	$	6,448	$ 3,876
		Material:	$	5,640	$ 3,390
		Total Crew Days:		18.8	11.3
		Total Person Days:		75.2	45.2
		Cost/Unit of Inv:	$	72	$ 43

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.1	1.1	1.1	1.1	1.0	.9	.9	.9	.9	.9	.7	.7	11.3

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (51/HR)		EQUIPMENT (34/HR)		MATERIAL (300/DAY)	
1120 ENG EQUIP OP	2.0	3220 ROAD GRADER	1.0	5080 BASE MATERIAL	20.0
1130 MOT VEH OP	2.0	3270 ROLLER	1.0		
		3090 WATER DISTRIBUT	1.0		
		3040 DUMP TRUCKS-5YD	1.0		

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		——1——	——2——	——3——
1500	UNPAVED ROAD		MILES			
	INVY	300.00				
	SL	.25				

TOTAL INVENTORY=	300.00	DES. EQUIV. SL.=	.25	AWQD=	75.00
		PLN. EQUIV. SL.=	.15	AWQP=	45.00

Activity: 1540 DUST CONTROL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y

A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	300.00 MILES			
Daily Prod:	6.00 ROAD MI			
Hours/Act Day:	10.0	Service Level:	.50	.30
Cost/Crew Day:	$ 298	Annual Work Quantity:	150.00	90.00
Cost/Unit of Work:	$ 50	Total Cost:	$ 7,438	$ 4,463
Standard Crew Size:	1.0	Labor:	$ 2,650	$ 1,590
Deviation Level:	20 %	Equipment:	$ 1,663	$ 998
		Material:	$ 3,125	$ 1,875
		Total Crew Days:	25.0	15.0
		Total Person Days:	25.0	15.0
		Cost/Unit of Inv:	$ 25	$ 15

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.4	1.4	1.2	1.4	1.4	1.4	1.3	1.1	1.1	1.1	1.1	1.1	15.0

P.G. Expn:Y

L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (11/HR)		EQUIPMENT (7/HR)		MATERIAL (125/DAY)	
1130 MOT VEH OP	1.0	3090 WATER DISTRIBUT	1.0	5170 DUST PALLIATVS	25.0

S.L. Expn:N

F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
1500	UNPAVED ROAD	MILES			
	INVY	300.00			
	SL	.50			

TOTAL INVENTORY= 300.00 DES. EQUIV. SL.= .50 AWQD= 150.00
PLN. EQUIV. SL.= .30 AWQP= 90.00

Activity: 1730 BLADE UNPVD SHLDRS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1000.00 MILES				
Daily Prod:	20.00 SHLDR MI				
Hours/Act Day:	10.0	Service Level:		3.00	2.00
Cost/Crew Day:	$ 269	Annual Work Quantity:		3,000.00	2,000.00
Cost/Unit of Work:	$ 13	Total Cost:	$	40,365	$ 26,910
Standard Crew Size:	1.0	Labor:	$	22,290	$ 14,860
Deviation Level:	20 %	Equipment:	$	18,075	$ 12,050
		Material:	$	0	$ 0
		Total Crew Days:		150.0	100.0
		Total Person Days:		150.0	100.0
		Cost/Unit of Inv:	$	40	$ 27

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
8.3	8.3	8.3	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.2	8.2	100.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (15/HR)		EQUIPMENT (12/HR)		MATERIAL (0/DAY)
1120 ENG EQUIP OP	1.0	3220 ROAD GRADER	1.0	

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
1700	UNPAVED SHLDRS	MILES			
	INVY	1000.00			
	SL	3.00			

TOTAL INVENTORY= 1,000.00 DES. EQUIV. SL.= 3.00 AWQD= 3,000.00
PLN. EQUIV. SL.= 2.00 AWQP= 2,000.00

Activity: 1820 MAINT RR SWITCH
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	10.00 EA			
Daily Prod:	3.00 SWITCH			
Hours/Act Day:	10.0	Service Level:	12.00	10.00
Cost/Crew Day:	$ 239	Annual Work Quantity:	120.00	100.00
Cost/Unit of Work:	$ 80	Total Cost:	$ 9,576	$ 7,972
Standard Crew Size:	2.0	Labor:	$ 7,776	$ 6,474
Deviation Level:	20 %	Equipment:	$ 600	$ 500
		Material:	$ 1,200	$ 999
		Total Crew Days:	40.0	33.3
		Total Person Days:	80.0	66.6
		Cost/Unit of Inv:	$ 958	$ 797

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
3.0	3.0	3.0	3.0	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	33.3

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (30/DAY)	
1170 RR MNT OP	2.0	3010 PICKUP-2WD	1.0	5630 MISC RR MTL	30.0

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		1	2	3
1820	RR SWITCH		EA			
	INVY	10.00				
	SL	12.00				

TOTAL INVENTORY= 10.00 DES. EQUIV. SL.= 12.00 AWQD= 120.00
PLN. EQUIV. SL.= 10.00 AWQP= 100.00

Activity: 1830 REPAIR RR TRACK
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	35.00 MILES			
Daily Prod:	.50 MILE			
Hours/Act Day:	10.0	Service Level:	1.00	.71
Cost/Crew Day:	$ 229	Annual Work Quantity:	35.00	24.85
Cost/Unit of Work:	$ 459	Total Cost:	$ 16,058	$ 11,401
Standard Crew Size:	2.0	Labor:	$ 13,608	$ 9,662
Deviation Level:	20 %	Equipment:	$ 1,050	$ 746
		Material:	$ 1,400	$ 994
		Total Crew Days:	70.0	49.7
		Total Person Days:	140.0	99.4
		Cost/Unit of Inv:	$ 459	$ 326

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
4.2	4.2	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.0	3.9	49.7

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (20/DAY)	
1170 RR MNT OP	2.0	3010 PICKUP-2WD	1.0	5630 MISC RR MTL	20.0

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	1	2	3
1830	RR TRACK	MILES			
	INVY	35.00			
	SL	1.00			

TOTAL INVENTORY=	35.00	DES. EQUIV. SL.=	1.00	AWQD=	35.00
		PLN. EQUIV. SL.=	.71	AWQP=	24.85

Activity: 2110 ROADWAY SWEEPING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

			Desired	Planned
Feature Inv:	260.00 MILES			
Daily Prod:	12.00 ROAD MI			
Hours/Act Day:	10.0	Service Level:	4.00	2.00
Cost/Crew Day:	$ 286	Annual Work Quantity:	1,040.00	520.00
Cost/Unit of Work:	$ 24	Total Cost:	$ 24,770	$ 12,371
Standard Crew Size:	1.5	Labor:	$ 17,479	$ 8,729
Deviation Level:	20 %	Equipment:	$ 7,291	$ 3,642
		Material:	$ 0	$ 0
		Total Crew Days:	86.7	43.3
		Total Person Days:	130.1	65.0
		Cost/Unit of Inv:	$ 95	$ 48

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.4	3.4	3.4	3.4	3.4	43.3

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

LABOR (20/HR)		EQUIPMENT (8/HR)		MATERIAL (0/DAY)
1130 MOT VEH OP	.5	3280 STREET SWEEPER	.5	
1120 ENG EQUIP OP	1.0	3283 SWEEPER W/MAGNT	.5	
		3090 WATER DISTRIBUT	.5	

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

CODE	NAME	TOTAL	—1—	—2—	—3—
1110	BITUMINOUS ROAD MILES				
	INVY	260.00			
	SL	4.00			

TOTAL INVENTORY= 260.00 DES. EQUIV. SL.= 4.00 AWQD= 1,040.00
PLN. EQUIV. SL.= 2.00 AWQP= 520.00

Activity: 2120 RUNWAY SWEEPING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	150.00 K SQ YDS			
Daily Prod:	150.00 K SQ YD			
Hours/Act Day:	10.0	Service Level:	20.00	15.00
Cost/Crew Day:	$ 167	Annual Work Quantity:	3,000.00	2,250.00
Cost/Unit of Work:	$ 1	Total Cost:	$ 3,330	$ 2,498
Standard Crew Size:	1.0	Labor:	$ 2,120	$ 1,590
Deviation Level:	20 %	Equipment:	$ 1,210	$ 908
		Material:	$ 0	$ 0
		Total Crew Days:	20.0	15.0
		Total Person Days:	20.0	15.0
		Cost/Unit of Inv:	$ 22	$ 17

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	15.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (11/HR)		EQUIPMENT (6/HR)		MATERIAL (0/DAY)
1130 MOT VEH OP	1.0	3282 RUNWAY SWEEPER	1.0	

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	---1---	---2---	---3---
1310	RUNWAY/TAXIWAY	K SQ YDS			
	INVY	150.00			
	SL	20.00			

TOTAL INVENTORY= 150.00 DES. EQUIV. SL.= 20.00 AWQD= 3,000.00
PLN. EQUIV. SL.= 15.00 AWQP= 2,250.00

Activity: 2140 MACHINE MOWING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	400.00 ACRES			
Daily Prod:	15.00 ACRES			
Hours/Act Day:	10.0	Service Level:	5.00	4.00
Cost/Crew Day:	$ 126	Annual Work Quantity:	2,000.00	1,600.00
Cost/Unit of Work:	$ 8	Total Cost:	$ 16,796	$ 13,444
Standard Crew Size:	1.0	Labor:	$ 14,130	$ 11,310
Deviation Level:	20 %	Equipment:	$ 2,666	$ 2,134
		Material:	$ 0	$ 0
		Total Crew Days:	133.3	106.7
		Total Person Days:	133.3	106.7
		Cost/Unit of Inv:	$ 42	$ 34

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
9.0	.0	.0	.0	.0	10.7	12.0	15.0	15.0	15.0	15.0	15.0	106.7

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (11/HR)		EQUIPMENT (2/HR)		MATERIAL (0/DAY)
1130 MOT VEH OP	1.0	3260 TRACTOR MOWER	1.0	

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
2100	MOWABLE ROADSID	ACRES			
	INVY	400.00			
	SL	5.00			

TOTAL INVENTORY= 400.00 DES. EQUIV. SL.= 5.00 AWQD= 2,000.00
PLN. EQUIV. SL.= 4.00 AWQP= 1,600.00

Activity: 2150 HAND MOWING TRIMMING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	400.00 ACRES			
Daily Prod:	20.00 PER HRS			
Hours/Act Day:	10.0	Service Level:	2.00	1.25
Cost/Crew Day:	$ 256	Annual Work Quantity:	800.00	500.00
Cost/Unit of Work:	$ 13	Total Cost:	$ 10,256	$ 6,410
Standard Crew Size:	2.0	Labor:	$ 6,936	$ 4,335
Deviation Level:	20 %	Equipment:	$ 3,320	$ 2,075
		Material:	$ 0	$ 0
		Total Crew Days:	40.0	25.0
		Total Person Days:	80.0	50.0
		Cost/Unit of Inv:	$ 26	$ 16

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (17/HR)		EQUIPMENT (8/HR)		MATERIAL (0/DAY)
1160 LABORER	2.0	4180 RIDING MOWERS	2.0	

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
2100	MOWABLE ROADSID	ACRES			
	INVY	400.00			
	SL	2.00			

TOTAL INVENTORY= 400.00 DES. EQUIV. SL.= 2.00 AWQD= 800.00
PLN. EQUIV. SL.= 1.25 AWQP= 500.00

Activity: 2151 LAWN MOWING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

			Desired	Planned
Feature Inv:	150.00 ACRE			
Daily Prod:	10.00 ACRES			
Hours/Act Day:	10.0	Service Level:	12.00	9.60
Cost/Crew Day:	$ 256	Annual Work Quantity:	1,800.00	1,440.00
Cost/Unit of Work:	$ 26	Total Cost:	$ 46,152	$ 36,922
Standard Crew Size:	2.0	Labor:	$ 31,212	$ 24,970
Deviation Level:	20 %	Equipment:	$ 14,940	$ 11,952
		Material:	$ 0	$ 0
		Total Crew Days:	180.0	144.0
		Total Person Days:	360.0	288.0
		Cost/Unit of Inv:	$ 308	$ 246

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
16.0	.0	.0	.0	.0	16.0	20.0	20.0	18.0	18.0	18.0	18.0	144.0

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

LABOR (17/HR)		EQUIPMENT (8/HR)		MATERIAL (0/DAY)
1160 LABORER	2.0	4180 RIDING MOWERS	2.0	

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

CODE	NAME	TOTAL	—1—	—2—	—3—
2140	MOWABLE LAWN	ACRE			
	INVY	150.00			
	SL	12.00			

TOTAL INVENTORY=	150.00	DES. EQUIV. SL.=	12.00	AWQD=	1,800.00
		PLN. EQUIV. SL.=	9.60	AWQP=	1,440.00

Activity: 2160 SPRAYING/WEED CONTRL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	400.00 ACRES			
Daily Prod:	10.00 PER HRS			
Hours/Act Day:	10.0	Service Level:	1.00	.75
Cost/Crew Day:	$ 266	Annual Work Quantity:	400.00	300.00
Cost/Unit of Work:	$ 27	Total Cost:	$ 10,640	$ 7,980
Standard Crew Size:	1.0	Labor:	$ 4,240	$ 3,180
Deviation Level:	20 %	Equipment:	$ 800	$ 600
		Material:	$ 5,600	$ 4,200
		Total Crew Days:	40.0	30.0
		Total Person Days:	40.0	30.0
		Cost/Unit of Inv:	$ 27	$ 20

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
3.0	.0	.0	.0	.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	30.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (11/HR)		EQUIPMENT (2/HR)		MATERIAL (140/DAY)	
1130 MOT VEH OP	1.0	3260 TRACTOR MOWER	1.0	5110 CHEMICAL-WEED	20.0

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
2000	MNTND GROUNDS	ACRES			
	INVY	400.00			
	SL	1.00			

TOTAL INVENTORY=	400.00	DES. EQUIV. SL.=	1.00	AWQD=	400.00
		PLN. EQUIV. SL.=	.75	AWQP=	300.00

Activity: 2210 REPAIR FENCES
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N ACTIVITY SUMMARY

			Desired	Planned
Feature Inv:	10000.00 LIN FT			
Daily Prod:	300.00 LIN FT			
Hours/Act Day:	10.0	Service Level:	.40	.30
Cost/Crew Day:	$ 540	Annual Work Quantity:	4,000.00	3,000.00
Cost/Unit of Work:	$ 2	Total Cost:	$ 7,181	$ 5,399
Standard Crew Size:	3.0	Labor:	$ 3,716	$ 2,794
Deviation Level:	20 %	Equipment:	$ 472	$ 355
		Material:	$ 2,993	$ 2,250
		Total Crew Days:	13.3	10.0
		Total Person Days:	39.9	30.0
		Cost/Unit of Inv:	$ 1	$ 1

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.3	1.3	1.0	.9	.9	.8	.8	.6	.6	.6	.6	.6	10.0

P.G. Expn:N LABOR, EQUIPMENT & MATERIAL

LABOR (28/HR)		EQUIPMENT (4/HR)		MATERIAL (225/DAY)	
1130 MOT VEH OP	1.0	3040 DUMP TRUCKS-5YD	1.0	5190 FENCE HARDWARE	100.0
1160 LABORER	2.0			5220 FENCING	100.0

S.L. Expn:Y FEATURE INVENTORY DETAIL

CODE	NAME	TOTAL		—1—	—2—	—3—
2220	FENCE		LIN FT			
	INVY	10000.00				
	SL	.40				

TOTAL INVENTORY= 10,000.00 DES. EQUIV. SL.= .40 AWQD= 4,000.00
PLN. EQUIV. SL.= .30 AWQP= 3,000.00

Activity: 2230 REMOVE RDWY DEBRIS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	760.00 MILE				
Daily Prod:	30.00 PER HRS				
Hours/Act Day:	10.0	Service Level:		2.00	1.92
Cost/Crew Day:	$ 466	Annual Work Quantity:		1,520.00	1,459.20
Cost/Unit of Work:	$ 16	Total Cost:	$	23,606	$ 22,628
Standard Crew Size:	3.0	Labor:	$	17,304	$ 16,587
Deviation Level:	20 %	Equipment:	$	6,302	$ 6,041
		Material:	$	0	$ 0
		Total Crew Days:		50.7	48.6
		Total Person Days:		152.1	145.8
		Cost/Unit of Inv:	$	31	$ 30

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
4.2	4.2	4.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	48.6

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (34/HR)		EQUIPMENT (12/HR)		MATERIAL (0/DAY)
1130 MOT VEH OP	1.0	3210 FRONT LOADER	1.0	
1120 ENG EQUIP OP	1.0	3040 DUMP TRUCKS-5YD	1.0	
1160 LABORER	1.0			

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	——1——	——2——	——3——
1600	TOTAL ROADWAY	MILE			
	INVY	760.00			
	SL	2.00			

TOTAL INVENTORY=	760.00	DES. EQUIV. SL.=	2.00	AWQD=	1,520.00
		PLN. EQUIV. SL.=	1.92	AWQP=	1,459.20

Activity: 2290 GEN GROUNDS MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

			Desired	Planned
Feature Inv:	400.00 ACRES			
Daily Prod:	20.00 PER HRS			
Hours/Act Day:	10.0	Service Level:	1.00	.75
Cost/Crew Day:	$ 228	Annual Work Quantity:	400.00	300.00
Cost/Unit of Work:	$ 11	Total Cost:	$ 4,554	$ 3,416
Standard Crew Size:	2.0	Labor:	$ 3,854	$ 2,891
Deviation Level:	20 %	Equipment:	$ 300	$ 225
		Material:	$ 400	$ 300
		Total Crew Days:	20.0	15.0
		Total Person Days:	40.0	30.0
		Cost/Unit of Inv:	$ 11	$ 9

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.3	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	15.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (20/DAY)	
1130 MOT VEH OP	1.0	3010 PICKUP-2WD	1.0	5610 MISC GRND MTL	20.0
1160 LABORER	1.0				

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	——1——	——2——	——3——
2000	MNTND GROUNDS	ACRES			
	INVY	400.00			
	SL	1.00			

TOTAL INVENTORY=	400.00	DES. EQUIV. SL.=	1.00	AWOD=	400.00
		PLN. EQUIV. SL.=	.75	AWOP=	300.00

Activity: 3190 GEN DRAINAGE MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1.00 EA				
Daily Prod:	20.00 PER HR				
Hours/Act Day:	10.0	Service Level:		200.00	200.00
Cost/Crew Day:	$ 258	Annual Work Quantity:		200.00	200.00
Cost/Unit of Work:	$ 13	Total Cost:	$	2,582	$ 2,582
Standard Crew Size:	2.0	Labor:	$	1,927	$ 1,927
Deviation Level:	20 %	Equipment:	$	355	$ 355
		Material:	$	300	$ 300
		Total Crew Days:		10.0	10.0
		Total Person Days:		20.0	20.0
		Cost/Unit of Inv:	$	2582	$ 2582

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8	10.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (4/HR)		MATERIAL (30/DAY)	
1160 LABORER	1.0	3040 DUMP TRUCKS-5YD	1.0	5600 MISC ROAD MTL	30.0
1130 MOT VEH OP	1.0				

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	1	2	3
9100	YEAR	EA			
	INVY	1.00			
	SL	200.00			

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 200.00 AWQD= 200.00
PLN. EQUIV. SL.= 200.00 AWQP= 200.00

Activity: 5120 REPAIR SIGNS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	300.00 EA				
Daily Prod:	5.00 signs				
Hours/Act Day:	10.0	Service Level:		.30	.25
Cost/Crew Day:	$ 288	Annual Work Quantity:		90.00	75.00
Cost/Unit of Work:	$ 58	Total Cost:	$	5,179	$ 4,316
Standard Crew Size:	2.0	Labor:	$	3,469	$ 2,891
Deviation Level:	20 %	Equipment:	$	270	$ 225
		Material:	$	1,440	$ 1,200
		Total Crew Days:		18.0	15.0
		Total Person Days:		36.0	30.0
		Cost/Unit of Inv:	$	17	$ 14

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	15.0

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (80/DAY)	
1130 MOT VEH OP	1.0	3010 PICKUP-2WD	1.0	5440 SIGNS-TRAFFIC	2.0
1160 LABORER	1.0				

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		——1——	——2——	——3——
5120	SIGNS		EA			
	INVY	300.00				
	SL	.30				

TOTAL INVENTORY= 300.00 DES. EQUIV. SL.= .30 AWQD= 90.00
PLN. EQUIV. SL.= .25 AWQP= 75.00

Activity: 5190 GEN TRAFFIC SRVC MNT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1.00 EA				
Daily Prod:	20.00 PER HRS				
Hours/Act Day:	10.0	Service Level:		150.00	125.00
Cost/Crew Day:	$ 258	Annual Work Quantity:		150.00	125.00
Cost/Unit of Work:	$ 13	Total Cost:	$	1,933	$ 1,624
Standard Crew Size:	2.0	Labor:	$	1,445	$ 1,214
Deviation Level:	20 %	Equipment:	$	113	$ 95
		Material:	$	375	$ 315
		Total Crew Days:		7.5	6.3
		Total Person Days:		15.0	12.6
		Cost/Unit of Inv:	$	1933	$ 1624

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	6.3

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (19/HR)		EQUIPMENT (2/HR)		MATERIAL (50/DAY)	
1130 MOT VEH OP	1.0	3010 PICKUP-2WD	1.0	5620 MISC TRAFFIC MT	50.0
1160 LABORER	1.0				

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		——1——	——2——	——3——
9100	YEAR		EA			
	INVY	1.00				
	SL	150.00				

TOTAL INVENTORY=	1.00	DES. EQUIV. SL.=	150.00	AWQD=	150.00
		PLN. EQUIV. SL.=	125.00	AWQP=	125.00

Activity: 6290 GEN SNOW/ICE CONTROL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1.00 EA				
Daily Prod:	30.00 PER HRS				
Hours/Act Day:	10.0	Service Level:		150.00	150.00
Cost/Crew Day:	$ 567	Annual Work Quantity:		150.00	150.00
Cost/Unit of Work:	$ 19	Total Cost:	$	2,837	$ 2,837
Standard Crew Size:	3.0	Labor:	$	1,707	$ 1,707
Deviation Level:	20 %	Equipment:	$	780	$ 780
		Material:	$	350	$ 350
		Total Crew Days:		5.0	5.0
		Total Person Days:		15.0	15.0
		Cost/Unit of Inv:	$	2837	$ 2837

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
.0	.0	1.0	1.0	1.0	1.0	1.0	.0	.0	.0	.0	.0	5.0

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (34/HR)		EQUIPMENT (16/HR)		MATERIAL (70/DAY)	
1120 ENG EQUIP OP	1.0	3220 ROAD GRADER	1.0	5430 SAND	10.0
1130 MOT VEH OP	1.0	3040 DUMP TRUCKS-5YD	1.0		
1160 LABORER	1.0				

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		—1—	—2—	—3—
9100	YEAR		EA			
	INVY	1.00				
	SL	150.00				

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 150.00 AWQD= 150.00
PLN. EQUIV. SL.= 150.00 AWQP= 150.00

Activity: 7110 HAUL TRASH/GARBAGE
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	2.00 EA				
Daily Prod:	3.00 TRUCK LD				
Hours/Act Day:	10.0	Service Level:		200.00	150.00
Cost/Crew Day:	$ 269	Annual Work Quantity:		400.00	300.00
Cost/Unit of Work:	$ 90	Total Cost:	$	35,804	$ 26,860
Standard Crew Size:	1.0	Labor:	$	19,808	$ 14,860
Deviation Level:	20 %	Equipment:	$	15,996	$ 12,000
		Material:	$	0	$ 0
		Total Crew Days:		133.3	100.0
		Total Person Days:		133.3	100.0
		Cost/Unit of Inv:	$	17902	$ 13430

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
8.3	8.3	8.3	8.5	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.2	100.0

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (15/HR)		EQUIPMENT (12/HR)		MATERIAL (0/DAY)
1120 ENG EQUIP OP	1.0	3061 GARBAGE TRUCK	1.0	

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL	—1—	—2—	—3—
7110	GARBAGE TRUCK	EA			
	INVY	2.00			
	SL	200.00			

TOTAL INVENTORY= 2.00 DES. EQUIV. SL.= 200.00 AWQD= 400.00
PLN. EQUIV. SL.= 150.00 AWQP= 300.00

Activity: 7120 MAINTAIN LANDFILL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

			Desired	Planned
Feature Inv:	40.00 ACRE			
Daily Prod:	10.00 PER HRS			
Hours/Act Day:	10.0	Service Level:	6.00	6.00
Cost/Crew Day:	$ 477	Annual Work Quantity:	240.00	240.00
Cost/Unit of Work:	$ 48	Total Cost:	$ 11,443	$ 11,443
Standard Crew Size:	1.0	Labor:	$ 3,566	$ 3,566
Deviation Level:	20 %	Equipment:	$ 7,877	$ 7,877
		Material:	$ 0	$ 0
		Total Crew Days:	24.0	24.0
		Total Person Days:	24.0	24.0
		Cost/Unit of Inv:	$ 286	$ 286

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	24.0

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

LABOR (15/HR)		EQUIPMENT (33/HR)		MATERIAL (0/DAY)
1120 ENG EQUIP OP	1.0	3420 BULLDOZER	.5	
		3410 SCRAPER	.5	

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

CODE	NAME	TOTAL		—1—	—2—	—3—
7120	LANDFILL		ACRE			
	INVY	40.00				
	SL	6.00				

TOTAL INVENTORY= 40.00 DES. EQUIV. SL.= 6.00 AWQD= 240.00
PLN. EQUIV. SL.= 6.00 AWQP= 240.00

Activity: 9100 SUPERVISION
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1.00 EA				
Daily Prod:	10.00 PER HR				
Hours/Act Day:	10.0	Service Level:		1,500.00	1,500.00
Cost/Crew Day:	$ 165	Annual Work Quantity:		1,500.00	1,500.00
Cost/Unit of Work:	$ 17	Total Cost:	$	24,780	$ 24,780
Standard Crew Size:	1.0	Labor:	$	22,530	$ 22,530
Deviation Level:	20 %	Equipment:	$	2,250	$ 2,250
		Material:	$	0	$ 0
		Total Crew Days:		150.0	150.0
		Total Person Days:		150.0	150.0
		Cost/Unit of Inv:	$	24780	$ 24780

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
12.5	12.5	12.5	12.6	12.7	12.6	12.6	12.4	12.4	12.4	12.4	12.4	150.0

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (15/HR)	EQUIPMENT (2/HR)	MATERIAL (0/DAY)
1110 MNT GEN FRMN-EW 1.0	3010 PICKUP-2WD 1.0	

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		1	2	3
9100	YEAR		EA			
	INVY	1.00				
	SL	1500.00				

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 1,500.00 AWQD= 1,500.00
PLN. EQUIV. SL.= 1,500.00 AWQP= 1,500.00

Activity: 9200 ADMIN/LV/TRNG
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

				Desired	Planned
Feature Inv:	1.00 EA				
Daily Prod:	120.00 PER HR				
Hours/Act Day:	10.0	Service Level:		4,000.00	4,000.00
Cost/Crew Day:	$ 1369	Annual Work Quantity:		4,000.00	4,000.00
Cost/Unit of Work:	$ 11	Total Cost:	$	45,571	$ 45,571
Standard Crew Size:	12.0	Labor:	$	45,571	$ 45,571
Deviation Level:	20 %	Equipment:	$	0	$ 0
		Material:	$	0	$ 0
		Total Crew Days:		33.3	33.3
		Total Person Days:		399.6	399.6
		Cost/Unit of Inv:	$	45571	$ 45571

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CD Total
2.8	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.7	33.3

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

LABOR (137/HR)		EQUIPMENT (0/HR)	MATERIAL (0/DAY)
1120 ENG EQUIP OP	3.0		
1130 MOT VEH OP	3.0		
1110 MNT GEN FRMN-EW	1.0		
1160 LABORER	3.0		
1170 RR MNT OP	2.0		

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

CODE	NAME	TOTAL		——1——	——2——	——3——
9100	YEAR		EA			
	INVY	1.00				
	SL	4000.00				

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 4,000.00 AWQD= 4,000.00
PLN. EQUIV. SL.= 4,000.00 AWQP= 4,000.00