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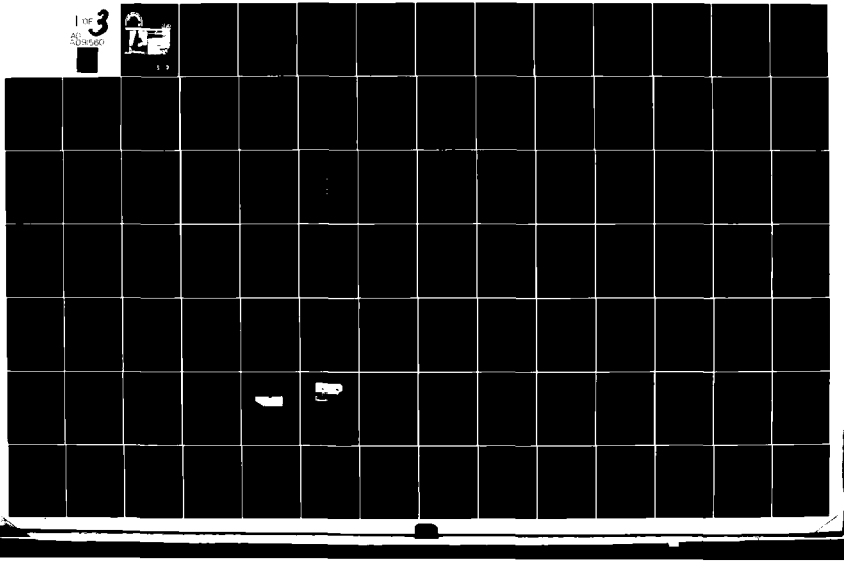

RECREATION RESEARCH PROGRAM

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DEVELOPMENT OF A METHODOLOGY FOR PREPARING PERFORMANCE STANDARDS FOR OPERATION AND MAINTENANCE ACTIVITIES AT CORPS OF ENGINEERS RECREATION AREAS

(3)

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The quantity and quality of operation and maintenance (O&M) activity at U. S. Army Corps of Engineers Civil Works Projects can be significantly increased through systematic application of work performance standards. This report identifies and evaluates criteria for preparing operation and maintenance standards. Existing Corps procedures, those used by other agencies, and potentially useful new procedures are evaluated and incorporated into recommended procedures.

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A methodology is described and illustrated for local preparation of O&M standards. Supporting rationale and optional techniques and sources of information are suggested for completing components of individual O&M standards. Example standards, developed from surveillance of maintenance activities at Corps projects, are illustrated.

A quality control plan is recommended for assuring that O&M activities performed by contractors adhere to Corps-established criteria. Performance inspections, time frames of inspections, and identification of personnel to perform inspections are discussed. Options are examined for recouping costs of unsatisfactorily completed work. Recommendations are given for implementing a standards program and furthering the Corps' research on this topic.

PREFACE

This report presents a methodology for preparing operation and maintenance performance standards for activities at Corps of Engineers recreation areas and was developed by the University of Southern Mississippi. A methodology, supporting rationale and optional techniques for completing the components of individual operation and maintenance standards are presented. The study was conducted under contract with the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, Contract No. DACW 39-79-M-2606.

Dr. Walter H. Bumgardner, Associate Professor, University of Southern Mississippi, was the Principal-In-Charge of this study.

Mr. Larry R. Lawrence (WES) was the project monitor and Mr. William J. Hansen was Recreation Research Team Leader. Dr. Adolph Anderson, WES, was program manager of the Environmental Laboratory (EL) Recreation Research Program. The study was supervised by Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL, and under the general supervision of Dr. John Harrison, Chief, EL.

Col. John L. Cannon, CE, and Col. Nelson P. Conover, CE, were Commanders and Directors of WES during this study. Technical Director was Mr. F. R. Brown.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
inches	2.54	centimetres
feet	0.3048	metres
yards	0.9144	metres
miles (U. S. statute)	1.609347	kilometres
square feet	0.09290304	square metres
square yards	0.8361274	square metres
acres	4046.873	square metres
cubic yards	0.7645549	cubic metres
ounces (mass)	0.02834952	kilograms
pounds (mass)	0.4535924	kilograms
tons (mass)	907.1847	kilograms
pints	0.0004731765	cubic metres
quarts	0.0009463529	cubic metres
gallons	0.003785412	cubic metres

INTRODUCTION

Concern over the efficiency and effectiveness with which government services are delivered is higher today than at any previous time. Administrative efforts to reduce the Federal budget have resulted in increased pressure on all Federal Agencies to rely more on the private sector for goods and services. Circular No. A-76, released March 29, 1979, by the Office of Management and Budget (OMB) reaffirmed the Government's general policy on increasing this reliance.

Upon implementing OMB's, Circular A-76 the U.S. Army Corps of Engineers will be required to use more rigid and detailed guidelines when determining whether certain maintetenance services should be performed under contract or with in-house resources.

There are other factors related to determination of the most efficient and effective utilization of Corps resources. The present level of contracted operation and maintenance (O&M) activities at the 440 Corps projects ranges from none to practically all activities. The number of permanent and temporary maintenance personnel employed by the Corps during 1977 exceeded operations personnel by less than 10 percent. In other Federal agencies with similar responsibilities for providing recreational opportunities, the number of maintenance personnel employed frequently

exceeds operations personnel by substantially larger percentages. Although the Federal Government has attempted to minimize payroll expenses and personnel, spaces are becoming increasingly limited; the Corps Civil Works program is nevertheless increasing in complexity as more projects become operational. The emerging trend is toward increased contracting for O&M services.

Little information is available on services which are most amenable to contracting in terms of cost, utilization of manpower, resources, contract administration, and performance. Information is needed to determine the criteria for effective (O&M) service contracting and minimizing in-house resources required for contract administration and monitoring. The U.S. Army Engineer Waterways Experiment Station (WES) has initiated a comprehensive research program to provide this information.

The research project reported herein developed a methodology for preparing O&M standards applicable to monitoring the quantity and quality of in-house as well as contractual work. A methodology, supporting rationale, and optional techniques for completing the components of individual O&M standards are presented. Examples of standards, developed from information and data collected at four Corps reservoirs, are illustrated. Options are discussed for recouping costs of unsatisfactorily completed work.

Recommendations are given for implementing a standards program and furthering the Corps' research in this area.

SCOPE OF WORK, OBJECTIVES, AND METHODOLOGY

Scope of Work

The research project reported herein is one of six elements in a comprehensive WES project, "Cost Efficiency of Methods of Operating and Maintaining Corps Recreation Areas," (Recreation Research Program Work Unit No. 31640). The overall purpose of the cost efficiency project is to identify information collection techniques and procedures that will optimize maintenance performance in Corps recreation areas through in-house and contractual services. It was precipitated largely by the trend toward more maintenance by contract and the need for more efficient and effective utilization of in-house resources. The six interrelated elements of the project include (a) identification and evaluation of current approaches, (b) cost documentation, (c) development of a methodology for preparing performance standards, (d) development of model contract procedures, (e) summary and recommendations, and (f) preparation of a user manual.

This particular study addresses element (c) -- development of a methodology for preparation of performance standards for operation and maintenance activities at Corps recreation areas.

Objectives

The primary objective of this study was to provide information for project management personnel on the preparation and utilization of performance standards for both in-house and

contractual maintenance. The intention was to produce a methodology which would be sufficiently general for Corps-wide application, yet specific enough for use in measuring performance.

The study required identification and evaluation of current approaches to the development of performance standards. Recommended procedures were to incorporate, where appropriate, existing Corps procedures, procedures followed by other agencies, and suggested new procedures.

The University of Southern Mississippi (USM) Department of Recreation agreed to develop guidelines for ensuring that operation and maintenance activities performed by contractors adhere to criteria established by the Corps. Suggestions for maintaining quality control, such as performance inspections, and scheduling of inspections were also to be included.

The methodology was also intended to become a tool for enhancing the visual appearance as well as the functioning of the various types of Corps recreation areas (e.g., visitor centers, campgrounds, beaches, boat ramps, restrooms, shower houses, and playgrounds). Activities that were to be addressed include: (a) mowing and grounds maintenance; (b) refuse removal; (c) restroom cleaning and maintenance; (d) building and facility maintenance; (e) road maintenance; (f) plumbing and electrical services; (g) equipment maintenance; (h) user surveys; (i) gate keepers; and (j) operation of sanitary treatment facilities. It was decided by USM personnel and WES

representatives that user survey and gate keeper activities would not be addressed because they are peripheral to the central focus of the study.

Methodology

From the outset there was close coordination of the project with WES personnel. Several meetings were held to discuss the research goals, objectives, and procedures. One outcome of those meetings was the selection by the WES coordinator of four Corps projects for analysis and case study to augment the research project. The Corps projects selected were: Garga--Little Elm Reservoir, also referred to as Lewisville Lake, located near Dallas, Texas; Lake Barkley, near Paducah, Kentucky; Stockton Lake, near Stockton, Missouri, and West Point Lake near Atlanta, Georgia. Several factors led to selection of these particular sites. They are characterized by maintenance of recreation areas and facilities typical of many Corps projects: two are located near major metropolitan areas and two are located in rural areas; two of them carry out a large part of their maintenance by contract and two use primarily in-house personnel.

Another outcome of those initial meetings with WES personnel was the coordination of the performance standards study with the cost documentation element. Data collection at the four sites for the cost documentation study was to be useful in the performance standards element as well. The investigators of the two project elements and the WES coordinator worked out details on the type and format of data that would be collected to document cost.

The objectives of the cost documentation element of the study were:

a. To design and develop a methodology for the capture of costs associated with providing for the operation maintenance of Corps recreation areas.

b. To develop computer programs for the organization, analysis, and presentation of O&M cost data.

c. To assess management strategies of contractual and non-contractual maintenance work activities.

d. To develop a prototype maintenance management system for use by resource managers in the planning and controlling of contractual and noncontractual work.

The WES coordinator also arranged for investigators of the two research elements to meet with the individuals responsible for day-to-day planning and management of O&M activities at the four Corps projects. The team of three then visited the projects, discussed the research elements, arranged for data collection, and reviewed current O&M procedures.

Subsequently, this investigator returned to the four sites for further analysis and review of O&M activities. At each site the following four tasks were completed:

a. Management personnel and maintenance foremen were interviewed on indicators of quality performance for the primary maintenance activities being considered.

b. Existing O&M contracts were reviewed and local experiences with enforcement of contracts were discussed.

c. O&M procedures (in-house and contractual) were examined. The use of standards was discussed and the local use of reference material was reviewed.

d. Onsite inspections of maintenance work in progress were conducted and photos were taken of a representative sample of conditions found.

In addition to the review, analysis, and data collection efforts that were completed with Corps personnel, an extensive effort was made to gather secondary information. Contacts were made with personnel in the U.S. Department of the Interior and information was received from the National Park Service and the Bureau of Land Management. Material was also received from the U.S. Forest Service. Numerous contacts were made and information obtained from State, county, and municipal agencies as well as private consultants. A substantial amount of information was also obtained from the Department of Housing and Urban Development and the Urban Institute. Contacts were made and material was received from the officials in the Departments of the Air Force (USAF) and the Navy. Several individuals who were working on similar projects that potentially relate to this project ware contacted. These are listed below:

a. David L. Muzio, Lt. Col., USAF
Air Force Medical Management Engineering Team (AFMEA)
Maxwell Air Force Base, Alabama 36112

b. Mr. Barney Lewis (Code 1001)
Commander Facilities Engineering Command
200 Stoval Street
Alexandria, Virginia 22332

c. Mr. Dave Williams
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Norfolk, Virginia 23511

d. Mr. Edward Collins
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e. Mr. Harry P. Hatry
The Urban Institute
2100 M Street, N.W.
Washington, D.C. 20037

f. Mr. Paul Epestein
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, D.C. 20410

In preparing this report, a thorough review was made of the current levels of attention being given to the contracting of O&M services, productivity assessment, techniques for preparing and utilizing performance standards, and quality control measures. Literature was reviewed and several case studies examined. Previous work by the author on procedures for preparing maintenance standards was reevaluated, tested, and further refined for incorporation in this report.

BACKGROUND OF PARK AND RECREATION O&M STANDARDS

The history of the development of park and recreation maintenance standards is unclear for several reasons. One reason is that very little research has been conducted to date. The need for performance measurement, quality control, and effects assessment has largely resulted from the austere funding experienced by public agencies during the last five years. Another reason has been the lack of interest by academicians. However, this seems to be changing as a result of the attention directed toward the need for improved park maintenance. An example of the increasing attention is found in a recent statement by Chris Delaporte, Director of the Heritage Conservation and Recreation Service (Department of Interior). Soon after taking office, Delaporte stressed his obligation to "be an advocate and to advise the Assistant Secretary and the Secretary that minimum standards of maintenance be instituted in this Department for its outdoor recreation facilities."[1]

The present state of the art of developing maintenance standards has been influenced by three fields: landscape architecture, industrial engineering, and personnel management. Landscape architecture gave rise to park administration and grounds maintenance. Park administration is the major force contributing to the development of maintenance standards for recreation areas today.

One of the earliest references to park maintenance standards is found in Conover's classic Grounds Maintenance Handbook first published by the Tennessee Valley Authority (TVA) in 1953[2]. In

this work Conover pointed out the need for classifying lands into categories which provide a basis for estimating appropriate levels of maintenance. The standards he proposed were primarily conditions and ways in which areas were to be maintained over a long period of time. Conover's beginnings and subsequent work by professional park managers have led to increased emphasis on qualitative aspects of maintenance standards.

The industrial management field is contributing a body of expertise to the development of maintenance standards from a more quantitative perspective. One of the key questions addressed by industrial engineers is the average length of time that certain maintenance tasks require. Their major contribution has been the refinement of techniques such as time study, work sampling, and methods time measurement (MTM) for developing Engineered Performance Standards (EPS) which are used in planning and scheduling maintenance activities. The use of EPS for deriving the quantitative element of standards is described in detail later in this report.

The third area that has influenced the present state of the art for developing park and recreation maintenance standards is the management by objectives (MBO) process. Under this concept, employer job descriptions are developed so that personnel performance is directed toward the attainment of agency objectives. Measurable personnel performance standards reflect expectations of the efficiency and effectiveness with which specific tasks are to be accomplished. Agency adoption

of management by objectives approaches has been a factor in the trend toward increased development and adoption of maintenance standards.

CURRENT STATUS OF THE DEVELOPMENT AND USE OF O&M STANDARDS

Before a widely acceptable methodology can be established for the preparation of O&M standards there must be common agreement on what these standards are supposed to represent. The intended uses, contents, and procedures for development fundamentally depend on an acceptable definition of O&M standards.

This fact as well as other very pertinent observations have been made by many individuals who have tried to prepare standards. Perhaps Ellison has summarized the current situation better than anyone when he says, "There are four major problems which make establishing park maintenance standards difficult, frustrating, and expensive."[3] He identifies these as:

a. Lack of commonly used or understood vocabulary.

b. Lack of a simple methodology which can be commonly adopted or applied without significant amounts of data.

c. Difficulty in predetermining measurable standards.

d. Failure of the types of standards currently available to address the factor or quality of the maintenance to be performed or expected.

Two of the most widely recognized authorities in the park and recreation field, Sternloff and Warren, in their book, Park and Recreation Maintenance Management, say that:

> Maintenance standards describe the conditions that will exist when maintenance tasks have been successfully completed. Maintenance standards provide a means to compare conditions as they are found by inspection or observation and the accepted standards for the particular area or facility.[4]

Another source, Gerald A. Rowe, experienced in maintenance with the National Park Service, stated that:

> Maintenance standards set forth descriptions of the work to be performed and the resources needed (personnel, equipment, materials, and money) in insure effective and economical achievement of the desired levels of maintenance.[5]

Both of these statements are relatively accurate assessments of the use and contents of maintenance standards, but are limited as operational definitions for developing a methodology. For this purpose, a better definition of park and recreation O&M standards would be:

> Description of qualitative levels to which quantified units of O&M functions should be accomplished and the associated personnel, equipment, and supplies, time, and costs.

This definition incorporates all of the basic elements identified by the sources cited. It also injects a sense of expectation relative to quality, efficiency, and effectiveness of work performance. The recommended definition is not only consistent with the suggestions of recognized authorities, it is also supported by existing standards and obvious needs for more comprehensive approaches to their formulation.

Park and recreation resource managers have developed maintenance standards mainly for keeping areas and facilities in aesthetically pleasing, clean, healthful, and safe conditions. Another motivation has been the need to ensure the proper functioning of equipment and facilities and to meet or extend their designed life expectancy. This has resulted in standards consisting largely of conditions that are expected to remain constant through the achievement of maintenance tasks as verified through periodic inspections. Typical of this approach are the early standards developed by the National Park Service

for buildings and equipment.[4] These standards reflect the need to address qualitative conditions which agencies constantly try to maintain, but omit the quantitative resources needed to attain the standard. Appendix A contains some example O&M standards.

Most of the emphasis in the development of standards has been on the quantification of time (man-hours) to accomplish units of maintenance work basic to the attainment of certain desirable conditions. The utilization of time standards has been recognized as a tool for management to assess the effectiveness of a work force; however, it is an inadequate measure of the quality of work performed. Nevertheless, time has been the key element incorporated in most standards. Examples of this approach are the time standards contained in Appendix B, prepared by the publishers of Grounds Maintenance.[6] According to the source of information, the time needed to accomplish certain tasks reportedly varies little with climate, training, and conditions of facilities, but will change as a result of adoption of simpler methods and the use of new or more efficient equipment.

Further examples of recent attempts to develop O&M standards reveal a movement to include elements other than time, such as costs, personnel requirements, material, and equipment. Appendix C contains excerpts of standards prepared by Fairfax County, Virginia, and the State of Pennsylvania. Although their standards provide details of the quantitative elements essential to good standards, they do not include qualitative

expectations. To this extent, they would be more applicable to analysis of current and future O&M costs associated with capital improvements, than assessment of quality of maintenance.

Much of the increased emphasis placed on the development and use of standards stems from a trend toward productivity measurement at all levels of government. The following few examples are typical of localized efforts in this area and some of the anticipated benefits.*

Santa Rosa, California, has analyzed its park maintenance operations and identified opportunities for improvement. Work measures have been developed and specific standards have been set and implemented.

New York, New York, has implemented a citywide park maintenance improvement program based on work standards and performance reporting.

South Bend, Muncie, Gary, and Fort Wayne, Indiana, are all involved in a work measurement study of parks and recreation services to provide a management tool for judging the efficiency of parks maintenance and for use as a basis for future management decisions.

Wilmington, Delaware, has conducted time and motion studies of its parks maintenance activities and has developed standards

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* Personal communication, Ms. Carol Mears, National Technical Information Service, U.S. Department of Commerce, Washington, D.C., 12 August 1979.

to improve overall efficiency. Implementation resulted in annual savings of $115,000 (a 27 percent savings).

San Diego, California, has developed a work scheduling system for gardening crews that reflects seasonal variations in manpower and equipment requirements. Work and performance standards for gardening foremen and journeymen have also been established.

Honolulu, Hawaii, has developed detailed descriptions of its parks and work standards for use in workload scheduling. A manual of pictures depicting the qualitative level of maintenance standards is used as a basis for regular evaluations.[7]

In the Honolulu project, standard time data obtained from U.S. Army pulbications were verified by field checks and modified to accommodate local conditions and work methods. The result was an inventory of tasks and associated time standards which formed the data base needed for a comprehensive resource allocation and scheduling program.

GENERAL FINDINGS OF PROJECT VISITS

Quality of Maintenance

The overall quality of maintenance, as determined through visual inspections and conversation with personnel at the Corps recreation areas selected by the WES coordinator, ranged from good to poor. Significant variations in quality appeared to reflect differing priorities and variations in the effectiveness of work effort.

For example, one project took great pride in the maintenance of its roads. A large portion of its attention and resources was directed toward that objective and, as a result, their roads were in much better condition than those in other projects. In another case, more effort was devoted toward grounds maintenance, grass cutting and trimming. At still another site, latrine maintenance received a proportionately higher emphasis with correspondingly good results. Latrine maintenance (particularly vault toilets) was, by comparison, poor in other instances. There was, in general, a significant lack of uniformity in the quality of maintenance at the four project sites.

Several factors appear to contribute to this situation. An absence of organized plans for maintenance that included planning, programming, and scheduling procedures was noticeable, especially with regard to in-house maintenance. Maintenance tasks seemed to be scheduled in an ad hoc manner or performed when the specific task needed to be done. In part this may

result from the lack of an organized approach to maintenance management, and in part may be attributed to insufficient maintenance staffs.

Other contributing factors were variations in tasks being completed and supplies being used. For example, at one project, the grass was neatly trimmed around buildings and trees. Sidewalks and curbs were edged after areas were mowed. At another project, there was no evidence that this was a common practice. One project was effectively using chemicals and deodorants to minimize odor in latrines; whereas, another project appeared to use no chemicals or deodorants and a third was searching for a more effective product.

Quality Control and Contract Surveillance

At all four sites, the field personnel were very interested in and supportive of this developmental research project. They willingly offered advice and opinions on ways in which it could be helpful to project management. One point on which there was consensus was the need for a full-time person to exercise quality control, conduct inspections, and monitor maintenance contracts. West Point, which does all of its maintenance by contract, has such a position (See attached Job Description, Appendix D).

The primary need expressed was for an established centralized means of carrying out these functions. Inspection responsibilities are frequently divided among maintenance foremen, rangers, and administrative personnel. The fragmented approach is partly a result of the vast size and large

distances to areas covered, and the workload placed on some maintenance is conducted by a combination of several contractors and in-house personnel.

Problems with Contractors

When questioned about project experiences with conducting maintenance by contract, the responses ranged from high satisfaction to strong dissatisfaction. Most of the dissatisfaction expressed involved two sets of related problems:

a. Unavailability of qualified contractors.

(1) This problem was more prevalent in but not limited to the Corps projects located in rural areas. In several instances it was reported that contractors did not possess the proper equipment to complete maintenance tasks in the manner and quality expected. The reported inability to specify maintenance techniques and equipment to be used by contractors was seen as an obstacle by project management personnel in preventing this situation.

(2) One limitation in seeking qualified contractors is the emphasis placed on dealing with contractors who are classified as small businesses. This reportedly prevents employment of larger contractors and sometimes results in dependence on less well equipped and less qualified contractors.

b. Nonfulfillment of Contract Specifications. This problem reportedly emanates from the difficulties of attempting to write contracts detailed and "tight" enough to enable maintenance objectives to be measured. For example, contracts stating that a task is to be performed at specified intervals and/or "as needed," often results in noncompletion to the satisfaction of project management personnel. Clauses that provide for a significant degree of discretion result in problems of compliance. An associated problem is the lack of definition of significant violation or noncompliance with a contract and lack of clarity on steps which can be taken to resolve the matter.

Attitudes About the Use of Standards

Almost all of the Corps personnel with whom the use of standards was discussed agreed that it would be beneficial. The only reservation expressed was concern over the potential increase in management workload and costs in preparing and applying standards.

There was also support for the establishment of Corps-wide standards and indicators of quality which would be helpful in determining the extent to which certain maintenance tasks should be carried out. A precedent currently exists for this possibility as exemplified by the Corps' South Atlantic District Office, Standard Operating Procedures (see Appendix E).

METHODOLOGY FOR DEVELOPING O&M STANDARDS

The methodology presented herein consists of a series of procedural steps designed to enable maintenance managers to systematically formulate, organize, and present information in a format illustrating local operation and maintenance standards. In other words, it contains the guidelines for describing the desired qualitative levels at which maintenance functions are expected to be accomplished and the resources characteristically required for carrying out these functions. The methodology has been developed on the premise that, for realizing maximum utilization and effectiveness, standards should be developed at the local level through the routine application of prescribed procedures and processes. The methodology consists of the following general steps for formulating and maintaining O&M standards:

a. Development of a land use/maintenance classification system.

b. Classification of areas and facilities according to the classification system.

c. Inventory of areas, facilities, and equipment.

d. Identification of key result areas (major functional groups of maintenance tasks) for which individual standards will be developed.

e. Collection of data and application of a formula that prescribes the component elements of a standard.

f. Presentation and illustration of the standard.

g. Local application and regular updating of the standards.

The application and utility of the methodology is shown in Figure 1. What follows is a step by step description of how to work through the methodology to prepare standards like those presented in Appendix A.

Development of a Land Use/Maintenance Classification System

Because of the great variations which exist among land uses and the maintenance required to facilitate those uses, it is necessary to classify and record areas and facilities on some systematic basis. One of the primary purposes of developing a classification system is to determine the scope and variety of resources for which O&M standards will apply. It also serves as a means of identifying the levels and intensity of maintenance required by types of existing development. In essence, when attempting to develop an O&M standards system for a Corps project, one must start by assessing the resources that the system will pertain to and organizing the information in a logical manner.

For developing a classification system, it is recommended that the Corps' existing land-use allocations system, prescribed by Change 3 to Engineer Regulation 1120-2-400, dated 12 February 1976, be utilized to account for local land use and development characteristics. At present, the Corps' allocation system identifies the following categories of land use: (a) project operations, (b) recreation-intensive use, (c) recreation-low density use, (d) natural area, (e) wildlife management, (f) reserve forest land, (g) intensive forest management, (h) recreation lands, and (i) fish and wildlife lands. Examination of the descriptions provided for each of these categories reveals that additional criteria are needed when making

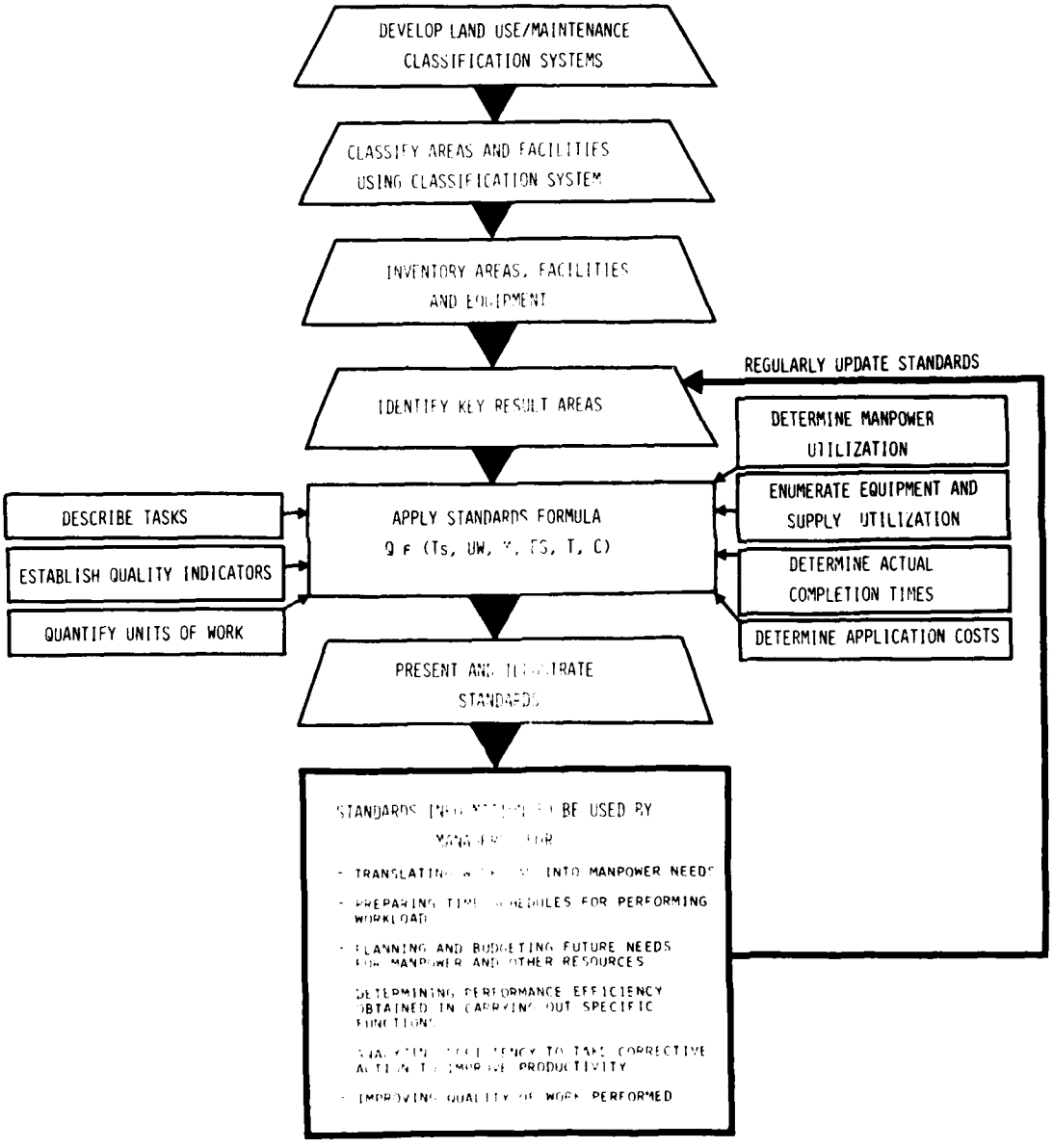

Figure 1

Illustration of methodology for developing and using O&M standards

classification decisions. While recognizing that each category will have to be expanded with appropriate criteria indicative of local maintenance requirements, the two categories for which the majority of O&M standards would most likely pertain are the recreation--intensive use and recreation--low density use areas.

The following are recommended revisions and expansions of criteria pertaining to these two classifications which could be used when developing classification systems.

Operations: recreation--intensive use

This level is defined as follows:

> Lands used for project operations and allocated for use as developed public use areas for intensive recreational activities by the visiting public, including areas for concession and quasi-public development. No agricultural uses are permitted on these lands except on an interim basis for terrain adaptable for maintenance of open space and/or scenic values.

The main distinguishing characteristics of this land use/maintenance category should be that it (a) represents the recreational areas most heavily used by the public, (b) possesses the most development such as parks, campgrounds, beaches, playgrounds, and boat launching facilities, and (c) receives the highest level and intensity of maintenance. Additionally, recommended criteria distinguishing this category are:

a. Regularly scheduled litter pickup and refuse removal.

b. Regularly scheduled grass mowing and trimming around trees, shrubs, curbs, and other structures.

c. Regularly scheduled janitorial or facilities cleaning program.

d. Caretakers assigned to areas, such as campgrounds, during the heaviest user or growing season.

e. Intensive weeds, trees, and turf management program.

f. Vector control program.

Operations: recreation--low density

This level is defined as follows:

> Land acquired for project operations and allocated for low density (often passive) recreation activities by the visiting public and required as open space between intensive recreational development and land which, by virtue of use, is incompatible with recreational development and would detract from the quality of the public use. Such incompatible land may be located either on the project or adjacent to the project. Land required for ecological workshops and forums, hiking trails, primitive camping, or similar low density recreational use available for a significant role in shaping public understanding of the environment will be under this classification. No agricultural uses are permitted on this land except on an interim basis for terrain adaptable for maintenance of open space and/or scenic values.

The main distinguishing characteristics of this land use/maintenance category should be that it (a) represents recreational areas which are the least heavily used by the public, (b) possesses minimum development such as improved or unimproved roads, trails, or walkways and latrines, and (c) receives a comparatively low level and intensity of maintenance. Additionally, recommended criteria distinguishing this category are:

a. Infrequent or periodic litter pickup and refuse removal.

b. Infrequent or no grass mowing. No grass trimming or infrequent selective trimming around trees, shrubs, curbs, and other structures.

c. Infrequent or only periodic facilities cleaning. No janitorial program.

d. No regularly assigned caretakers to the areas.

e. Weeds, trees, and other vegetation managed primarily in a natural state.

f. Minimum or no vector control.

In addition to the criteria suggested above, classifiers may wish to establish other relevant criteria indicative of local maintenance systems. Other class categories such as wildlife management would be clarified and expanded to meet local needs. After all of the classification categories have been completed, each category would be assigned a permanent numerical code starting with 1 and ending with the number that is inclusive of all class categories in the system. For consistency between projects, it is recommended that numerical codes assigned should correlate sequentially with the alphabetic designations contained in Change 3 to Engineer Regulation 1120-2-400, dated 12 February 1976, e.g. a-1, b-2, and so forth.

Classification of Areas and Facilities According to The Land Use/Maintenance Classification System

Once the classification system has been developed, categories described and numbered, and distinguishing criteria determined, the standards developer should proceed to classify all project areas and facilities according to the system.

As a rule of thumb, classification decisions should be based on the majority of criteria to which logical grouping of areas and facilities conform. In other words, using the classification system as a checklist, through visual analysis and review of maintenance practices, areas should be assigned the class designation consistent with the largest number of criteria representative of each area or facility. It is forseeable that with varying local characteristics, there will be different areas classified within areas.

Given the information available, the classifier should designate the land use/maintenance classification of all project

lands and facilities on a base map. A master list should be compiled and included as a key to the map or an addendum that identifies the number of areas and facilities in each classification category.

Inventory of Areas, Facilities, and Equipment

The importance of developing a complete and accurate inventory of areas, facilities, and equipment cannot be overstated. This information will be necessary for data collection, determination of work volume, computation of productivity, keeping track of government property, and other essential management tasks. Most importantly, it will be used in establishing specific O&M standards.

Areas and facilities When inventorying areas and facilities, the land use/maintenance classification system should be used as the guide for unit location and identification. The amount and size of areas and facilities within each classification category should be inventoried and tallied. Standard units of measure should be used for computations. It is recommended that the following units be used uniformly:

Open Space	-	Acres
Roads	-	Linear miles
Buildings & structures	-	Square feet
Campgrounds	-	Acres and number of campsites or pads
Beaches	-	Square yards
Trails	-	Linear miles
Electrical hookups	-	Number of units

Road shoulder	-	Square yards
Picnic area	-	Acres and number of tables
Lighting system	-	Number of lights
Parking lots	-	Square yards
Boat ramps	-	Square yards
Trash bins	-	Number of containers
Playgrounds	-	Acres and number of apparatuses
Athletic fields	-	Number of each type of field

Sources of information to be used for area and facility inventory include real property records, as-built drawings, and installation or construction contracts. Field verification of totals and quantities will be necessary where information is unavailable, incomplete, or inaccurate. When completed, the area and facilities inventory should establish a permanent record of classification categories, descriptive nomenclature of areas or facility, and totals of numbers and/or sizes.

Equipment The existing system prescribed by Engineer Regulation 735-2-1 "Property Accountability - Civil," dated 6 September 1978, provides for equipment inventories that will be needed. The Corps' District Offices send "annual property accountability inventories" to projects that identify each of their equipment items by individual numerical codes and corresponding nomenclature. Total quantities for each equipment category and acquisition costs are also contained on inventory listings.

Identification of Key Result Areas

Having completed the inventory and classification of areas, facilities, and equipment, the standards developer is prepared to proceed to the next step of the methodology--identification of key result areas (KRAs). Key result areas may also be referred to as O&M functional areas; however, in either case they represent the systematic grouping of maintenance processes considered essential or key to a complete effective O&M program.

Key result areas should not be confused with physical areas per se. Although commonly focusing on physical areas or facilities, KRAs are best viewed as groupings of O&M tasks or activities. The purpose of identifying key result areas is to narrow down groups of tasks or activities that would form a logical basis for a standard. Thus, the outcome of identifying key result areas decides the general task performance for which individual standards will apply.

When identifying key result areas (standards topics), the developer should refer to the classifications tabulation and the areas and facilities inventory. With this information, he is prepared to formulate a list of pertinent maintenance tasks and activities. The list need not be exhaustive, but it should cover most of the activities involved in seasonal operations and maintenance. As a rule of thumb, "consultants with expertise in this area generally agree that about 75 to 80 percent of the real property maintenance and repair work should be covered by standards."[8]

With the list of O&M activities, the standards developers should proceed to deductively group them into major functional areas

in a manner that is consistent with normally scheduled work. In some cases, however, it may be locally desirable to subdivide some of these groups into separate functions. For example, hand trimming around vegetation and structures may be considered as an inherent part of scheduled grass mowing, or, because of local priorities, it may be singled out as a special function worthy of developing an individual standard. Another example would be litter pickup as it relates to trash removal. If these tasks are normally conducted as separate and distinct functions, then individual standards would be appropriate. If they are carried out as interrelated functions, and especially if done by the same personnel, then a single standard would be more appropriate.

Grouping maintenance tasks into key functions has been described as the fundamental technique for determining what standards should be developed. For further classification of how to proceed in deciding on appropirate standards topics, the following guidelines are suggested:

a. Standards should be developed around routine and recurring O&M activities.

b. Standards should be developed for functions whereby descriptions can be clearly made of what the standard is intended to prescribe and measure. Reasonably easy and accurate measurements of work units, man-power requirements, equipment and supplies utilized, time period of completion, and costs are essential.

c. Standards are best developed around O&M functions that are conducted repeatedly by personnel with the same position classification or skill levels such as laborer, equipment operator, and so forth.

d. Standards should be prepared for O&M functions that require a challenging, realistic (sufficiently high, but not too high) level of worker and equipment performance.

e. Standards are best developed for functions whereby the same types of equipment and supplies are routinely used.

f Standards are best developed for O&M activities where quality of performance can be visually assessed. Mowing, trash removal, and brush clearing are examples that can be readily evaluated through visual inspection.

There are numerous O&M activities for which development of standards could prove beneficial. Engineered standards (performance completion times) are typically prepared by work planners throughout the Department of Defense for most of the skilled trades such as, plumbing, electrical work, welding, painting, masonry work, and so forth. For the purposes of developing standards concerning the two main classification categories of Corps recreation areas (high intensity and low intensity use), standard's topics might best be limited to routine O&M activities performed on roads, grounds, and facilities. The following is a list of topics which are considered highly recommended or potentially desirable for development of performance standards of Corps recreation areas.

Highly Recommended	Potentially Desirable
Facilities cleaning	Brush clearing
Janitorial work	Tree removal
Litter pickup	Tree planting
Refuse removal	Tree/shrub maintenance
Grass cutting	Watering and irrigation
Grass trimming	Snow removal
Beach cleanup	Vector control
Road repair and maintenance	Sign construction
Equipment and vehicle servicing	Sign replacement
Plumbing system maintenance	Trail clearing
Electrical system maintenance	Facilities repair
Sanitary treatment facility operation	Shoreline cleanup

Application of Standards Formula

Having completed the four previously described steps of the methodology, the standards developer is prepared to apply a

formula that enables identification and description of the components of individual O&M standards. The formula is based on the need for information for prescribing and evaluating O&M work. It represents an expansion and improvement of recent attempts by public agencies to formulate procedures for preparing standards, e.g., Commonwealth of Pennsylvania, 1979.[3] It is also based on proven industrial engineering techniques such as those used by the armed forces for planning and estimating work loads (Army TB 420-32). Furthermore, it is consistent with industrial techniques for work measurement and improvement of productivity (National Commission on Productivity and Work Quality).[9]

Description of formula components

The formula incorporates all of the factors considered essential for describing the qualitative levels at which specific O&M tasks are to be performed. Represented by Qf (Ts, UW, M, T, ES, C), the formula is interpreted as: quality is a function (Qf) of tasks (Ts), unit of work (UW), manpower (M), time (T), equipment and supplies (ES), and cost (C). It is not a statistical formula, although it could potentially be developed into a regression equation.

To further clarify the application of the formula, descriptions of each component are provided below:

a. Quality: A description of the condition expected upon completion of the work. Quality is a derivative of many factors such as considerations of aesthetics and orderliness, health and cleanliness, safety, properly functioning equipment and facilities, as well as conservation and sound environmental practices.

b. Tasks: A combination of the operations and activities required to accomplish the work defined in the task descriptions. To the extent feasible, this includes a description of the processes and procedures that are the most efficient and effective for completing the work.

c. Unit of Work: The quantification, in standard units of measurement, e.g., individual numbers, acres, miles, square feet, square yards, of the amount (volume) of work for which the standard applies.

d. Manpower: The identification of the number and classification of personnel that it would take to accomplish the tasks within the time frame alloted using the techniques, equipment, and materials specified. Where applicable, manpower identifications should coincide with commonly used craft designations.

e. Time: This represents the average time necessary for a qualified craftsman or adequately qualified individual working at a normal pace, following prescribed methods, working under capable supervision, and experiencing only normal delays to perform a defined amount of work of a specified quality. These times include all operation times constituting the tasks for each standard, but do not include job preparation, travel, or unusual delays.

f. Equipment & Supplies: The enumeration of the types, sizes, and specifications of equipment, tools, and supplies required for completing the tasks pertaining to the standard. The procedure for specifying materials should include, where applicable, a description of non-standard stock items, quantity, and applicable stock numbers and/or catalogue numbers or procurement source. Caution should be exercised to preclude identification of equipment or supplies in a manner which may be construed as advertising or which implies that the government endorses or favors a product provided by a specific supplier.

g. Cost: This represents the direct costs for personnel equipment, supplies consumed, and equipment operation. Employee benefit costs are included. Overhead costs of depreciation on equipment should be incorporated if total costs are desired.

Frequency of task completion

Upon examination of the above ocmponents proposed for O&M standards, one might logically ask why frequency of task completion has been omitted. There is a tendency by some standards developers to incorporate this factor as a component of park and recreation maintenance standards. It is recognized that frequency of task performance is a determinant of the appearance and functioning of areas, facilities, and equipment over a period of time.

However, the frequency with which tasks pertaining to specific standards are performed is dependent on numerous variables such as work priorities, seasonal visitation rates, weather, and growth patterns. For this reason, frequency of performance is regarded as a matter of work scheduling and is omitted as a component of an individual standard.

Procedures for applying formula in developing individual standards

With an understanding of the formula and its components, the standards developer should be ready to apply the formula in preparing individual O&M standards. One starts by referring back to the titling of standards (e.g. grass cutting, page 12) that were determined through grouping O&M tasks according to key result areas. Having titled a standard, the next step is to briefly list all of the inherent work tasks (Ts) pertaining to the standard's topic. Next, indicators of quality (Q) with which the tasks are to be performed are briefly described.

At this point the procedure becomes primarily that of quantifying the remaining components of a standard. The unit of work (UW) (e.g., acres of grass) for which the standard applies is identified. Next the manpower requirements (M) (e.g., number of equipment operators) are identified for performing the unit of work. Following that, average amount of time (T) e.g., 30 to 45 min) required to complete the tasks is identified. The next step is to enumerate the equipment and supplies (ES) used to complete the tasks. Last is the calculation of costs (C) involved in the application of the standard.

Alternative approaches for completion of standard components

Task identification and description. Task identification requires an understanding of the steps or operations that, when successfully completed, will lead to attainment of the specifications of a standard. Although first hand knowledge of maintenance procedures is a good, logical source of information for identifying and describing tasks, there are more efficient and effective approaches. For best results, task identification and description should be approached through first hand knowledge with the aid of a variety of secondary sources of information that are readily available. The following sources of secondary information have been examined and are recommended as useful tools for task identification and description.

a. Real Property Maintenance Activities Guide Specifications Handbooks (RPMAGS Handbooks). These handbooks contain descriptions of tasks and procedures recommended by the Corps for operations and maintenance. Frequency of task and completion specifications are presented in detail. Anyone preparing O&M standards for Corps recreation areas should have copies of the applicable handbooks. An index of those available and addresses for obtaining copies are listed in Appendix A2.

b. Books and Periodicals. H. S. Conover's Grounds Maintenance Handbook[3] is the most complete book ever written on grounds maintenance. Sternloff and Warren's textbook titled Park and Recreation Maintenance Management[4] is highly recommended for individuals responsible for maintaining Corps recreation areas. It is the most complete source of information available for planning, organizing, and conducting maintenance of park and recreation areas. It also describes in detail procedures for maintaining buildings and structures, grounds maintenance, and equipment selection and maintenance. Several periodicals that regularly present the latest sources of information on maintenance are Park Maintenance,[10] The Journal of Arboriculture,[11] and Weeds, Trees and Turf.[12]

c. Contracts for Services. Existing O&M contracts and "Information to Offers or Quoters" belonging to the Corps and other Department of Defense Agencies are valuable sources of information. These documents characteristically contain descriptions of work to be performed, specifications, and general procedures to be followed. Excerpts from two such documents examined during this study that would be of use are contained in Appendix G.

d. Manufacturer's Guides, Trade Manuals, Suppliers Literature. These sources of information often provide illustrated descriptions of techniques and procedures applicable to maintenance work. For example, the S. C. Johnson and Son Corporation has a "Modern Maintenance Handbook" showing how to maintain facilities and equipment and products.[13] Many national professional and trade associations also provide technical information.

e. U. S. Forest Service, "Cleaning Recreation Sites." This publication, prepared by the Forest Service for use by contractors, Forest Service employees, and cooperating Federal and State agencies, warrants special attention.[14] The 52-page handbook contains complete, illustrated descriptions of techniques and procedures to follow, material and equipment to use, indicators of quality, and "standards of cleaning and policing" for assessing effectiveness of work effort. Excerpts from this handbook are contained in Appendix H.

Quality. Specifying the qualitative conditions which completed maintenance tasks are expected to yield is the most difficult phase of standards development. Performance values are necessarily based on subjective assessments. One factor which complicates the establishment of indicators for maintenance of recreation areas is the necessity of using visual appearance as the primary mode for assessing quality.

Nevertheless, establishment of valid and reliable indicators of quality assessment is of utmost importance to the development and application of performance standards. The Air Force has developed the most comprehensive guidelines reviewed in this study for establishing quality performance indicators (AF Regulation 400-28; Draft, dated 1 June 1979).[15] The following

synopsis of these guidelines, prepared primarily for development of Air Force base level service contracts, would be appropriate in development of Corps O&M standards for contractual as well as in-house maintenance.

Quality indicators should be developed so that realistic demands can be placed on the performers. Indicators should be appropriate for effective incorporation in a "quality assurance surveillance plan" and/or be useful as quality control and reporting measures. It is therefore important that quality indicators accurately correspond to the tasks described in the standard.

Quality performance indicators must be characteristic of task outputs that can be measured. Subjective measures alone will not suffice and indicators of quality must include quantified measurements that are applicable to quality. Care must be taken to choose quantifiable performance indicators that are realistic. The grams of dust per square centimeter on a picnic table may be a measurable performance indicator for cleaning picnic tables, but this would not be a realistic indicator for general use. In this case, reliance on a less satisfactory measure (such as cleanliness) which calls for subjective judgment may have to be used.

Maintenance tasks must have acceptable quality levels established. An acceptable quality level should rarely be 100 percent, for this indicates perfect performance which may be very expensive, nearly impossible to achieve, and often unrealistic. Acceptable quality levels should equal, but not exceed, the expectations generally met when the Corps provides the in-house service. Acceptable quality levels should be based on allowable degrees of variations from the expected norm.

Sources of quality indicators include the materials provided, reference for the identification of work tasks, Corps directives regulating the service, managerial desires, or command imposed quality levels. Examples of quality levels are found in a recent study undertaken by the city of Honolulu to develop park and recreation performance improvement measures which resulted in the identification of the degrees, i.e., excellent, good, fair, and poor, to which tasks can be completed. Verbal descriptions keyed to photographs were used as the basis for appearance standards. The descriptions, contained in Appendix I, are recommended as good examples for analysts determining appropriate qualitative levels and allowable degrees of variation from expected norms.

Support for this approach is contained in a recent study by the Urban Institute.[16] In developing techniques for assessing the overall effectiveness of refuse collection and street and alley cleaning programs for the District of Columbia, a set of photographs was developed to illustrate visual rating levels for use in prescribing work quality.

Units of work. There are few special guidelines for prescribing units of work, other than they should be based on standard units of measurement and used consistently. Selection of appropriate units may vary according to the types of tasks to be performed and local physical conditions, such as location and configuration of parks and recreation sites.

Another factor that should be considered in specifying units of work measurement is the relationship to the element of time.

For example, in specifying the work units for refuse collection using rear-loading packer trucks and three-man crews, one could consider several alternatives:

a. Route miles (associates travel time per mile for the total route).

b. Numbers and types of containers collected (associates time per individual site).

c. Volume of refuse (associates time per ton or cubic yard of refuse collection).

The best indices available for selecting units of measurement are the standard units included in Engineered Performance Standards Handbooks. See Appendix J for a list of references.

Manpower. Determination of manpower requirements is primarily based on the time necessary for completing given maintenance tasks. Since much of O&M work at Corps reservoirs is accomplished by crews, guidelines contained in the Planner and Estimators Workbook (Army TB 420-32) would be applicable to manpower estimates. Points to be considered include:

a. Normal size of work crew--e.g., a craftsman and helper or individual.

b. Type of work--does task require a safety person or a certain number of people to be able to handle equipment?

c. Location and size of the job--how many people can comfortably work together without getting in each other's way? Is the work area large enough to accommodate the extra person?

d. Number of craft hours involved--how many people could properly utilize their time for a 16-hr job versus a 1600-hr job?

e. Size of work-force--depending on the number of people assigned to a given shop, how many people can reasonably be used on any one job?

Another factor which should be taken into account is the makeup of Corps work forces performing maintenance of recreation areas. From field observations, the work is being accomplished by individuals who possess multiple skills and talents. For example, individuals whose classification is equipment operator are occasionally used for a variety of other tasks. Other general maintenance personnel who are considered "jacks-of-all-trades" are used when carpentry, electrical, or plumbing problems arise. Crews are sometimes composed of seasonal unskilled or semiskilled Corps employees possessing trade and skill classifications.

Equipment and supplies. Specification of the amount and supplies can be done only after tasks and unit of work have been delineated. General Services Administration (GSA) catalogues provide listings of potential types of equipment and supplies that may be used. Corps authorization directives prescribe equipment authorized for use.

Decisions should be based on what has proven efficient and effective in the past as well as considerations of improved items intended for future use. Other factors that should be analyzed include the following:

a. Existing equipment inventories (number of units, type of models, age, and condition).

b. Services work force and employee skill levels.

c. Management's service policies.

d. Economic factors.

Time. Time, like quality of work, relates directly to the maintenance tasks prescribed by a standard. Several alternative techniques are available to the analyst preparing maintenance standards. The Federal Office of Management and Budget, in its

circular A-76, recognizes the use of time "estimates utilizing prior experience," "engineered standards," or "engineering estimates." In a recent study, Michalski identified and evaluated the following techniques for estimating times:[19] (a) historical estimates, (b) foreman's or planner's experience estimate (conventional estimate), (c) statistical slotting standards, (d) universal maintenance standards (including engineered performance standards), and (e) engineered standards. Ellison, an authority in park maintenance, recently discussed the advantages and disadvantages of using trial and error methods, historical records, statistical standards, and engineered standards. The following description is partially based on the findings and observations of Michalski and Ellison.

a. Conventional estimates. This approach, based on personal knowledge of work required, is widely used despite the availability of better techniques. It is the least reliable and is open to question and rejection by a more knowledgeable expert.

b. Historical estimates. Estimates from historical records and past experience can be used in projecting times. The disadvantage of this approach is that past records may reveal only what time the job took and not the time it should have taken. Furthermore, records applicable to new jobs being planned may not exist. Another advantage of historical records lies in the fact that they are based on past performance with older equipment and less efficient methods and are generally slow.

c. Statistical standards. Because statistical times are based on statistical data they differ from times derived from historical records. The analyst would calculate average performance time using method time measurement (MTM) or average actual times. A series of slots would then be set up so that average times for each slot would be calculated by totaling the number of jobs according to trade or job classification in each group and averaging the times. Man-hours to accomplish tasks would be expressed as ranges, e.g., 1 1/2 to 2 hr.

This approach would have merit for Corps purposes and is acceptably accurate, especially when applied to the small repetitive jobs characteristic of recreation area maintenance. It does, however, require a substantial data base.

d. Engineered performance standards (EPS). Engineered performance standards are prepared by the Navy Industrial Engineering Division and used throughout the Department of Defense. They are standard times predetermined through proven industrial engineering techniques (MTM), work sampling, and time study. Their primary use has been by planners and estimators when preparing job descriptions and determining costs. (See Army TB 420-32.)

The use of EPS as a means of determining times is accurate and reliable. Because of the representative sampling techniques employed to establish EPS times, they are also universally applicable and transferable. In a 1965 study conducted for the Navy, it was concluded that sizeable cost reductions are being realized where EPS is used and potentially larger cost reductions (34.5 percent) were probable for installations that adopt it in the future. It was also concluded that "in addition to the increase in productivity on EPS estimated jobs, experience with EPS causes conventional estimates to drop from a level of 34.5 percent too high to 17.0 percent too high, thus producing a 17.5 percent savings on conventionally estimated jobs.

It is the author's opinion that establishment of time elements through the use of EPS is another feasible alternative approach. A listing of applicable EPS handbooks is contained in Appendix J.

Costs. There are undoubtedly numerous variations of techniques applied by governmental agencies for determining costs of labor, equipment operations, supplies, and materials. After examining a representative sample of techniques, it was concluded that there are basically three general approaches that could be effectively applied in computing costs for O&M standards. They are:

a. Identifying anticipated costs by calculating estimates of salary rates, hourly equipment operating rates, and other expenses before O&M tasks are performed.

b. Systematically collecting historical data which accounts for salaries, equipment operating expenses, materials and supplies consumed, and other expenses during the periods that O&M tasks are performed.

c. Obtaining from secondary sources information such as equipment rental rates, or another agency's equipment operating rates.

What follows is a description of sources of documents and information that are recommended for applying these three approaches:

If the calculated estimates approach is chosen as a means of preparing cost components of standards, the best source of thorough and complete guidelines for doing so is contained in the "Cost Comparison Handbook," Supplement No. 1 to OMB Circular No. A-76, dated March 1979. It provides detailed instructions, forms, and examples for calculating all of the costs included in an O&M standard. Guidelines on estimating the following costs are included:

a. Material costs.

(1) Direct material costs.
(2) Material overhead.

b. Personnel costs.

(1) Direct labor
(2) Fringe benefits.

c. Operations overhead.

(1) Indirect labor.
(2) Indirect materials and supplies.
(3) Depreciation.
(4) Rent.
(5) Maintenance and repair.
(6) Support costs.
(7) Utilities.
(8) Insurance.
(9) Overtime and other premium pay.

d. Developing overhead rates.

Another very good source of guidelines and procedures for estimating costs is the "Planners and Estimator's Workbook" (Army TB 420-32). This book describes how to use Engineered Performance Standards (time estimates) for calculating anticipated

costs of work. The "Unit Price Standards Handbook" (Army TB 420-33) used in conjunction with the estimators handbook will enable the standards developer to calculate all of the costs pertinent to an O&M standard.

In developing costs through the collected historical data approach a systematic process commonly becoming known as "Workload/Cost Tracking" developed by Chrystos Siderelis from North Carolina State University is recommended. This approach was employed to collect data as a part of this study.

As explained by Siderelis, this approach accounts for "time spent by individuals doing particular jobs in the total work process. "Cost tracking is the process of recording all elements of expense associated with labor, equipment, and materials used in the performance of specific jobs within the total work process."[19]

For collecting cost data at four Corps projects, a "Workload-Cost Tracking Data Collection Handbook" was provided to project personnel who assisted with the study. Given data collection forms, field personnel were responsible for writing in the number of work applications, employee numbers or crew numbers, man-hours worked, man-hours in travel, equipment number, hours equipment was used, and estimated dollar amount of supplies. The data were centrally collected at North Carolina State University and processed through automatic data processing techniques using Fortran IV on an IBM 370/360 to facilitate data transfer to other service centers.

There are several advantages to using this approach. One is the potential accuracy of cost estimating because the data

account for actual instead of projected estimates of costs. Another is that information obtained through workload/cost tracking can be readily used as a work scheduling tool. Also, since this technique potentially involves first hand observation of work in progress, it facilitates inspection procedures and quality control over work performed. A forseeable disadvantage is the amount of time and expense involved in collecting and processing the data.

The final approach involves the use of secondary sources. Governmental interest in O&M efficiency and cost-effectiveness is expanding rapidly at all levels. A number of municipalities across the country are employing sophisticated procedures such as workload/cost tracking. A few sizeable municipal park and recreation agencies that are known to be collecting O&M cost data are: Boston, Massachusetts; Dalton, Georgia; Oskosh, Wisconsin; Dallas, Texas; Houston, Texas; Scottsdale, Arizona; and Boulder, Colorado. The Broome County Department of Parks and Recreation at Binghamton, New York, has been collecting O&M cost data since 1972.

In addition to public park and recreation agencies, a number of private companies and other governmental agencies serve as sources of information for such things as equipment operating costs. Established hourly rental rates for equipment can be obtained by writing to the following organizations:

a. United States Department of the Interior
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife
Region 4
Atlanta, Georgia 30323

b. Ford Motor Company
Tractor Operations Division
2500 East Maple Road
Troy, Michigan 48084

c. Associated Equipment Distributors
615 W. 22nd Street
Oakbrook, Illinois 60521

d. Associated General Contractors of America, Inc.
1975 E. Street N.W.
Washington, D. C. 20006

e. American Association of Nurserymen, Inc.
230 Southern Building
15th and H Street N.W.
Washington, D.C. 20005

f. Associated Landscape Contractors of America, Inc.
1750 Old Meadow Road
McLean, Virginia 22101

g. New York State Department of Transportation
Albany, New York 12204

h. North Carolina State Department of Transportation
Raleigh, North Carolina 27601

For sources of cost data pertaining to materials and supplies, the Corps' supply activity (inventory control point) could estimate issue prices for inventory items, and GSA or other suppliers' catalogues could be used for nonstocked material. Recent purchase prices of similar items could also be used. The procurement office (purchasing department) could be asked to help estimate the purchase price of special or unusual direct material items. When purchase prices are entirely uncertain, quotes may be obtained from potential suppliers.

There are basically two secondary sources of information pertaining to manpower or employee costs. Normally the skills required to perform the work tasks of an O&M standard will be classified as Wage Board (WB) and/or General Schedule (GS) level.

Wage Board rates, normally expressed as hourly rates, can be obtained from the Wage Board nearest to Corps projects. General Schedule rates are normally expressed as annual rates of pay and can be obtained through Corps personnel channels or directly from the U. S. Office of Personnel Management.

Presentation and Illustration of Standards

Presentation and illustration is an important step in the development of O&M standards. It is the phase of the methodology in which each of the formulated contents of individual standards must be communicated in an easily comprehensible format.

The format used in the example standard in Appendix A, page A1, is recommended as one style. The photograph illustrates the optimum condition such as excellent, good, fair, and poor. Another approach might be illustration of acceptable and unacceptable conditions. In either case, the use of several photographs depicting degrees of quality would seem to be the most effective means of communicating qualitative expectations. Color photographs, although more costly, would also be better than black and white, especially for illustrating such things as degrees of cleanliness.

Where space permits, it is recommended that individual standards be presented and illustrated on a single sheet of paper. Particularly when using several photographs, it may become necessary to use both sides of a sheet of paper. It is also recommended that standards be kept in a two- or three-ring notebook type binder. That will facilitate easy removal and replacement.

Local Application and Regular Updating of Standards

In order to maximize the utility of O&M standards, they must be systematically applied and regularly updated. In the long run, this becomes as important an element in the development methodology as the initial information and data collection steps.

There are numerous ways in which O&M standards can be applied. Foremost is their use as a planning, programming, and scheduling tool for determining and specifying the resources required to achieve a prescribed quality of work at any given time. That is to say, until the work specified by a standard is repeated, public use and natural processes will decrease the condition reached.

Aside from this primary application of performance standards, there are numerous other uses. The following uses are recommended by the U. S. General Accounting Office:[8]

a. Translating workload into manpower needs.

b. Preparing time schedules for performing workload.

c. Planning and budgeting future needs for manpower and other resources.

d. Determining performance efficiency attained in carrying out specific functions.

e. Analyzing efficiency to take corrective action to improve production.

Once a comprehensive set of standards has been developed, it cannot be applied indefinitely without change. Standards must be continuously evaluated and adjusted to meet local and changing circumstances. They must be periodically updated to reflect changing agency objectives or priorities, capabilities, and the nature of the resources being maintained. Maintenance

standards should be changed in accordance with improvements in workforce, proficiency, technology, mechanization, and the availability of improved supplies and equipment. It is recommended that O&M standards be updated annually.

QUALITY CONTROL PLAN

A quality control plan should be established for ensuring that O&M standards are carried out as specified. In cases where maintenance is conducted by contract, the contractor should be required to provide the contracting official at a preaward survey with a copy of his proposed quality control program. Updated copies should be provided to the contracting officer on the contract start date and as changes occur. The program should include, but not be limited to, the following:

a. An inspection system covering all of the services and maintenance tasks that are to be performed. This should specify areas to be inspected on either a scheduled or unscheduled basis and identity of the individual(s) who will do the inspecting.

b. A method of identifying deficiencies in the quality of services performed before the level of performance becomes unacceptable during the period of the contract.

c. Quality assurance measures prescribed by O&M standards which will be used by the Corps to monitor the contractor's performance.

d. A file of all inspections conducted by the contractor and the corrective action taken should be made available to the contracting officer during the period of the contract.

Performance Evaluation Meetings

The Corps project manager should meet with the designated quality control official, the contracting official, and the contractor or designated representative once a week during the first few months of the contract. Meetings should be held in, but not limited to, instances when "Contract Discrepancy Reports" are issued. A mutual effort should be made to resolve all problems identified. Written minutes should be prepared for each of

these meetings and signed by the contractor's project manager, the Corps contracting officer, and the Corps quality control official. Should the contractor not concur with the minutes he should be required to submit a written statement to the contracting officer indicating areas of disagreement.

Timing and Frequency of Inspections

A schedule of the dates, times, and locations of maintenance activities should be provided to the inspecting official. Inspection should be performed immediately after the work has been accomplished in order to obtain a true view of the resulting condition. In some cases, where facilities are closed over night or there is no use for a period of time, inspections on the following morning would be permissible. In situations where high impacting use continues as the work is being accomplished, inspections should be performed concurrently with the work. Performance evaluations must take the impact of use into consideration.

As a rule, the frequency of inspection should be proportionate to the frequency with which maintenance tasks are carried out. For example, if latrines are cleaned twice each day, seven days per week, then they should be periodically inspected twice a day, several days each week. Less frequently performed tasks should be subjected to proportionately fewer inspections.

The procedure recommended by the Air Force for selecting work for inspection is based on a random sampling procedure.[15]

During the last day of the month preceding the inspections, a table of random numbers is used to select the sample of areas and facilities to be inspected during the month. Randomly selected numbers are applied to a sequentially numbered list of parks, areas, or facilities. The sample is apportioned equally over all days of the month, including Saturdays and Sundays, when maintenance is performed on those days. After initially identifying the sampling list, it is compared with the work schedule. In instances where work is not being performed at a given site on a given day, the table of random numbers may have to be used again to predetermine inspections at times and places where work is being accomplished.

Selection and Training of Inspectors

The success of an inspection system and, consequently, of a quality control program depends largely on the effectiveness of inspectors. The Corps proposal to OMB for implementation of OMB circular A-76 stated that inspection of contract maintenance and refuse collection on recreation sites will be conducted by Corps employees.[20] The following guidelines, some of which were extracted from the Urban Institutes' study on street cleaning,[16] are recommended for selection and training of Corps inspectors:

a. Candidates for inspectors should be highly conscientious individuals, known to be able to perform with alertness, repetitive and often tedious tasks over sustained periods of time.

b. They should be individuals possessing a high sensitivity to visual aesthetics and should be

knowledgeable of the proper functioning of facilities, equipment, and utilities.

c. They should be trained on methods for conducting and reporting inspection findings as specified in quality control plans.

d. They should be familiar with the Corps' contractor relationships and the Corps' procedures for working with contractors.

e. Their primary job should be contract surveillance, quality control, and standards maintenance.

Even after training, it should not be assumed that the effectiveness of an inspector will continue indefinitely. The monotony of the job can lead to less than top performance. The Urban Institute suggests that it is uncertain whether an inspector will maintain the required performance quality over a long period of time.[16] It therefore recommends that inspectors' ratings be periodically checked by an analyst or the person in charge of the operation to see that they are accurate judgments and evaluations. If the inspector is found to be unacceptably deficient in his work, he should be retrained or replaced.

Inspection Rating Options

Three inspection reporting systems were reviewed during the course of this study. The Honolulu[8] and Urban Institute[16] systems employ weighted average rating scales. The first assigns point values to conditions shown in photographs with descriptions of degrees of quality (4.0 excellent, 3.0 good, 2.0 fair, and 1.0 poor). The second system also uses descriptive photographs and assigns values of 1.0 to clean

conditions, 2.0 moderately clean, 3.0 moderately littered, and 4.0 heavily littered. The Air Force System assigns a value of P for tasks that were performed to standard and F for tasks that failed to meet the standard. If P's outnumber F's at the completion of an inspection of a building or area, an evaluation is considered satisfactory. If F's outnumber P's, the evaluation is unsatisfactory.[15]

The Air Force System also provides a way to determine what constitutes contract violation or noncompliance:

> Performance is judged unsatisfactory if the number of buildings or areas failing monthly inspection reaches a previously determined minimum number.
>
> Under this system an allowance is provided for an initial phase-in period of the contract. During the first month, the predetermined numbers selected for judging what constitutes satisfactory or unsatisfactory ratings are adjusted. During this period the contractor will presumably be given some margin for error.
>
> It is recommended that the Corps adopt elements of each of the two basic approaches described. Standards supplemented with descriptive photographs would aid the inspection process. A rating scale correlating numerically weighted averages with levels of satisfaction would be a very useful tool in carrying out quality control.

Monetary Deductions for Nonperformance or Inadequate Performance of Service Contracts

Government contracts for services such as custodial work, refuse removal, grounds maintenance, and cleaning are awarded with the expectation that prescribed qualitative levels of work will be delivered at specified intervals. Failure by the

contractor to perform as specified can create hardships for the government (sometimes monetary) and deny services to the public. When services are not rendered as specified, the agency may have to disburse in-house employees to complete the work, temporarily procure the service elsewhere, or let the unsatisfactory condition exist until the contractor corrects the situation.

During this study, two approaches were identified which have been designed to deter noncompliance and to make monetary adjustments to contractor payments if it does occur. The first approach being tried by the Corps' Vicksburg District Office[21] relates to a decision by the Comptroller General of the United States on July 10, 1975. In reviewing a protest by the Kleen-Rite Corporation over inclusion of a clause for monetary adjustment for inadequate performance, the following decisions were issued and the protest denied:

a. Liquidated damages clause for nonperformance or inadequate performance of custodial services does not constitute penalty since damage assessment is reasonable in relation to losses contemplated.

b. There is adequate justification for application of liquidated damages clause to instances of non-performance and inadequate performance even though under prior contracts, the clause applied only to nonperformance because both situations are undesirable and cost of correction may be just as expensive.

Based on this ruling, the Vicksburg District Office has begun preparing contracts containing schedules for monetary adjustments (deductions) from contractor payments in the event that maintenance services on recreation areas are not performed as specified in the contract description/specifications

of work. The schedule of adjustments itemizes the amount that may be deducted on a per unit basis, i.e., picnic tables - $2.57, vault comfort stations - $20.71, and so forth. Using this schedule, deductions can be made for each item where inspection found performance to have been incomplete or unsatisfactory.

This approach has been utilized by the Vicksburg District on seven projects during the past two years. It is reportedly presently being challenged by two contractors.*

Both the Air Force system, described below, and the Vicksburg District's attempt to deduct amounts which represent as nearly as possible the cost of the services. The main difference is in the two techniques for determining total deductible amounts. Air Force deductions are based on percentages of total contract cost (as fixed price contracts); whereas, the Vicksburg District's deductions are based on per item maintenance cost estimates. Under the Air Force system, the contract administrator must know the major cost categories in the contract and the percentage of cost each service output represents. Applying their random sampling procedures, deductions are made according to the percent of one month's accumulation of sampling observations found defective. For example, assume a maintenance contract of $100,000 and that restroom cleaning services represent 10 percent of the total services contracted. If 20 percent of the sample restroom inspections found defects, $2,000 would be the amount potentially deducted from the contractor's payment.

*Personal communication, Mr. Mac Montgomery, 1 August 1979, U.S. Army Engineer District, Vicksburg, Vicksburg, Mississippi

CONCLUSIONS AND RECOMMENDATIONS

The Preparation of O&M Standards

The methodology developed in this research project for the preparation of O&M standards provides a feasible technique for improving the efficiency and effectiveness of maintenance at Corps reaction areas. In addition, adoption of this methodology would have several advantages for the Corps:

a. It would improve overall quality of maintenance programs and establish uniform standards for operations and maintenance.

b. It would provide a tool for more clearly defining work expectations for both in-house personnel and contractors.

c. It would provide improved techniques for planning, scheduling, and programming in-house and contractual maintenance.

d. It would provide a tool for more accurate estimation of resources needed to carry out maintenance tasks.

e. It would improve work productivity.

Corps-Wide Application of O&M Standards

The Corps has a choice of centrally developing and establishing Corps-wide standards or permitting standards to be developed and applied locally. Although arguments can be made to support both approaches, if uniformity and conformity are desired, then a centralized approach would yield the best results.

The Corps could centrally establish the qualitative levels which maintenance work on recreation areas should meet. Standard descriptions of quality with illustrations could be

disseminated to field offices for local use in preparing standards. Project directors could then identify resources to be incorporated in their standards for meeting qualitative expectations.

Local Identification of Quantitative Elements

The quantitative elements of O&M standards can be identified using the secondary sources of information described in this study such as engineered performance times, equipment rental costs, etc. They can also be identified through the collection of local performance data. The use of locally collected data may yield more accurate information than secondary sources; however, it will be more time-consuming and costly.

The Corps should consider the feasibility of both approaches and decide which is most desirable. Over the long run, institution of uniform, local data collection procedures may best serve the requirements for standards development and would be useful in improving planning, programming, and scheduling efforts.

Specification Consequences

Prior to application of the methodology developed herein to contractual services, the possible consequences should be explored. It is possible that narrow specification of completion times, equipment, and manpower may create conflict with labor and trade unions. Furthermore, too detailed specifications of task procedures could create monitoring problems.

Trained Personnel

Preparation of O&M standards, quality control and monitoring, and surveillance of in-house or contractual maintenance requires a full-time personnel position at project level. Individuals occupying these positions should be adequately trained and experienced in their work.

The Corps could adjust existing positions or create new positions at projects where the volume of work warrants. Appropriate selection criteria and training requirements should be established.

Improved Distribution of Corps Information

During the collection of data for this study, it became apparent that the Corps project personnel are not aware of many Corps publications and secondary sources of information. In order to optimize the use of information which is already available, the Corps could use training sessions and improve distribution of relevant publications.

The Naval Facilities Engineering Command

An additional source of information is potentially available that could provide useful primary and secondary data to the Corps for preparing standards. The Corps should contact the Naval Facilities Engineering Command and investigate the possibilities for having several Corps projects added to the Navy's list of "Service Representative Activities." Two projects where most maintenance is done with in-house

resources and two with contracted services could be included in the list of U.S. Army activities on which engineered performance standards data are collected.

The Ad Hoc Department of Defense Service Contract Group

Other Department of Defense agencies, including the Air Force and the Army, are carrying out similar research on contractual services and developing model contracts, standards criteria, etc. Closer coordination of the Corps project with these agencies and the exchange of information could be mutually beneficial. The Corps could inquire about the possibility of participating in or observing the Ad Hoc Department of Defense Service Contract Group (SCG).

The OMB Circular A-76

If the Corps does not receive an exemption from the requirements of OMB Circular A-76 for its Civil Works Projects, the impact relating to this research project could be significant. The requirements for future analyses, reporting, and usage of cost-estimating procedures would have implications for the preparation of O&M standards.

Personnel at WES need to stay closely informed about the outcome of the Corps' request for the exemption. Even though, the request for service resulting from Circular A-76 will likely have an impact on Corps contracting considerations.

Financial Restitution

The Vicksburg District is potentially involved in two court cases concerning liquidated damage clauses in contractual agreements. The outcome of these cases will be relevant to the future use of contractual O&M services. The Corps should also follow cases involving other Department of Defense agencies as the findings may be applicable to the Corps' situation.

Further Research and Data Collection

Local project application of the methodology for developing O&M standards would be useful for more extensive testing and refinement. Additional data collection through workload/cost tracking procedures would be helpful toward that effort.

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APPENDIX A:

Key Result Area:	Mowing and Trimming
Tasks:	Cut grass to height of 1 or 1 1/2 to 3 inches above ground. Grass trimmed horizontally around trees, shrubs, lights, guardrails and barrier posts, and buildings. Grass trimmed vertically along curbs and sidewalks.
Quality Indicators:	Grass cut evenly, not knocked down or left with ragged ends. No skinned surfaces, no damaged trees, shrubs, or fixtures. Grass neatly and evenly trimmed.
Unit of Work:	1 acre of open space with 10 to 15 trees.
Manpower:	1 equipment operator and 1 laborer.
Time:	0.75 hours.
Equipment and Supplies:	1 tractor-mounted mower, 1 weedeater, 1 gallon gasoline.
Cost:	$8.75.

Key Result Area:	Road Maintenance
Tasks:	Patch bituminous surfaces by applying and compacting a mixture of mineral aggregate and bituminous material. Prepare surface by digging out and removing dirt and fine material. Thoroughly clean and apply bonding material to holes. Seal with hot coat of bituminous material and finish by spreading stone chips evenly over repaired surfaces.
Quality Indicators:	Road returned to specified gradient, smooth and free of potholes or bumps. No excess bleeding of bituminous material or oil. Chips uniformly spread. No excess buildup of stone chips.
Unit of Work:	1 mile of bituminous surfaced road.
Manpower:	2 equipment operators and 3 laborers.
Time:	17 to 18 hours.
Equipment and Supplies:	1 road grader, 2 dump trucks, 1 oil distributor, 1 steel roller, 1 loader, hand tools.
Cost:	$355.00.

Key Result Area:	Restroom Cleaning and Maintenance
Tasks:	Remove insect webs and deposits from walls and ceiling. Pick up paper and refuse. Dust window sills, rafters, and other flat surfaces. Wipe or scrub soiled or dirty surfact. Sweep and wet mop floors. Clean and disinfect stools and urinals. Clean plumbing fixtures and mirrors. Replace deodorant blocks and chemicals where applicable. Replace toilet tissue and paper towels.
Quality Indicators:	Restroom appears and smells clean. Toilet seats, sinks, and urinals spotless. Mirrors and fixtures spotless. Floors free of debris, stains, and other foreign material. Walls and ceiling free of insect material and dust.
Unit of Work:	1, 6-stool comfort station, 980 square feet.
Manpower:	2 laborers.
Time:	1.6 hours.
Equipment and Supplies:	6 ounces scouring powder, 1 pint of disinfectant, 150 paper towels, 3 5-ounce deodorant cakes, broom, mop, dusting brush.
Cost:	$36.88.

Key Result area:	Building and Facility Maintenance
Tasks:	Clean interior window surfaces. Vacuum carpet. Sweep and mop floors. Dust window sills, furniture, pictures, and fixtures. Spot clean walls, partitions, doors, and fixtures removing smudges, fingerprints, marks, streaks, etc. Clean drinking fountains. Clean chalkboards and empty ashtrays and wastebaskets. Clean restrooms and replace restroom supplies. Return furniture to designated places.
Quality Indicators:	Windows free of spots and smudges. Floors shiny, carpets free of dust and debris. Furniture, windowsills, pictures, and fixtures free of dust. Walls, partitions, doors, and fixtures free of smudges, fingerprints, marks, streaks, etc. Drinking fountains spotless and shiny. Ashtrays clean and wastebaskets empty of paper and debris. Restrooms clean and supplies plentiful. Furniture in designated places.
Unit of Work:	1 administration building; 3,700 square feet.
Manpower:	1 janitor.
Time:	3.7 hours.
Equipment and Supplies:	Vacuum sweeper, broom, mop, dusting brush, 6 ounces scouring powder, 2 deodorant cakes, 100 paper towels.
Cost:	$27.26.

Key Result Area:	Plumbing Services
Tasks:	Repairing and replacing faucets, flushometers, ball cocks, pipes, valves, and fittings; clearing stopped drains and repairing water coolers and electrical and hand pumps. Maintenance of water piping, both direct buried and/or encased.
Quality Indicators:	Fixtures restored to working conditions and all leaks stopped. Drains working properly. Water coolers and electrical and hand pumps functioning properly. Water piping restored to operable condition.
Unit of Work:	50-unit campground with vault toilet.
Manpower:	1 plumber.
Time:	3 to 5 hours.
Equipment:	Hand tools--wrenches, plumber's tape, plunger.
Cost:	$31.69.

Key Result Area:	Equipment Maintenance--vehicle lubrication and engine maintenance.
Tasks:	Drain motor oil. Replace oil filter. Check and replace brake fluid if needed. Check and fill radiator coolant to proper level. Fill windshield washer. Grease chassis.
Quality Indicators:	Oil filter and oil plug properly replaced without evidence of oil leaks. Lubricant filled to specified level. Windshield washer fluid and radiator coolant filled to capacity.
Unit of Work:	1 1/2-ton pickup truck.
Manpower:	1 vehicle maintenance specialist.
Time:	45 minutes.
Equipment and Supplies:	Oil filter, 5 quarts oil, 1 quart antifreeze, 1/2 pint brake fluid.
Cost:	$21.00.

Key Result Area:	Refuse Removal
Tasks:	Pick up litter around trash cans. Remove plastic bags from trash cans and place in dempsy dumpster refuse containers. Replace plastic bags. Pick up litter around dempsy dumpsters. Empty dempsy dumpsters into garbage truck.
Quality Indicators:	No litter remaining in vicinity of trash cans. Cans returned to designated locations and placed in upright position. No litter remaining around dempsy dumpster.
Unit of Work:	1 32-unit campground.
Manpower:	1 equipment operator, 2 laborers.
Time:	1.3 hours.
Equipment and Supplies:	1 12-yard compactor garbage truck, 2 rakes, 2 shovels, 60 plastic garbage bags.
Cost:	$32.07.

Key Result Area:	Electrical Services
Tasks:	Repairing and replacing burned out lamps, ballasts, light fixtures, outlets, wiring, and fuses. Maintenance of underground wiring, both direct burial and in conduit.
Quality Indicators:	Lamps, ballasts, light fixtures replaced without breakage or damage to electrical system. Broken wiring replaced according to electrical codes. Fuses replaced with proper sizes. Underground wiring restored to operable condition.
Unit of Work:	63-unit campground electrical lighting system.
Manpower:	1 electrician and 1 electrician's helper.
Time:	3 hours.
Equipment and Supplies:	Hand tools--pliers, screwdriver, tape, etc.
Cost:	$48.72.

Key Result Area:	Sanitary Treatment Facility Operation
Tasks:	Checks inflow of water to determine amount used, ensures timers are operating properly and aeration boots are cleaned as necessary. Monitors amount of sludge pumped, amount of chemicals used, flow valves, diversion gates, rate of flow, amount bypassed, amount recirculated, and runs the plant through a manual cycle to determine if all components are functioning properly. Collects and tests samples in accordance with established procedures. Tests for settleable solids, pH, dissolved oxygen and biological oxygen demand. Cleans treatment plant by scraping inside walls, washing walls, skimming, and removing residue.
Unit of Work:	1 50,000-gallon capacity activator and tertiary filter system.
Quality Indicators:	Plant is visually clean. Blowers are running quietly. Good flow in aeration basin. No sludge on top of tank.
Manpower:	Sewage disposal plant operator.
Time:	1.5 hours.
Equipment and Supplies:	None.
Costs:	$15.24

GROUNDS MAINTENANCE STANDARD

APPENDIX B:

Task	Unit	Standard (Man Hours)	Local Estimate
Mowing, Hand and Power (Improved Areas):			
Hand mower, 14" to 16"	1,000 sq.ft.	0.18	
Power Mower, 18" to 22"	1,000 sq.ft.	0.11	
Power Mower, 27" to 20"	acre	3.12	
Power mower, 30" to 32"	acre	2.75	
Sulky ridden triplex power mower, 76"	acre	1.92	
Mowing, Tractor:			
Curb edging	mile	0.67	
Cutter- or sickle-bar, rough terrain, 5 ft.	acre	1.66	
Cutter- or sickle-bar, smooth terrain, 5 ft.	acre	1.02	
Hammer knife, 4 ft.	acre	1.21	
Mow drainage channel with 5 ft. sickle-bar, tractor towed; both sides	mile	1.58	
Reel, 3-gang, 7 ft.	acre	0.37	
Reel, 5-gang, 12 1/2 ft.	acre	0.31	
Rotary, 5 ft.	acre	0.90	
Rotary, 6 to 8 ft.	acre	0.64	
Reforestation:			
Hand planting	acre	6.16	
Machine planting	acre	0.88	
Seeding	acre	1.54	
Tree and Shrub Maintenance:			
Chip pruned tree limbs (per tree)	each	0.08	
Hedge trimming by hand and dispose of cuttings	100 lin.ft.	2.85	
Hedge trimming, electric and dispose of cuttings	100 lin.ft.	1.56	
If ladder is required, add per 100 LF		0.40	
Prune shrubs(deciduous)	each	0.20	
Prune shrubs(evergreen)	each	0.13	
Prune trees(large)	each	2.80	
Remove dead trees	each	3.88	
Watering Turf:			
Water lawn, garden hose with sprinkler	1,000	0.22	
Water lawn, hoseless, quick-coupling plug in sprinklers	acres	0.41	
Water lawn, 50 ft. soaker hoses, set up	10,000 sq.ft.	0.97	
Water lawn, 60 ft. spray sprinkler, set up	10,000 sq.ft.	0.90	
[illegible]			
[illegible] herbicides with fence line with [illegible] sprayer, 2 ft. wide (1 ft. [illegible] 1 ft. outside fence)	1,000 sq.ft.	0.45	
[illegible] herbicides with manual [illegible] small areas	1,000 sq.ft.	0.68	
[illegible] with manual [illegible]	acre	3.10	

GROUNDS MAINTENANCE STANDARD (APPENDIX B:) (Continued)

Task	Unit	Standard (Man Hours)	Local Estimate
Weed Control (Continued)			
Selective herbicides with tractor operated equipment, 20 ft. boom	acre	0.27	
Wildlife Management:			
Aquatic weed control	acre	6.40	
Clearing and seeding food plots	acre	3.20	
Fertilizing fish ponds	acre	0.80	
Roadside and drainage:			
Repair cut and fill slipes	mile	0.90	
Repair or replace drain pipes	mile	1.05	
Clean drain pipes and culverts	mile	0.30	
Clean and repair unpaved ditches	mile	8.00	
Clean paved flumes, gutters and inlets	mile	2.00	
Repair stone riprap	mile	0.15	
Remove trees from roadside	mile	0.20	
Mow both roadsides w/tractor	mile	6.25	

September, 1970

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GROUNDS MAINTENANCE STANDARD

APPENDIX B:

Grounds maintenance performance standards (specific)

Task	Unit	Standard (Man Hours)	Local Estimate
Controlled Burning (Large Areas):			
Grasslands	100 acres	6.40	
Woodland, level terrain	100 acres	1.84	
Woodland, rolling terrain	100 acres	6.40	
Cultivating:			
Combined shrubbery and flower beds	100 sq. ft.	0.902	
Shrubbery beds	100 sq. ft.	0.035	
Drainage Channels:			
Clean flowline, average of 33 cu. yds./mi	mile	39.00	
Repair erosion, average 50 cu. yds./mi. (excavate, load, spread, and roll average less than 1 ft. depth)	mile	9.64	
Fertilizing:			
Hand push spreader, 36" (no watering included)	acre	2.96	
Liquid fertilizing by truck	acre	0.19	
Tractor-towed spreader, 8 ft.	acre	0.64	
Tractor-towed spreader, 12 ft.	acre	0.43	
Truck, whirlwind spreader	acre	0.27	
Firebreaks, Maintaining:			
Grass and low brush	mile	1.28	
Woodland and tall brush	mile	2.56	
Grass Planting (Small Areas):			
Cut and plant sod by sand, sq. ft. blocks (per sq. ft. of sod or areas planted)	sq. ft.	0.03	
Cut and plant sod by hand, 1 1/2" strips (per sq. ft. of sod or area planted)	sq. ft.	0.06	
Cut sod by machine and plant, sq. ft. blocks (per sq. ft. of sod or area planted)	sq. ft.	0.048 + sq. ft.(0.009)	
Cut sod by machine and plant, 1 1/2" strips (per sq. ft. of sod or area planted	sq. ft.	0.048 + (0.043)	
Cut and plant sprigs by hand (not watered)	1,000 lin. ft.	10.90	
Fertilize and lime	acre	2.00	
Land preparation	acre	5.33	
Mulching (hay, straw)	acre	6.70	
Seeding, hand	1,000 sq. ft.	0.50	
Stolons (sprigs) with 1-row mechanical planter	acre	0.75	
Watering planted stolons	1,000 lin. ft.	1.50	

GROUNDS MAINTENANCE STANDARD (APPENDIX B:) (Continued)

Task	Unit	Standard (Man Hours)	Local Estimate)
Landscape Plantings:			
Plant shrubs, individual	each	0.36	
Plant shrubs, individual, including watering	each	0.51	
Plant shrubs, in groups	each	0.30	
Plant shrubs, in groups, including watering	each	0.40	
Plant trees, 5-6 ft. ht.	each	0.46	
Plant trees, 5-6 ft. ht. including watering	each	0.68	
Plant trees, 2-2 1/2" dia.	each	1.02	
Plant trees, 2-2 1/2" dia., including watering	each	1.27	
Lawn Trimming; Sidewalks and Curbs:			
Electric trimmer	1,000 lin. ft.	1.89	
Gasoline trimmer	1,000 lin. ft.	1.01	
Leaf Disposal:			
Hand rake flower and shrubbery beds	400 sq. ft.	0.33	
Hand rake lawn	1,000 sq. ft.	0.34	
Tractor-operated mulcher--5 ft.	acre	0.90	
Walk behind leaf mulcher--30 to 32"	acre	6.24	

APPENDIX C:

EXAMPLE EXCERPTS FROM MAINTENANCE STANDARDS
FAIRFAX COUNTY, VIRGINIA

Maintenance and Operating Actions Required	Frequency	Standard	SEASON COSTS		
			Personnel	Operating	Capital Equipment
1. Mowing	34 Times Per Season (26 weeks per season, April 15 - October 15	.5 Hours Per Ball Field (E-10 Mower) Plus 1 Hour Per Ball Field (Hand Mower)	MOTOR EQUIPMENT OPERATOR .5 hours x $4.64 per hour x 34 times = $78.88 LABORER I 1 hour x $3.92 per hour x 34 times = $133.28		E-10 MOWER $8.80[1] per hour x .5 hours x 34 times =$149.60 HAND MOWER $.22[2] per hour x 1 hour x 34 times = $7.48
2. Seeding and Fertilizing	-Fertilize Twice Per Year (early spring, late fall) -Seed Once Per Year	7 hours Per Ball Field Per Season (2 hours for fertilizing; 5 hours for seeding)	MOTOR EQUIPMENT OPERATOR 7 hours per season x $4.64 per hour = $32.48	FERTILIZER 320 lbs per acre per application x 2 acres per ball field x 2 applications per season x $.1375 per pound = $176 SEED 150 lbs per acre x 2 acres per field x 1 application per season x $1 per pound = $300	TURF TRACTOR 7 hours x $7.70[1] per hour = $53.90 LILLY SPREADER 7 hours x $2.75[1] per hour = $19.25

Appendix D:

DEPARTMENT OF THE ARMY
JOB DESCRIPTION
For use of this form see CPR 501 the proponent agency is DCSPER

1 JOB NUMBER: 4966

2 INSTALLATION OR HEADQUARTERS OFFICE: U. S. ARMY ENGINEER DISTRICT, MOBILE

3 ORGANIZATIONAL LOCATION (Complete on organization copy only): OPERATIONS DIVISION
West Point Lake

4 CITATION TO APPLICABLE STANDARD AND THE DATE OF ISSUANCE: OPM GS-802 JUN 69

5 TITLE: Civil Engineering Technician

6 PAY SCHEDULE	7 OCC CODE	8 GRADE
GS	802	7

9 FAIR LABOR STANDARDS ACT: ☐ EXEMPT ☒ NONEXEMPT

10 COMP LEVEL:

11 EVALUATION APPROVAL

TITLE, PAY SCHEDULE, OCC CODE, AND GRADE OF THIS JOB HAVE BEEN FIXED IN ACCORDANCE WITH OFFICIAL POLICY AND GRADE LEVEL STANDARDS

J. P. BARTER
(Signature) (Date)

12 JOB CONTENT APPROVAL (COMPLETE ON ORGANIZATION COPY ONLY)

a. I CERTIFY THAT THIS IS AN ACCURATE STATEMENT OF THE MAJOR DUTIES AND RESPONSIBILITIES OF THIS POSITION AND ITS ORGANIZATIONAL RELATIONSHIPS AND THAT THE POSITION IS NECESSARY TO CARRY OUT GOVERNMENT FUNCTIONS FOR WHICH I AM RESPONSIBLE. THIS CERTIFICATION IS MADE WITH THE KNOWLEDGE THAT THIS INFORMATION IS TO BE USED FOR STATUTORY PURPOSES RELATING TO APPOINTMENT AND PAYMENT OF PUBLIC FUNDS AND THAT FALSE OR MISLEADING STATEMENTS MAY CONSTITUTE VIOLATIONS OF SUCH STATUTES OR THEIR IMPLEMENTING REGULATIONS

(Signature of Approving Supervisor) (Date)

b. THIS JOB DESCRIPTION WITH SUPPLEMENTAL MATERIAL IS ADEQUATE FOR PURPOSE OF EVALUATION

(Signature of Position Classification Specialist) (Date)

13 STATEMENT OF DUTIES AND RESPONSIBILITIES

SUPERVISORY CONTROLS

Works under the general supervision of the Park Manager. Receives general and written assignments, with responsibility of carrying regular assignments through to completion on own initiative, subject only to spot checks and review on completion.

MAJOR DUTIES

As a Civil Engineering Technician, incumbent is responsible for performing preliminary surveys, investigations and inspections for contruction and operation and maintenance planning.

1. Inspects all phases of project facilities such as roads, lighting, parking areas, picnic and camping units, beaches, playgrounds, boat launching ramps, change houses, pump houses, waterborne toilets, wells, drain fields, septic tanks, water and sewage treatment, etc.. Monitors and/or inspects work performed by contractual or hired labor. Checks all phases of contractor's work, such as navigational aid maintenance, debris removal, grass cutting, cleaning services, electrical and plumbing maintenance, vegetative and insect control, seeding, fertilization, water sampling, asphalt patching, etc. for compliance with plans and specifications.
2. Assists in conducting performance and operational tests, accepting or rejecting work in cases of compliance or non-compliance with plans and specifications. However

APPENDIX E:

STANDARD OPERATING PROCEDURES,
SOUTH ATLANTIC DISTRICT

SOP No. 1
4 August 1977

SUBJECT: Standard for Cleaning Services

PURPOSE: To establish a minimum acceptable standard of sanitation maintenance for all Corps of Engineers operated lands in SAD.

TARGET DATE: As soon as possible but not later than the 1978 recreation season.

IMPLEMENTATION:

1. The following minimum services shall be provided during the recreation season:

a. Toilets and shower-wash houses shall be thoroughly cleaned five days each week: Friday, Saturday, Sunday, Monday, and Wednesday. This does not apply to single family facilities located at individual camp sites.

b. Group picnic shelters shall be cleaned twice each week.

c. Picnic tables, grills, and fireplaces shall be cleaned once each week.

d. Trash cans shall be emptied and cleaned three days each week with two of the days falling on Friday, Saturday, or Sunday. Utilization of trash can liners is recommended.

e. Scattered litter throughout the recreation areas shall be gathered and disposed of twice each week.

2. The entire Corps controlled shoreline, including islands, shall be cleaned once every three years. Utilization of contracts or volunteer labor is encouraged.

3. The above standards will be reflected in contracts for cleaning operations.

FOR THE DIVISION ENGINEER: s/C. G. GOAD

C. G. GOAD
Chief, Constructin-Operations
Division

SOP No. 2
4 August 1977

SUBJECT: Standard for Mowing Services

PURPOSE: To establish a Division standard policy regarding mowing in recreation areas

TARGET DATE: As soon as possible but not later than the beginning of the 1978 mowing season

IMPLEMENTATION:

1. All mowing areas shall be inspected and redefined to eliminate unnecessary mowing and improve mowing techniques in areas which are mowed.

2. Mowing which destroys desirable natural plant succession, such as between camp sites where screening is desirable, shall be eliminated. Care shall be taken to curtail mowing activities or use flushing bars on mowing equipment in areas where wildlife populations could be negatively altered during the nesting season.

3. Vegetation in the mowing areas at recreation areas shall be maintained between three inches and eight inches height.

4. Mowing areas shall be designated by land managers in accordance with good conservation practices. The above standards shall be reflected in contracts for mowing operations.

FOR THE DIVISION ENGINEER:

C. G. GOAD
Chief, Construction-Operations Division

APPENDIX F:

PARTIAL REAL PROPERTY MAINTENANCE
ACTIVITIES GUIDE SPECIFICATIONS INDEX

Topic Title	Handbook Number	Handbook Title
Grounds Maintenance Services	70310-19	Soil Surveys
	70320-29	Grasses, Legumes, and Ground Covers
	70330-39	Trees, Shrubs, and Vines
	70340-49	Outleases
	70350-59	Control Measures
	70360-69	Recreational Area Maintenance
	70370-79	Grass Cutting
	70380-89	Tree Pruning and Removal
Refuse Collection Services	70410	Refuse Collection
Refuse Disposal Services	70450-59	Refuse Classification
	70460-69	Refuse Disposal

APPENDIX G: CONTRACT EXAMPLES

Excerpt from Vicksburg District Contract, Scope of Work

SECTION F. DESCRIPTION/SPECIFICATION

F.1. SCOPE OF WORK. The work to be performed under this contract consists of furnishing all labor, equipment, fuel, transportation, tools and supplies necessary for the performance of the services set forth in the schedule and in strict accordance with these specifications.

F.2. GENERAL. The Contractor shall furnish the following cleanup services at the areas listed under the Schedule, SECTION E.

(1) Comfort Stations (Vault and Flush), Portable Toilets, and Washhouses. Wash and render all floors, walls, windows, doors, louvers, sills, fixtures, mirrors, shower courtains and stalls, benches partitions, exterior and interior wash basins and interior trash receptacles clean and sanitary. Sweep and remove all litter, leaves, grass, dust, rocks, and dirt from connected sidewalks and center passageways. Inclusive, but not restricted to in this cleaning is the removal of all dust from window sills and screens, and the removal of insect nests such as spider webs, dirt dauber nests and wasp nests. All toilet tissue and paper towel dispensers shall be checked and filled daily. Prior to leaving the facility, all remaining soap shall be thoroughly rinsed and excess water mopped dry or otherwise removed. There shall be no soap film left from any cleaning operations.

(2) Picnic Tables. Wash and render the table top and seat clean and sanitary. Inspect and clean the table legs and underneath side and remove all insect nests such as spider webs, dirt dauber nests and wasp nests. Sweep and remove all litter, leaves, grass, dust, rocks, and dirt from table pad. Inclusive, but not limited to in the washing of the table top and seat is the scrubbing of these surfaces with a soft bristle brush using a mild disinfectant and soap and followed by a thorough rinsing and removal of excess water to the point of being damp dry.

(3) Grills. Remove all ashes, unburned material and litter from the pit and remove all grease and cooked-on food from the grill and fire ring. Inclusive, but not limited to in the cleaning, is the scrubbing of grills with a wire brush to remove all grease and foreign material. Also included is the cleaning of the charcoal stove unit service table (round table) associated with the unit. The top of this table shall be scrubbed with a soft bristle brush using a mild disinfectant and soap and then thoroughly rinsed and dried to damp dry.

(4) Trash Receptacles. Each trash receptacle should be emptied and any material adhering to the receptacle removed. Subsequently, if the plastic bag insert was either torn or soiled then it should be replaced. Also, if the bag contains a significant quantity (more than two or three individual items) of litter then it should be replaced. A general rule of thumb to follow is that if the bag must be removed to be emptied then it should be replaced. Any receptacles that are soiled either internally or externally should be washed and disinfected. Also, where nuisance insects

such as flies and yellow jacket wasps are noticed then the containers should be sprayed with an insecticide approved by the Resource Manager to suppress these insects' activities. Any trash or litter which has been piled or placed around the trash receptacle must also be removed by the Contractors.

(5) Drinking Fountains and Hand Pump Wells. Wash and render the spigot, drain bowl, and top of the unit clean and sanitary. Remove all dirt, dust, and insect nests from the unit pedestal and sweep and remove all grass, leaves, dust, dirt, rocks, and litter from the sidewalk surrounding the unit. Inclusive, but not limited to in the cleaning, is the scrubbing of the spigot, bowl, and top with a soft bristle brush using a mild disinfectant and soap and followed by a thorough rinsing.

(6) Well Shelters, Bench Covers, Foot Bridges, and Picnic Shelters. Sweep and remove all litter, leaves, grass, dust, rocks, and dirt from the floor. Remove all insect nests including dirt dauber nests, wasp nests, and spider webs from ceilings, eaves, posts, beams, rafters, and hand rails.

(7) Policing Grounds. These areas are all grounds in a recreation area which are mowed or otherwise used by the public. Such areas include beaches, boat ramps, parking areas, internal circulation roads, riprap areas and river banks traversed and used by fishermen, foot paths, and designated cycle and nature trails. Pick up all trash, paper, cans, pop tops, bottles, wire, rope, string, driftwood and other materials deposited in these areas down to and including the shorelines readily accessible by the public. Specifically included in this requirement is floating or beached litter and driftwood on the riverbank.

(8) Policing Roads. Pick up all trash, paper, cans, bottles, and other debris along the roads and their rights-of-way included in this contract. The limit of right-of-way cleanup will vary depending on the openness of vegetation and the slope paralleling the road. For example, the uphill sides of an access road may be characteristically steep and covered with dense brush while the downhill side may be the opposite. Consequently, litter thrown, dropped, or otherwise deposited by passing motorists may travel or be blown a short distance on the uphill side and a substantially greater distance on the downhill side. Under these circumstances, the limits of cleanup will be dictated by the observed travel distance of the litter with the result being that no litter should be left along the roads irrespective of either its distance or its visibility from the road.

F.3 MOWING.

a. General. For the purpose of this contract, mowing is defined as the cutting of grass, weeds, vines, or other vegetation with reel and rotary lawn mowers, flail mowers, gang mowers, or bush hogs. This is in contrast to trimming which is defined and covered elsewhere in these specifications. Also, for the purpose of this contract, a mowing and trimming cycle is defined as the performance of all mowing and trimming within an individual area, a group of areas, or all of the areas included under the contract within a ten consecutive day period excluding weekends, holidays or other variances allowed or required by the Resource Manager. In this

respect, the Resource Manager may suspend mowing and/or trimming operations at any time due to wet grounds, safety hazards, or other reasons which he deems valid. Likewise, mowing and trimming operations in recreation areas will not be conducted on Saturdays, Sundays, Memorial Day, Independence Day, or Labor Day, unless approved in advance by the Resource Manager. In most cases the Resource Manager will order a mowing and trimming cycle for all areas included under the contract and therefore the Contractor should be staffed and equipped to complete all mowing under the contract within a ten-day period. The approximate acreages to be mowed are shown on the bid form. The location of the mowing to be performed in each area will be directed by the Resource Manager. The Contractor shall strictly mow to these limits without exceeding them.

b. Mowing Operations. All mowing operations shall be conducted in a prudent manner to protect the grass sod, equipment, trees and shrubs in the areas and to ensure the safety of all persons around the mowing operations. Grass and weeds shall be mowed to a height of not more than (6) inches or less than four (4) inches on the dam and not more than three (3) inches or less than one and one-half (1-1/2) inches at all other areas to be mowed. Mowers of any widths may be used in some areas while other areas of uneven terrain or containing trees or other obstacles may require mowers of lesser widths to prevent scalping the sod, barking trees, or other damage. All mower blades must be kept sharp to assure clean cutting and minimize damage to the sod. Also, as a safety precaution, alignment or facing the open vent in the mower housing toward vehicles or people should be avoided. Prior to mowing any area, that area shall be inspected for all paper, cans, glass, or other debris and this material removed. Should such material be struck by a mower and scattered, the scattered pieces shall be picked up and removed. All soft and damp areas which would be rutted by the mowing operation should be avoided and reported to the Resource Manager on the same day that they are noted.

F.4 TRIMMING. For the purpose of this contract, trimming is defined as the cutting of grass, weeds, vines, or other vegetation around buildings, sidewalks, guardrails, posts, instruments, telephone poles, drinking fountains, picnic tables, grills, fire rings, trees, shrubbery, curbing riprap areas, and other such obstacles which are not accessible to mowing and conventional mowing machines and which therefore require specialized cutting attention with sickles, sling blades, and mechanical edgers. Such trimming with specialized devices shall be conducted in every location where conventional mowing would risk damage to either the object or the mowing device or risk the safety of the operator or anyone else in the area. Also, the use of "weed eater" or machanical flail type trimmers in trimming around any shrub or tree is not allowed and special care should be exercised in trimming around trees and shrubs so as not to damage the roots or bark on this vegetation, Trimming in recreation areas will not be conducted on Saturdays, Sundays, Memorial Day, Independence Day, or Labor Day unless approved by the Resource Manager. The locations where trimming is to be performed are not specified but should generally be around the items previously mentioned. However, the trimming or mowing of any vegetation in recreation areas or along roads which does not interfere directly with public use, (e.g., honeysuckle vines on the edge of camp sites and climbing on trees and bushes in recreation areas) shall be avoided for environmental and aesthetic reasons. The Resource Manager will provide individual direction to the Contractor in areas where vegetation falls in this category.

SECTION F. DESCRIPTION/SPECIFICATIONS

F.5 WATER SUPPLY. Water required may be obtained from existing Government water supply systems at points and during hours specified by the Resource Manager.

F.6 SOLID WASTE DISPOSAL. For the purpose of this paragraph, solid waste is defined as all material, trash, and other debris collected under the terms of the contract. The Contractor shall haul and dispose of all solid waste collected under the terms of the contract at an off-project location and in a manner and at locations which are approved by the Contracting Officer and, in instances where State, local, and/or Federal laws are applicable, in a manner and at locations approved by the Governmental agency or agencies having jurisdiction over the hauling and landfill operation. The Contractor shall assume all costs and responsibilities related to his use of these sites. If the Contractor utilized any landfill which is owned or leased by another party, the Contractor must be prepared to show written documentation of approval of his use of that landfill by the owner or lessee upon requiest of the Contracting Officer. Furthermore, the Contracting Officer or his authorized representative reserves the right to enter upon any property wherein the landfill or landfills are located, without prior notification of the Contractor, and inspect the landfill for compliance with the requirements of this paragraph. Relatedly, the Contractor is responsible for assurance to the Contracting Officer that this access is possible at all times during the term of this contract. If the Contracting Officer or his authorized representative determines that the landfill is not in compliance with the requirements of this paragraph, the Contracting Officer reserves the right to prohibit the use of the landfill in question by the Contractor for the purpose of disposing solid waste collected under the terms of the contract. Should the Contractor be unable to provide a means of disposal, which meets the requirements of this paragraph, then solid waste collection services required by the contract (garbage collection, policing grounds, and policing roads) shall be ceased at no cost or obligation to the Government and the Contractor shall not include in any invoice items for payment which are not performed as a result of this cessation. In this case, the Government reserves the right to have these services performed immediately by other persons or by its own employees and facilities and the Contractor shall be responsible for all costs incurred by the Government in securing such performance, and the Government is authorized to permanently withhold the amount of such costs, which are in excess of the amounts which would have been payable to the Contractor had he performed these services, from any amounts payable to the Contractor under the contract. Concurrently, the Contractor shall exclude from his invoice all items which were not performed for the reasons stated above.

Excerpt From Westpoint Reservoir Contract

DACW01-77-R-0003

TECHNICAL PROVISIONS
Section 12

Maintenance of Grassed and Landscaped Areas

TP-1. WORK TO BE PERFORMED:

TP-1.1 Seeding: All bare areas, eroded areas or other areas, designated by the Contracting Officer, where a satisfactory stand of grass does not exist, shall be seeded. Seeding shall be confined between the dates 1 April 1977 and 1 October 1977 and between the dates 1 March 1978 and 31 March 1978.

TP-1.2 Mulching: All areas to be seeded, which lie on slopes of 4 horizontal to 1 vertical or steeper, shall be mulched in addition to seeding.

TP-1.3 Mowing Existing Grass: The Contractor shall mow existing grass in all areas as required by Section 3 TECHNICAL PROVISIONS. Mowing shall be done normally between 1 April and 30 September.

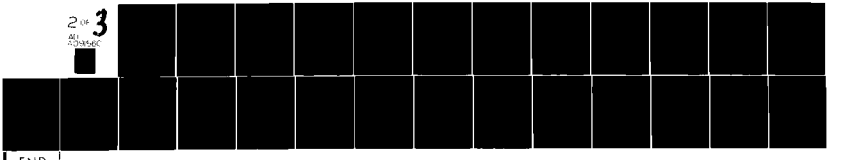
TP-1.4 Pruning Shrubs: All shrubs, planted around buildings, in public use areas, or in other areas shall be pruned, if needed. Evergreen shrubs shall be pruned between 1 May and 1 July. Deciduous shrubs shall be pruned between 1 April and 1 May and between 1 August and 1 September. Numbers 1 and 2 on Figure 170 illustrate, in general, the methods to be used in pruning.

TP-1.5 Deweeding and Remulching Shrubs and Trees: Commencing 1 April 1977 and continuing throughout the contract period, weeds and grass shall be completely removed from around all shrubs, trees and ground covers, including the removal of all grass and weeds from planter boxes, slopes and plant beds. The removal of weeds and gress shall be accomplished in four separate operations during the period specified above. Weeds and grass shall be removed from plant beds out to the originally specified limits of the beds. Weeds and grass shall be removed from around individual trees and shrubs in a circle for a minimum distance of 2-foot radius from the base of the plants. Mulch shall be placed in all plant beds and around all individual trees and shrubs to a compacted depth of 3 inches. Mulch shall be placed in a circle around all individual trees and shrubs for a minimum distance of 2-foot radius from the base of the plants.

TP-1.6 Replacing Dead Plants: All trees, shrubs and ground covers, planted around buildings, in public use areas or in other areas included within the scope of this contract which are either dead or in

AD-A091 560 UNIVERSITY OF SOUTHERN MISSISSIPPI HATTIESBURG DEPT --ETC F/G 13/2
DEVELOPMENT OF A METHODOLOGY FOR PREPARING PERFORMANCE STANDARD--ET
SEP 80 W H BUMGARDNER DACW39-79-M-2606

UNCLASSIFIED WES-MP-R-80-2 NL



Unacceptable condition, shall be replaced. The replacement plants shall be the same size, quality and species as originally planted. Planting of replacement plants shall be done between the dates 15 November and 15 March. The determination of the plants which will need replacing will be made by the Contracting Officer.

TP-1.7 Watering: Water shall be applied as needed to all newly seeded areas and to all plants replaced under this contract. The Contracting Officer will determine the frequency of application and the volume of water applied to seeded areas at each application. Replacement plants shall be watered by filling the water holding basins constructed around each tree or shrub. The frequency of the water applications to replacement plants shall be determined by the Contracting Officer.

TP-1.8 Replacing Wood Chips: As needed wood chips shall be replaced on campsite wear areas, on trails, and play areas. Chips shall be maintained on a 2-inch depth.

TP-1.9 Continual Nutrient Maintenance Program: Once each year the contractor shall take soil samples (approximately thirty (30) samples) and turn the samples over to the county agent for analysis. Contractor shall then apply an application of ground limestone and the recommended blend of fertilizer at the recommended rates based on test results of the tests made at developed portions of recreational and administrative areas.

TP-2. MATERIALS:

TP-2.1 Mulch for shrubs and ground covers: Mulch shall consist of any of the following materials.

TP-2.1.1 Pecan hulls.

TP-2.1.2 Cotton seed hulls.

TP-2.1.3 Peanut hulls.

TP-2.1.4 Sawdust and/or ground bark.

TP-2.1.5 Any combination of the above.

TP-2.1.2 Mulch for seeded areas: Threshed straw of cereal grain such as oats, wheat, barley, rye, rice, etc., shall be furnished. Materials that contain objectionable weed seeds or other species that might be detrimental to the planting being established or to adjacent farmland will not be acceptable.

TP-2.3 Commercial fertilizer shall be delivered to the site in unopened original containers bearing the manufacturer's statement of analysis, and shall contain the following minimum percentages of available food by weight:

*Nitrogen ----------12%
Phosphoric Acid ---------- 6%
Potash ---------- 6%

At lease 50% of the nitrogen shall be of the water insoluble organic form, such as nitrogen derived from urea.

TP-2.4 Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.

TP-2.4.1 For mixtures with two or more seed kinds, seed with the following minimum percentage by weight of pure live seed of each kind in the mixutre in each lot shall be furnished:

Seed kind 1	Percentage by weight of each seed kind in mixture 2	Percentage by weight of pure live seed of each kind 3	Percentage by weight of pure live seed in mixture 4
'Pensacola' Bahiagrass (Paspalum notatum)	60	78	46.8
Bermudagrass (Cynodon dactylon)	40	82	32.8

Total pure live seed in mixture ----------	79.6
Weed seed, not to exceed 1% by weight --------	1.0
Other than weed and pure live seed, maximum ----------	19.4
Total	100

TP-3. APPLICATION OF FERTILIZER:

TP-3.1 Fertilizing all areas to be seeded: Prior to tillage, fertilizer shall be applied at the following rate to areas to be seeded:

1300 pounds per acre (equivalent to approximately 30 pounds per 1,000 square feet)

TP-4. PREPARATION OF GROUND SURFACE FOR AREAS TO BE SEEDED:

TP-4.1 Tillage: After the application of fertilizer to areas to be seeded, these areas shall be tilled to a depth of 4 inches to mix the fertilizer into the soil and to prepare a seed bed. Tillage shall be done with hand operated rototillage machinery or other approved tools that will accomplish the required soil preparation.

TP-5. PLANTING SEED:

TP-5.1 Broadcast seeding; Seed shall be broadcast by hand crank seeders, or with other approved sowing equipment. Seed shall be distributed uniformly over designated areas. Half of seed shall be sown with sower moving in one direction, and the remainder with sower moving at right angles to first sowing. Seed shall be covered to an average depth of 1/4 inches by a light raking with a hand rake with wood tines, or other approved device. Seed shall not be broadcast during windy weather.

TP-5.2 Seeding rates;

TP-5.2.1 Seed mixture;	Pounds per 1000 square feet
'Pensacola' Bahiagrass	1.8
Bermudagrass	1.2
Total	3.0

TP-6. APPLYING AND ANCHORING MULCH FOR SEEDED AREAS: Mulch shall be spread uniformly in a continuous blanket, using 1-1/2 tons per acre. Mulch shall be spread by hand or suitable equipment. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched. Immediately following spreading, the mulch shall be anchored to the soil by hand tools which will chop or force the mulch partially into the soil.

APPENDIX H:

U. S. FOREST SERVICE STANDARDS AND PROCEDURES FOR CLEANING RECREATION SITES

Standards of Cleaning and Policing

Cleaning and policing should be performed with sufficient regularity at each developed site to give the overall appearance of:

1. Being clean and sanitary.

Indicators:

Toilets--free of dust, insects (dead and alive), etc., on window ledges, dividers, and rafters; unpleasant odors--both sewage odors and chemical odors; writing and soil on walls; trash and water on floor. Toilet tissue is available. Toilet fixtures are clean; seats and covers are dry.

Toilet vaults--not over 3/4 full.

Tables--free of caked grease and food particles. Surface appears as clean as the finished condition will allow.

Fireplaces--free of baked-on grease and food remnants. Fireplace usable--no more than 1/2 full of ashes. Ashes and partially burned wood confined to fireplace.

Water hydrants--free of food particles, grease, and debris in catch basin. Faucet is clean.

Garbage--cans not overflowing; free of crusted garbage buildup on inside of can; tight lids; free of holes; clean on the outside; no flies or yellowjackets.

Signs--fresh, neat, and well maintained. No signs or blackboards on trees in developed sites.

Water systems--water clear and colorless.

2. Being free of litter.

Indicators:

Litter should not be obvious. A few scattered cigarette butts, bottle caps, etc., may be present; however, several large pieces, such as candy wrappers, cigarette package foil, or paper plates, or concentrations of small pieces, should not. Family units should be free of obvious concentrations of small items (bottle caps, cigarette butts, etc.) such as occur when an ashtray is dumped, or as can be expected around a picnic bench, etc. Emphasis on the small items generally will be limited to the family unit. In the buffer areas between and around family units, emphasis will be placed on removing the large, noticeable pieces of litter. This includes areas surrounding a site that are directly influenced by users, such as a trail alongside a stream, a short loop trail to a vista point, etc.

A stream running through a site should be free of all litter, as should a lakeshore or beach adjacent to a developed site.

3. Being neat in appearance.

Indicators:

Toilet roofs free of year's accumulation of needles and leaves; building exterior walls clean so as not to draw attention. Portable tables, garbage cans, and other

facilities reasonably level and in proper location. Rocks and masonry clean of vandals' paint.

4. Being well kept by minor maintenance.

Indicators:

Maintenance work should be limited to minor projects needed to keep facilities serviceable. They should not be performed at the expense of completing the cleaning and policing job. Examples of such projects are:

a. Replacing gasket in leaky faucet.

b. Straightening a signpost.

c. Tightening door hinges.

d. Minor drainage work to protect the site.

e. Removing nails and wire from trees and facilities.

Frequency and Management

Frequency for performing the various cleaning and policing tasks must be determined by unit managers to meet the goal using the preceding standards. It is recognized that there will be times when, because of occupancy by the public, it will not be possible to clean or police a given facility. In these cases, treatment can be postponed until the next reasonable time, considering the severity of the situation. Thus, cleaning the living area of a camp unit will be postponed until the unit is next vacant. On the other hand, if a toilet needs cleaning, the caretaker should do other work in the area until the toilet is vacated, rather than simply postponing the cleaning until the next

day. Generally, items of work needed for safety or sanitation should not be postponed. Also, stove ashes may be removed while the camp unit is occupied. Unit managers should maintain close contact with use patterns in order to vary the frequency of cleaning and policing treatment to meet the existing conditions. Our policy will be to meet our goal at all times that facilities are in use. Consequently, it will be good business for managers to vary frequency of treatment by any or all of the following means:

a. Adjust number of personnel.

b. Adjust amount of equipment (vehicles, garbage cans, etc.).

c. Execute "variation clauses" in contracts, or increase cleaning visits by force account.

d. Adjust length of stay of visitors.

e. Temporarily close whole sites or portions of sites when use is light.

f. Permanently close uneconomical and unneeded sites.

g. Ask public to haul out trash from undeveloped and boat access sites. Provide plastic bags or burlap sacks and instructions for use where necessary.

h. Ask public to haul out trash from developed sites. This technique is new, but it has been successful in the sites where it has been tried.

How to Do the Job

A recreation site that is clean and well maintained is easier to keep in that condition since visitors are more cooperative when they are pleased with clean facilities. This also deters vandalism. The procedures, tools, and materials that follow do not constitute the only way to do

the job. However, they have been derived from Servicewide sources and from professional janitorial firms to meet our goal under the special circumstances of our recreation sites. Deviations should be carefully considered for their potential effect on safety, sanitation, and cost. Facilities have been divided into two classes, Class A--Waste Facilities, and Class B--Other Facilities, in order to separate the tools and materials into two kits. This separation has been made to prevent cross-contamination of the Class B facilities.

Class A--Waste Facilities

Since these facilities are contaminated by disease bacteria, they should be cleaned separately, using different tools and materials than those used for Class B facilities. A separate kit of tools and materials should be put together for each class of facilities.

Cleaning Toilets

Tools and materials Broom, double bucket, mop, mop bucket and wringer, sponge, toilet brush or swab, putty knife, measuring cup (nonbreakable), disinfectant, deodorant, detergent, toilet cleaner, rags, dustpan, dusting cloth, toilet paper, seat covers (if used), and rubber gloves (if desired).

Procedures Pick up all paper scraps and refuse on floor and on trail to toilet. Place in litter receptacle or in vault. Dust with brush: window sills, rafters, window louvers, and other flat surfaces. Clear all cobwebs.

Mix a solution of disinfectant, deodorant, and detergent (3D) in one side of the double bucket. Have clear water in the other half. Use the measuring cup to measure the proper amount of 3D concentrate recommended by the manufacturer. Dilutions vary from 1:20 to about 1:120, depending on the amount of soil encountered and the disinfection desired. However, always use the measure, because unneeded detergent or disinfectant will not do a better job, it will be wasted and make your job more difficult. Always read the label and follow instructions.

Wipe or scrub (as needed) all walls, using a 3D soaked sponge. Use the abrasive side of the sponge where necessary on stubborn marks after the detergent has had a chance to loosen the mark. Rinse the sponge in clear water before dipping it into the 3D solution again. This step helps keep the 3D solution clean and effective. It is not necessary to rinse the 3D solution from the walls unless soil is heavy. It will provide residual disinfectant and deodorant action. (If wash basins are provided, clean them before starting on the walls with a clean sponge and fresh 3D solution.)

At each visit use a sponge to scrub the outside of the toilet stool and both sides of the seat and cover with 3D solution. Pay particular attention to the hinge. Remember not to use this sponge for cleaning wash basins or Class B facilities. Finish up by using the long-handled toilet brush or swab to scrub the inside of the toilet down to the collar with the toilet bowl cleaner. Scrape the gum,

etc., from the floor with a putty knife. Sweep the floor clean. Pick up material with dustpan. Don't sweep small litter, etc., out the door. Check toilet paper supply and replace as necessary. Replace space deodorant as needed. Polish and dry the toilet stool seat and cover with a clean rag. Give the compartment a final check. Mop at least once a week with 3D solution or as often as necessary to maintain a clean, smear-free floor. Dry mop the floor so as to leave it as dry as possible. Change mop bucket 3D solution often. Dirty solution loses its effectiveness.

Odor control. Toilet vaults--most odor problems are associated with open stool toilets. The construction type, size, or material of the waste receptacle is unimportant. What is important is that there are many square feet of waste surface, plus the exposed, odor-producing vault walls and top, under the large opening of the toilet stool. The vent system, in most cases, cannot overcome the draft up through the toilet stool, so strong, unpleasant odors in the toilet compartment result.

Odor is caused by bacterial action on the wastes. There are two forms of bacterial action, anaerobic and aerobic. Anaerobic action is typical of septic tanks and takes place in the absence of oxygen. Aerobic action is typical of aerated sewage treatment plants and requires oxygen to take place. Anaerobic action is characterized by strong odors. Aerobic action is relatively odorless.

It is virtually impossible to successfully encourage 100 percent aerobic action in a pit or a vault toilet because of the impossibility of getting oxygen to all of the waste particles. Temperature and alkalinity are also important environmental factors in the growth of bacteria that are uncontrollable in vaults or pits. Therefore, addition of aerobic bacteria or enzymes can only be of negligible benefit to the surface of the waste mass.

Supression of odor by killing all bacterial action is not recommended because of the difficulty which may be encountered when the sterile wastes and residual chemicals must receive final disposal. Strong, unpleasant chemical odors also often result from the use of bactericides.

Odor control with deodorants is recommended. There are two general types of deodorants that suppress odor by working on the odor molecule. One masks the odor, the other combines with a bad odor to form a new, more pleasant odor or neutralizes it entirely. Both are satisfactory.

Two deodorants that have a record of success in toilet vaults are listed. There are undoubtedly others which are not recommended because we have no experience with them. Dosages and frequency of application should be determined from manufacturer's instructions and from a good deal of experience and constant checking with the nose.

If you wish to purchase a deodorant other than the two listed, be guided by your nose, the total cost of treatment, and by being sure the product is truly a deodorant.

Toilet compartments--space deodorant blocks in an appropriate diffuser should be used in the toilet building, even in flush toilets.

Insect control--Shell No-Pest strips provide easy, safe, and effective control. One of the Shell strips, removed from its cardboard diffuser, cut in half, and tacked high in the rafters of the toilet compartment, should provide adequate control of flies. Only one half of a strip should be needed in the average size compartment.

Safety and sanitation. Watch for splinters, protruding nails, torn screen, or hardware cloth, etc., while dusting. Correct hazards as you go along. The 3D solution in proper strength is not hazardous, but most toilet bowl cleaners are. Read the labels of all chemicals and follow directions. Always install insecticide and deodorant blocks where children cannot reach them.

Cleaning Garbage Cans

Tools and materials. Scrub brush (need long handle), disinfectant, deodorant, detergent (3D solution), double bucket, rags, plastic liners, heavy work gloves, insecticide.

Procedure. Prevent dirty garbage cans. Use plastic liners. Consider the fact that an empty can weigh s 30 lb and the average weight of waste in a full can is 27 lb. You can save a lot of lifting useless weight by using the plastic liners.

Scrub (as needed) garbage cans inside and out to remove caked and dried spilled garbage. Check the underside of the

can for grease and garbage. Steam clean once a year. Increase number of cans if overflowing cans are evident. Tie down (or otherwise secure) cans that are being tipped over by animals. Spray with Johnson Wax Raid insecticide once a week. Pick up all litter and garbage immediately surrounding the can. Before hauling, tie off plastic liners or cover the load with a tarp. Do not scatter litter and garbage in transit. Replace badly damaged cans and ones that no longer will accept a tight-fitting lid.

Safety and sanitation. Heft plastic liners and check the load before lifting. Get help and double bag heavy or torn liners before handling. Watch out for plastic bags containing toilet wastes--handle carefully. Use heavy work gloves.

Class B--Other Facilities

Facilities in this group should not be cleaned with tools or materials used for cleaning of Class A facilities. Tools used for cleaning toilets and garbage cans are contaminated.

Cleaning Tables

Tools and materials. Disinfectant, deodorant, detergent (3D solution), sponge, scrub brush, double bucket, squeegee, rags.

Procedure. Apply a liberal amount of the 3D solution to table tops and benches with the sponge. Let the detergent work a minute or so. Scrub the table top and benches with the sponge or scrub brush as appropriate to remove the soil

or stain. Rinse as necessary to remove soil. Squeegee excess solution from table tops and benches. Wipe excess solution from plank edges and squeegee skips with a clean rag.

Safety and sanitation. Watch for splinters, nails, and loose planks. Correct deficiencies on the spot. Also, check for knee hazards under the table.

Cleaning Hydrants

Tools and materials. Small brush, 3D solution, double bucket, rags.

Procedure. Remove all litter and other refuse from catch basin. Replace gravel in catch basin if it is full of grease or has silted in with dirt. Clean the entire water hydrant or pump with 3D solution. Scrub hose bib threads with small brush. Rinse the faucet.

APPENDIX I:

HONOLULU, HAWAII, PARK MAINTENANCE
APPEARANCE STANDARD

The original Honolulu park evaluation standards are contained in a looseleaf notebook composed of color photos of conditions with descriptions under the photos. Each page generally has four photos and verbal descriptions of conditions. This appendix reproduces the text of the notebook. The headings at the left are the title pages from the notebook and the text is that which is typed underneath each picture.

Lawn Care--Color

EXCELLENT - Deep rich green with even color over entire field.

GOOD - Color not quite as deep as excellent. Can have slight variations in color.

FAIR - Grass is green but has moderate variations of color.

POOR - Wide variations in color. Some brown areas evidently due to lack of water and/or fertilizer.

Lawn Care--Mowing

EXCELLENT - Evident that lawn has been recently mowed. Grass blade height level over entire field.

GOOD - Slight growth variations but field still visibly neat.

FAIR - Lawn has been mowed regularly but some high weeds remain uncut. Lawn is due for regular mowing.

POOR - Evident that the lawn is overdue for regular mowing. Grass is 2-1/2 in. or more in length.

Lawn Care--Trimming

EXCELLENT - Grass is neatly trimmed around trees, walls, buildings, etc., to same height as field grass.

GOOD - Grass around trees, etc., slightly higher than surrounding grass. Apparent that grass has been cut one time since last trimming.

FAIR - Grass is approximately 2 in. higher than surrounding grass. Apparent that grass has been cut two or three times since last trimming.

POOR - Apparent that trimming has not been done for a month or more. Grass is more than 2 in. higher than surrounding lawn.

Lawn Care--Edging

EXCELLENT - Grass is cut smoothly at the sidewalk edge. Very distinct straight line.

GOOD - Grass runners beginning to grow into edged area. Runners have grown to no more than 1/2 in.

FAIR - Grass runners have grown approximately 1 in. into edged areas.

POOR - Edging is not good enough to qualify for fair.

Lawn Care--Weeding

EXCELLENT - Grass areas are visibly weed free.

GOOD - Weeds are visible but over 5% or less of the grassed area.

FAIR - Weeds comprise not more than one fifth of the grassed area.

POOR - Weeds comprise more than one fifth of the lawn area.

Lawn Care--Leaf Removal

EXCELLENT - To all appearances there are no leaves on the ground. A small amount of small leaves acceptable as long as you have to look hare to see them.

GOOD - Some leaves are apparent but do not cover 5% of the grassed area.

FAIR - Leaves cover about one tenth of grassed area where trees are located.

POOR - Leaves cover more than one tenth of the area under or near trees.

Lawn Care--Policing

EXCELLENT - No litter on the ground including small items such as drink can tabs.

GOOD - One or two pieces of obvious litter in the field area or several nonobvious pieces of litter such as drink can tabs.

FAIR - Three to six pieces of obvious litter in the field area or many nonobvious pieces of litter such as drink can tabs.

POOR - Does not meet the standards for fair.

Plant Care--Hedge Trimming

EXCELLENT - Hedge presents an even, well-trimmed appearance.

GOOD - Hedge has been neatly trimmed but a very small amount of new growth is apparent.

FAIR - Hedge retains its trimmed shape but new growth is apparent over most of the hedge.

POOR - Does not meet the criteria for fair. Hedge definitely requires trimming.

Plant Care--Pruning

GOOD - For single and multitrunked trees, should have no sucker growth coming from the ground. Well-balanced appearance (within 8 ft of ground) and low branches have been trimmed.

POOR - Does not meet the criteria for good.

Plant Care--Weeding and Cultivation

EXCELLENT - Planted area is weed free and soil has been loosened by cultivation. Dead or yellow foliage removed.

GOOD - A few weeds are apparent and/or small amount of dead or yellow foliage; appears to have been recently cultivated.

FAIR - Approximately 10% weed cover and/or several pieces of dead or yellow foliage. Soil has been cultivated but requires cultivation again.

POOR - Heavy weed infestation and soil heavily compacted.

Refuse Removal

EXCELLENT - Area is clean. Trash cans are neatly placed with plastic bags properly installed in all cans. cans are not completely full.

GOOD - Trash cans are neatly placed with plastic bags in most of the cans. Cans are not completely full.

FAIR - Area is fairly clean with trash containers not completely full. Plastic trash bags have not been placed in most containers.

POOR - Trash is overflowing containers.

Comfort Stations--Toilet Facilities

EXCELLENT - Toilet is clean. Has no surfact dirt or stains. Pipes are clean.

GOOD - Toilet is clean but bowl is slightly stained.

FAIR - Toilet may be slightly dirty and/or has moderate staining. Piping is slightly corroded.

POOR - Toilet is dirty and/or heavily stained. Piping is corroded.

Comfort Stations--Wash Basins

EXCELLENT - Basins are immaculate.

GOOD - Basin is clean but slight staining apparent around faucet or other metal parts.

FAIR - Basin is slightly dirty and/or has moderate staining in the basin or around metal parts.

POOR - Does not meet minimum standards for a fair rating.

Comfort Stations--Walls

EXCELLENT - Walls are clean and unstained.

GOOD - Walls are clean but slightly stained probably at base of wall.

FAIR - Walls are slightly dirty and/or moderately stained. Tile grouting is stained.

POOR - Walls are quite dirty or marked up. Does not meet minimum criteria for fair.

Comfort Stations--Floors

EXCELLENT - Floor is clean and unstained. Very slight staining in grouting is acceptable.

GOOD - Floor is slightly dirty and/or slightly stained.

FAIR - Floor has loose dirt or litter, is heavily stained, and/or is very dirty.

Comfort Stations--Tissue Containers (no pictures)

GOOD - All tissue dispensers contain tissue.

POOR - At least one tissue dispenser is without tissue.

Comfort Stations--Odor (no pictures)

GOOD - No objectionable odor.

POOR - Has objectionable odor.

Drinking Fountain--Cleanliness

EXCELLENT - Drinking fountain is immaculate.

GOOD - Fountain bowl is unstained, may be slightly dirty from use, surrounding area is clean.

FAIR - Fountain is slightly stained and surrounding area is policed.

POOR - Fountain basin is heavily stained or has algae build up. Does not meet minimum criteria for fair.

Shower Facilities--Indoor

EXCELLENT - Walls, floors, and plumbing completely clean. Slight stain in the grouting is acceptable.

GOOD - May have slight staining on the floor or base of the walls. Slight soap scum on wall but no surface dirt.

FAIR - Heavy soap buildup on walls, floors badly stained, and/or algae evident.

Shower Facilities--Outdoor

EXCELLENT - Concrete pad and shower base are clean with no visible algae.

GOOD - Shower area is clean with some sand on the shower pad. Small patch of algae is acceptable.

FAIR - Shower base or pad may have a buildup of algae. Pad area should be reasonably free of sand or rocks.

POOR - Algae covers over one fifth of the shower base. Shower pad has large quantity of sand.

Ballfields--Baseball

EXCELLENT - Infield grass is well watered and with few weeds. Skinned infield basepaths and plate area are smooth with proper cinder mix and neatly edged. Pitcher's mound and home plate in good condition.

GOOD - Infield grass has scattered weeks, is not as green or skinned areas are not as well maintained as would qualify for excellent. Grading is based on overall appearance and condition of the field. Field is good if all areas are not excellent.

FAIR - Infield grass 10% or more weeds, skinned area definitely not edged, skinned areas not smooth or in need of cinders, and/or infield grass shows some lack of water and/or fertilizer.

POOR - Infield grass heavily weeded and/or skinned area rutted. Skinned area has lost any clear boundaries.

Ballfields--Softball

EXCELLENT - Grass is well watered and relatively weed free. Bases are clearly defined circles. Home plate is in good condition. Base areas are smooth.

GOOD - Rating is based upon overall appearance and condition of the field. Any of the following reduce rating from excellent to good: infield up to 10% weed growth, field apparently lacking water and/or fertilizer, base areas are elongated or pitching rubber and/or home plate are in fair condition.

FAIR - Grass color is not satisfactory, base paths elongated or pitching rubber and/or home base require replacement. Base areas are slightly rutted.

POOR - Grass in the field is heavily weeded, grass is badly worn with bases not defined, and/or bases or base path rutted.

Court Areas--Surface Cleanliness (pictures show basketball courts)

EXCELLENT - Court area is completely clean of dirt, litter, leaves, sand, or rocks. Evident that court has been recently hosed. Court lines are clearly painted or Requisition Order (RO) submitted for repainting. Court equipment in top condition or RO submitted.

GOOD - Court surface is clean of litter and dirt but may have some leaves. Court lines, court equipment (backboards, fences, etc.) are in good condition or an RO has been submitted.

FAIR - Some dirt or small amount of gravel or sand. Evident that court has not been hosed for a week or more. Court lines and equipment acceptable or RO submitted.

POOR - Court littered or dirty and/or lines and/or equipment not in good condition with RO not submitted to make repairs.

Park Buildings--Outdoor Floors

EXCELLENT - Floor must be completely clean. Appears as if it had been recently swept or mopped. No evidence of stains or spills.

GOOD - Floor must be clean. Slight quantity of small leaves or dust which have blown in is acceptable. May be very slightly stained but cannot have spills (soft drinks, etc.)

FAIR - Floor may have slight quantity of litter or may be dusty. May be stained but should not have spills.

POOR - Floor has stains or has litter, dust or leaves to a degree which would not qualify it as fair.

Park Buildings--Indoor Floors

EXCELLENT - Mopped clean, waxed & buffed, minimum scuff marks.

GOOD - Swept & mopped clean, waxed & buffed, may have some visible scuff marks but not to the degree to create unkept appearance.

FAIR - Swept & mopped clean, may need waxing or stripping, visible scuff marks.

POOR - Needs sweeping, mopping, waxing & buffing, and removal of scuff marks.

Park Buildings--Windows

EXCELLENT - Window is clean. No dirt or dust noticeable when looking through the windows. Frosted jalousies should be free of dust.

GOOD - Window may have water marks from raon but these must be barely perceptible when looking out. Frosted jalousies may be slightly dusty.

FAIR - Windows may have some smudge marks from usage but are generally clean. Water marking and dust may be more noticeable than for a good rating. Frosted jalousies may be dusty.

POOR - Windows or jalousies are dirty. Do not meet the criteria for fair.

Park Buildings--Walls

EXCELLENT - Walls should be clean of dirt and graffiti. May have been touched up with paint which does not exactly match faded existing paint.

GOOD - Walls should be clean but may have very small amount of graffiti which would be difficult to remove.

FAIR - Walls should be fairly clean and/or may have small amount of graffiti which can and should be removed.

POOR - Walls are dirty and/or have more than slight amount of graffiti which could be removed or painted over by the groundskeeper.

Park Area--Picnic Tables/Benches

EXCELLENT - Surfaces are clean and unstained. Wooden tables have good coat of paint. If paint is starting to deteriorate, an RO has been submitted requesting painting.

GOOD - Surface is clean and may have very slight stains or marks. Wooden tables or benches ahve a good coat of paint or an RO has been submitted for repainting.

FAIR - Surface is clean but may have several stains. Requires painting but an RO has been submitted.

POOR - Surface is dirty, littered, or has spills. In need of painting but has no RO submitted.

Pincic Area--Barbecue Stoves

EXCELLENT - Grill and charcoal tray are clean. Grill is complete and in good repair or an RO has been submitted. No charcoal or other litter at base of stove.

GOOD - Grill is clean. Charcoal tray may have charcoal from last use. Grill is usable or an RO has been submitted. No charcoal or other litter at base of stove.

FAIR - Grill may have some evidence of recent cooking. Should be in good repair or RO must have been submitted. Some charcoal may be at base of stove.

POOR - Stove is not complete or in poor condition with no RO submitted and/or grill is dirty from cooking.

Picnic Area--Picnic Sink

EXCELLENT - Sink is completely clean and scoured. Plumbing is completely operational or an RO submitted. No algae.

GOOD - Sink is clean, may be slightly stained. Plumbing operational or RO submitted.

FAIR - Sink requires scouring though no surface dirt evident. May have small amount of algae. Plumbing operational or RO submitted.

POOR - Sink is dirty, has algae, and/or plumbing not fully operational and no RO submitted.

Paved-Area--Parking Lot

EXCELLENT - Asphalt in good condition, no pits, holes, or cracks; parking stall lines well defined, or RO submitted; well swept, free of litter and dirt or gravel.

GOOD - Asphalt intact, no pits or holes; parking stall lines readily defined or RO submitted. Small amount of litter, sand, gravel, or dirt acceptable.

FAIR - Asphalt may have small holes with RO submitted; stall lines clear or RO submitted; may have some litter, sand, gravel, etc.

POOR - Asphalt in disrepair, may have holes, pits, or cracks, with no RO submitted; parking stall lines obscure with no RO submitted. Lot is littered and apparently unswept.

Paved Area--Sidewalk/Stairs

EXCELLENT - Sidewalks and stairs well swept and hosed. No stains and graffiti.

GOOD - May have small amount of leaves, sand, gravel, etc., or may be slightly stained.

FAIR - May have small amount of leaves, sand, gravel, litter and may be slightly stained.

POOR - Has litter, graffiti, and does not meet standard for fair.

Play Apparatus Area--Overall Appearance

EXCELLENT - Equipment in excellent condition or RO submitted for required repairs, surrounding grass area free of litter, well mowed, trimmed, deep green color.

GOOD - Equipment in good repair or RO submitted for required repairs, surrounding grass area clean, mowed, and green color.

FAIR - Equipment sturdy and safe or RO submitted for required repairs, surrounding grass area may have small litter, grass reasonably green in color, requires some trimming.

POOR - Equipment needs repair or replacement and no RO submitted, surrounding grass contains brown areas of marked degree, requires trimming and/or edging.

Special Categories

These conditions are unacceptable and will be brought to the attention of groundskeeping personnel.

Edging with herbicides (picture of uneven brown grass near curb).

Very poorly maintained shower (brick wall under shower is black).

APPENDIX J:

PARTIAL INDEX ON ENGINEER PERFORMANCE STANDARDS HANDBOOKS

ARMY TB 420-	Title
2	General Handbook - June 64, CH-1 Apr 69, CH-2 Sep 70
4	Carpentry Handbook - Nov 78
6	Electric, Electronic Handbook - July 78
8	Heating, Cooling, Ventilating Handbook - May 77
30	Emergency/Service Handbook - Jun 79
10	Janitorial Handbook - Oct 77
12	Machine Shop, Machine Repairs Handbook - Jun 79
14	Masonry Handbook - May 63, CH-1 Feb 66, CH-2 May 69
16	Moving, Rigging Handbook - Dec 62
18	Paint Handbook - Nov 78
20	Pipefitting, Plumbing Handbook - Feb 79
22	Roads, Grounds, Pest Control, Refuse Collection Handbook - Aug 69, CH-1 Nov 70
24	Sheet Metal, Structural Iron and Welding Handbook - July 65, CH-1 Jun 69
26	Trackage Handbook - Aug 63, CH-1 Jan 67, CH-2 Jul 69
28	Wharfbuilding Handbook - Jan 63
32	Students Workbook - Nov 74

Publications are available from:

U.S. Army AG Publication Center
1655 Woodson Rd.
St. Louis, MO 63114

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Bumgardner, Walter H
Development of a methodology for preparing performance standards for operation and maintenance activities at Corps of Engineers recreation areas / by Walter H. Bumgardner, University of Southern Mississippi, Hattiesburg, Miss. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1980.
iv, 64, [26] p. : ill. ; 27 cm. (Miscellaneous paper - U. S. Army Engineer Waterways Experiment Station ; R-80-2)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C., under Contract No. DACW39-79-M-2606.
References: p. 63-64.

1. Operations research. 2. Performance. 3. Recreational facilities. 4. U. S. Corps of Engineers. I. Mississippi. University of Southern Mississippi, Hattiesburg. II. United States. Army. Corps of Engineers. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Miscellaneous paper ; R-80-2.
TA7.W34m no.R-80-2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SEP 80 W H BUMGARDNER DACW39-79-M-2606

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SUPPLEMENTARY

INFORMATION

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESEV

1 September 1981

Errata Sheet

No. 1

DEVELOPMENT OF A METHODOLOGY FOR PREPARING PERFORMANCE STANDARDS FOR OPERATION AND MAINTENANCE ACTIVITIES AT CORPS OF ENGINEERS RECREATION AREAS

Miscellaneous Paper R-80-2

September 1980

1. Page 6, under center heading "Methodology," change sixth line to read:

   research project. The Corps projects selected were: Garza--

2. Page 34, under side heading "Frequency of task completion," change first line to read:

   Upon examination of the above components proposed for O&M