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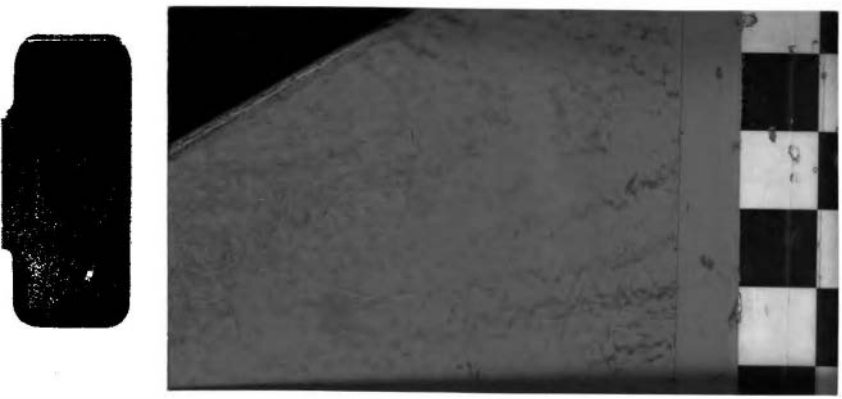

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No. 88

Budgeting for Maintenance and Repair of Facilities

(Summary of a Symposium)

Federal Construction Council
Consulting Committee on Operations and Maintenance

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PREFACE

The effectiveness and efficiency of the federal government, like most organizations, is directly affected by the condition of its facilities. Inadequate maintenance and deferral of repairs on facilities can cause a reduction in the morale and output of employees, a decline in the image of the government among citizens in general, and, in extreme cases, the loss of entire facilities.

To ensure that its facilities do not deteriorate, the federal government spends billions of dollars each year on facilities maintenance and repair. Although the need is not disputed, the formulation of federal maintenance and repair budgets is often troublesome. This is because it is difficult to demonstrate conclusively that the deferral of some maintenance and repair work will have serious adverse effects; therefore, government officials with tight budgets may be tempted to reduce funding allocations for maintenance and repair in order to have more money for operational activities.

Those responsible for facilities in many federal agencies have been seeking better methods of determining and validating their maintenance and repair needs. The Program Committee of the Federal Construction Council (FCC) decided that federal agencies would benefit from an exchange of views on the subject among themselves and with representatives of private organizations with similar concerns. The Program Committee, therefore, asked the FCC Consulting Committee on Operations and Maintenance to organize a symposium on budgeting for maintenance and repair of facilities as part of the FCC program for 1987.

The Symposium was held at the National Bureau of Standards (NBS) on September 15, 1987 in cooperation with the NBS Center for Building Technology (CBT) and as part of the CBT Symposium Series for 1987. Eleven papers were presented, six by representatives of federal agencies and five by representatives of private organizations. The speakers were asked to prepare summaries of their remarks and these summaries comprise the body of this report. The speakers were not given precise instructions on the type of summaries to be provided; consequently, they vary considerably in style and length. If additional information is desired on any topic discussed at the symposium, the author of the relevant paper should be contacted directly.

The committee gratefully acknowledges the assistance of Gail Crum and Geoffrey Frohnsdorff of the NBS-CBT staff in arranging the symposium.

The subjects of the papers presented at the symposium are listed in the Table of Contents. While the subjects are varied, one idea was expressed by many speakers: In order to develop accurate maintenance and repair budgets, owners need reliable but low cost procedures for determining the current conditions of their facilities. Several federal agencies have been working on the development of such procedures.

CONTENTS

MAINTENANCE RESOURCE PREDICTION MODEL

James Stern
U.S. Army Corps of Engineers

The Army is very interested in improving its maintenance management. A steering committee was formed to develop improvements within maintenance management. The steering committee is composed of representatives from ten installations, three major commands, Army reserves, and all Department of the Army Headquarters (HQDA) offices involved in maintenance planning. The steering committee obtained the assistance of the Construction Engineering Research Laboratory (CERL) to perform research activities as directed by the committee. The purpose of this briefing is to present the capabilities of the Maintenance Resource Prediction Model (MRPM) system which CERL developed.

INSTALLATION CAPABILITIES

For the first time in history the Directorate of Engineering and Housing (DEH) will be able to keep a complete corporate maintenance data base in one location. Answers to inquiries from Congress, major commands (MACOMs) related to maintenance planning and programming activities can be answered quickly while the inquirer is still on the telephone. Use of the system by HQDA and MACOMs will eliminate many of the current inquiries to installation personnel. The installation will be able to predict its out-year maintenance resource requirements. Information related to geographic location of the facility on the installation, travel time from shop to facility, organizations performing the work, and the effect of the occupant and weather conditions on the facility can be kept together in the same data base.

Installation personnel can go to one source and obtain all answers related to maintenance resource prediction questions.

Records of the last time a task was performed and the next time the task is scheduled to be performed can be kept. Notes can be kept on each task. The notes can be used to record the materials used, special problems encountered, etc. Such computerized records eliminate the need for separate paper files such as family housing painting and floor refinishing schedules. This also eliminates the need for separate paper files now being kept on each facility within each shop. (When an employee leaves, the information in his paper files or his mind do not leave with him.) The installation will have a record of when work was performed and when it should be scheduled. Facility resource prediction summaries can be displayed in either bar chart or tabular format. This information can be used by the installation to help the MACOM and HQDA understand the actual resource requirements of an installation.

Predicted resources for an installation are not constant. Some years require fewer resources than other years. One or two years may require an extremely large amount of resources. The resources spent in one year may be much less than the resources needed the next year. This installation-generated summary information will be passed through the MACOM and eventually be included in the President's budget that goes to Congress. The installation now has a tool to more accurately predict resource needs based upon its facilities.

An ordered list of the high cost items during each year can be obtained in descending order of costs by both components (e.g., carpet) and tasks (e.g., replace carpet). These reports will allow the installation to pinpoint the high cost items during a specific year and check to insure that all supporting documentation has been prepared. The installation now knows the high impact areas that should be investigated to try to reduce resource requirements.

Questions such as "What are the installation's predicted resource requirements for shingle roof replacement for administration facilities in a specific year?" can be answered quickly by displaying the information on the screen. This feature should save the installation hours of manual data collection, analysis, and special report generation. The answers to most questions can be

obtained while the requester is on the telephone. A listing of the individual facilities can be obtained. This list can serve as the basic list for inspection of facilities for inclusion in the 2-year annual work plan. It can also be used to write the statement of work for contracts and produce the government estimate. Use of MRPM by MACOMs and HQDA levels will eliminate many of the inquiries being made to the installation.

FACILITY DESCRIPTION

A set of general information must be entered about each facility and facility group. This information includes the facility identification number (ID), geographic location on the installation (subinstallation and area), and travel time from shops to the facility. Effects of the weather, occupant, original construction, and maintenance program on the predicted facility resources can be defined through the use of the special condition multiplier.

At this point all information related to the location and other factors have been defined. The next step is to describe the characteristics of the facility itself. The minimum facility description is composed of four data items: (1) year of construction, (2) gross square footage of floor area, (3) the Facility Class and Construction Categories Code (F4C), and (4) the scheduled disposal date (if known).

This minimal information can be used to predict resources based upon one of two calculation methods: (1) Recurring Maintenance Factor, (2) Average Facility Factor.

More detailed models of the facility can be constructed. The most detailed contains the definition of all components within the facility.

RESEARCH COMPUTER EQUIPMENT

MRPM uses a color graphics display monitor, a wide carriage printer and a 60 MB Maynard tape deck. The central processing unit is an IBM-AT personal computer (compatible system) with a math coprocessor, 3 MB RAM storage, and two of the largest Core disk drives available (70 MB to 260 MB each).

STATUS OF THE SYSTEM

The MRPM system is still under research testing at four installations in the United States and two communities in Germany. Errors, inconsistencies and incorrect wording are being corrected as they are found. New functions are being added as requested by the test sites. By 1 January 1988 the test sites will have sufficient experience to decide how they plan to use the system and to recommend to the Steering Committee how it should be used throughout the Army. The system is fully supported by the research staff at CERL. Field users are given immediate service to solve problems and correct errors.

HOW FACILITIES MAINTENANCE AND REPAIR IS MANAGED AND FUNDED AT A UNIVERSITY

Elwin Stevens
New York State University
Construction Fund

The list of speakers representing a wide spectrum of organizations here today is rather impressive and I am sure we all have a common goal, that of maintaining our facilities at the best possible level and at a reasonable cost. We would all like to rate our facilities near 100% perfect each time we make an inspection, but such a rating depends on (1) an administration that cares, (2) good management and supervision of a well-trained staff, and (3) proper funding. When such conditions exist, we tend to relax our priorities and satisfy ourselves that we are doing a good job. But when the resources are inadequate, we fall into the infamous "deferred maintenance" mode. At that point, our priorities must look toward providing essential services to keep the facilities in reasonable order and improve our management skills.

I am not going to dwell today on statistics or budgeting procedures except to say that for our facilities, the average cost of maintenance and operation is currently $1.82 per square foot, and the average cost of utilities is $1.66 per square foot, giving a total maintenance and operation cost of $3.48 per square foot. Obviously, the individual cost per campus varies a great deal between Health Science Centers, University Centers, State Colleges and Agriculture and Technology Colleges and their location in the State, with a high of $6.32 for the Health Science Center at Brooklyn and a low of $2.69 for the State College at Potsdam. Funds for maintenance and operation are provided, in one way or another, through a State appropriation as part of a campus' budget or University-wide appropriation controlled by the Central Office.

In the early 1960s, State University of New York started an expansion program that made the University the largest system of higher education in this country under a central board of trustees. It is important to understand this growth in order to visualize the magnitude of our current repair and maintenance program. In the early 1960s, the University consisted of two major educational entities: (1) the State-operated portion, constituting twenty-six campuses and approximately 680 buildings and 16.6 million outside gross square feet, and (2) twenty-five locally sponsored Community College facilities. The latter receives one third of its operating budget funding from the local sponsor (usually a county), one third from student tuition, and about one third from the State. Funds for capital projects are split between the sponsor and the State. My discussion today will focus upon the 100 percent State-operated entity of the State University of New York, a multi-campus system with university centers and colleges throughout the State and the Central Administration, located in Albany.

During the 1950s, State University limped along, such that by 1960 the pressure was so great for rapid expansion that the Governor and the Legislature created the State University Construction Fund, whose charge was to increase the educational capability of the University through new construction and rehabilitation. The necessary funds were derived through the sale of bonds supported by student tuition. This program proved so successful that by 1972, the University had increased to 34 campuses with 58 million outside gross square feet in 1,600 buildings. While the rate of growth has diminished in recent years, the University currently has 35 State-operated campuses with 66.8 million outside gross square feet in 2,080 buildings with an approximate replacement value of nearly $8 billion. We more than tripled the number of buildings and more than quadrupled the square feet.

While the facilities were increased at a rapid rate, the maintenance staff and maintenance dollars did not keep pace. From 1974 through 1984, over 375 maintenance and operation positions were lost or frozen due to budget reductions. The limited operating funds obviously supported faculty positions when a choice had to be made. The maintenance and operation staff's responsibilities increased from 9,000 outside gross square feet per person to nearly 12,500 today. While it was obvious

that these continuing staff reductions would have a debilitating affect on the overall condition of the physical facilities, making those in other agencies who provided the resources aware of the problem was something else.

The University had always prided itself in maintaining a high-quality facility. As the Construction Fund continued its construction and rehabilitation program, more attention was given to getting new facilities ready for students and less to maintaining the existing facilities. After many attempts to increase staffing and funding for repairs and maintenance, we were finally successful in convincing the State Division of the Budget and the University's Finance Section to at least set aside funds from the University's operating budget on an annual basis to begin to cover necessary repairs. Up to this point, the University had been depending upon the campus' maintenance staffs to handle maintenance and repairs, but in 1972 there were repair project requests totaling $5.8 million with a funded appropriation of only $2.25 million. Projections at that time through 1980 indicated a potential backlog of over $40 million at the 1972 funding rate.

The University's Physical Plant Support Services Division (PPSS), which was responsible for review and recommendation of the campus' repair projects each year, had made numerous efforts to alleviate the problem. Historically, each campus would prepare its own annual capital budgets during the summer and fall preceding the upcoming fiscal year which commences on April 1st. Their Capital Budget Request would consist of:

1. New facility requests
2. Major facility rehabilitation projects--generally over $60,000 each and
3. Minor facility rehabilitation projects--generally under $60,000 each.

In addition to their Capital Budget Request, each campus would also submit their Maintenance and Operating Budget to the University's Finance Section, which, after allocating all academic costs, would include the cost of their maintenance staff, supplies, utilities and repairs. Up to 1972, the Physical Plant Support Services Division was only responsible for review and recommendation of these items, but with the 1972-73 oil embargo and the

rapid increase in utility costs, the door was also opened for more management participation by the PPSS Division. By 1973, the PPSS Division had already developed a University-wide Custodial Staffing Guide, which included various guidelines for presentation of repair and rehabilitation projects, and the staffing and operational procedures for a campus Maintenance and Operation Center which would provide the cost data required to properly evaluate maintenance and repair needs.

PPSS recommended an elaborate energy conservation program which included computerized consumption reporting, various means of reducing utility consumption, and cost budgeting by campus (managed by the central office staff). The program was approved and has produced over $250 million in cost avoidance since 1972. In addition, the University and the Construction Fund developed day-to-day energy user guidelines and energy efficient construction standards for all of its projects. It was the early positive response to these programs that we believe provided the agreement that annual funding for repairs be provided from the University's operating (State Purpose - tax dollars) budget. This continuing funding source has become known as the Repair Account Program and has now expanded to $7.83 million in this fiscal year for repairs of academic buildings only, and has reduced our project backlog through 1987 from $40 million in 1980 to approximately $9.2 million.

This program proved so successful that the Division of the Budget has expanded it to all other State agencies and lists the following definition of repairs in their Agency's Budget Request Manual:

> All repair projects are to be included in the Agency's State Operations Budget Request. A repair is a maintenance expenditure for the purpose of maintaining a facility in an ordinarily efficient operating condition. It does not significantly add to the value of the facility, nor does it appreciably prolong its life. It merely keeps the property in an efficient operating condition over its probable useful life for the uses for which it was acquired.

This program is one of four major sources of funding provided to the University for rehabilitation; the others being:

1. Capital Construction Budget - New Construction and Major Rehabilitation Program. Recommended in the Executive Budget followed by appropriations by the State Legislature and funded through the sale of bonds.
2. Capital Construction Budget - Minor Rehabilitation Program. Funded by the State Legislature to Division of the Budget which in turn provides funds to all State agencies on a project justification basis.
3. Dormitory Authority - Dormitory Rehabilitation/ Repair Program. Funded by the Dormitory Authority from construction bond fund interest. Recent legislation directed towards making the dormitory rental program "self-sufficient" may eventually change this program dramatically, but it is too early to tell in which direction the source of rehabilitation funds may go.

I briefly mentioned maintenance priorities and the need to convince others of our maintenance needs. In order to expand the University in the 1960s, a Physical Space Inventory program was developed to allow the University and the Construction Fund to determine the type of academic space that was in existence, how it was used, and the amount and type of space needed to be added or expanded to carry out the University's enrollment and academic goals. All of the facts pertaining to academic and related space are in one set of documents, making the need of new space or conversion of existing space easier to justify. This type of documentation was essential to the continued support of its maintenance, repair and rehabilitation program. In 1979, the University developed the first version of the State University of New York - Physical Plant Report. This yearly report was distributed to all State support agencies and all members of the State Legislature. From the favorable response, it was obvious there was a new awareness toward the University's concern and efforts to maintain and operate a quality University system at a reasonable cost.

With most of the programs outlined in this report already in place by the early 1980s, we set about to provide a greater degree of flexibility within an appropriation and to enhance all program funding. Up to this point, the Minor Rehabilitation and Repair Programs

were funded to the University after submission of a totally justified and prioritized program with each project accomplished in that order. While these early priorities had been established by the University to facilitate its selection of campus projects, it ultimately became trapped by them. Rehabilitation projects were prioritized into eight Purpose Codes:

1. Health, Safety, and Security
2. Accreditation
3. Preservation of Facilities
4. Facilities for Physically Disabled
5. Energy Conservation
6. Environmental Protection or Improvement
7. New Facilities and Equipment Replacement
8. Program Improvements or Program Changes

Repair projects were prioritized into six Purpose Codes:

1. Exterior Repairs to Preserve Structures
2. Exterior Paved Surface Repairs
3. Exterior Athletic Surface Repairs
4. Exterior Caulking/Painting
5. Building Mechanical/HVAC/Sanitary/Electric System Repair
6. Interior Building Repairs

Generally, funds provided would not allow very many projects from the last two or three Purpose Codes to be accomplished. This became of great concern because these items were those that directly affected the academic program. The University then proposed to establish a budget with priorities for each Purpose Code. During the fiscal year, adjustments would be made between Purpose Codes as emergencies arose. This proposal was approved by the Division of the Budget and the experiment eventually became a very effective and permanent managing tool.

While we had new programs and management tools to work with, we still had to determine the effectiveness of campus maintenance and operating programs and the effect of these various projects on campus physical facilities. As I mentioned earlier, a reduction in maintenance and operation staffs during the 1970s and early 1980s had adversely affected our physical plant conditions, but to what degree were they actually affected? In an effort to

determine this, a University-wide site evaluation of the conditions and functions of each campus was made in the fall of 1978 and annually thereafter. The initial program established and evaluated 13 rating factors from level of general maintenance and preventative maintenance to facilities management An additional evaluation and review of the number of maintenance staff, cost of maintenance/repair supplies, and maintenance oriented service contracts was included. Each campus was ranked according to their total number of points. After several years of this procedure, a competitive atmosphere had developed between the top ranked campuses (and Legislators), and funding improved. In 1984, a new Condition Report was developed which covered in considerably more detail, Facilities Management, Exterior/Site, and Building evaluations. The new report eliminated the campus-against-campus ranking process in favor of determining how many of the various elements evaluated were Good to Excellent or Fair to Poor. This revised procedure has produced some interesting statistics as to the condition, University-wide, of some of the elements being evaluated.

After explaining these fancy programs, funding, and definitions, it is still necessary to accomplish the work within a reasonable time frame. I mentioned that the State University of New York had established the Construction Fund in 1962 to handle its new construction and major rehabilitation programs. This agency was to have an approximate life span of ten years. The fund is now celebrating their 25th Anniversary. The Construction Fund's attention was shifted from new construction projects to rehabilitation projects. The Fund normally administers all projects and assigns them to private architectural/engineering firms for design, award, and supervision. Today, even though a reasonable amount of new work is still being accomplished, the major work is in Major/Minor Rehabilitation and Repair projects. These projects are accomplished using private firms, the campus staff, or directly by Construction Fund personnel.

The management structure of the construction unit of State University and the Construction Fund has changed significantly and we are now merged into one operating unit, the Office of Capital Facilities. However, each entity still retains its legal functioning powers under separate laws, thus allowing a greater degree of flexibility than other State agencies enjoy.

I mentioned the University's Maintenance and Operating staffing problems. These reductions have had, over the years, what continues to be a lasting effect on the physical maintenance of the University's facilities. Adequate funding and a reasonable staff allows the campuses to use a method of construction called Special Fund Estimates, under which a campus can use funds from its own Maintenance and Operation Account, or from its previously approved Minor Rehabilitation or Repair Account program, to complete projects generally up to $15,000. The campus can hire student help, outside labor or tradesmen through the local construction unions and place them on their payroll to accomplish the project under the campus' supervision. While the Special Fund Estimate program is still a popular and quick method of accomplishing some types of work, the loss of tradesmen and supervisory staff on the campuses has reduced the use of this program on many campuses. In order to supplement this effort, the Construction Fund developed a complete Architectural and Engineering In-House Group that now handles a substantial portion of the Minor Rehabilitation and Repair Account program.

One last item I should mention is the development of Campus Maintenance and Operation Centers which are used to review and coordinate maintenance and repair projects. These centers have now been upgraded by the addition of a Maintenance Cost Accounting System, a computerized program that draws upon all the stored University programs and staff data and blends it with the campus man-hour and material expenditures. With time and proper refinement of the data, it is expected that the results will improve campus management of supervisory and maintenance personnel. We may never return to the staffing level of the 1960s, but improvement of management techniques will result in better maintained campuses.

I hope that this overview of State University of New York's rather extensive Repair and Rehabilitation program has been of some benefit to all of you. The copy of the 1984 Physical Plant Report contains more details on these programs, and if you have a special interest or need additional information, give me a call and I will have one of our staff who has daily contact with that program talk to you.

3

FACILITY MAINTENANCE AND THE INTEGRATED LOGISTIC SUPPORT SYSTEM

Joseph Weatherspoon
U.S. Postal Service

In most organizations, facility upkeep equates to the maintenance of a number of facilities - usually fewer than 50 - in an optimum condition. In the U.S. Postal Service (USPS), facility upkeep encompasses a much greater effort simply because of the vast number of buildings. Currently we have 29,293 buildings leased from private sources, 317 leased from the General Services Administration, 900 Self Service Postal Units, and 4,769 buildings that are USPS owned for a grand total of 34,379. These structures range in size from the 30 square foot Self Service Postal Units to the Chicago Post Office that is slightly over 2 million square feet in area. Approximately 100 of these buildings are in the 200,000 to 500,000 square foot range. Inside these structures are myriad pieces of equipment and systems required to support the primary purpose of the U.S. Postal Service; that is, the movement of the mail.

Leased buildings are either owner maintained or USPS maintained while all USPS owned buildings are strictly USPS maintained. In the majority of cases, as leases expire, owner maintenance is being converted to USPS maintenance. A work force of about 30,600 craft and 3135 supervisory personnel, located in approximately 2200 of the largest offices, maintain these facilities and the associated equipment. Also providing various types of support are approximately 1,000 Facilities Department personnel and 100 maintenance personnel in the headquarters and field offices.

In order to better illustrate the magnitude of facility management and maintenance, it is helpful to present the organizational structure of the USPS. The Postal Service field organization consists of 74

divisions divided among the 5 regions. Headquarters activities are located both in the Washington area and in field locations. The two headquarters organizations primarily involved in facility upkeep are the Facilities Department and the Engineering and Technical Support Department. The Facilities Department has 5 Service Centers and 11 Service Offices located in various parts of the country that assist local divisional personnel. The Engineering and Technical Support Department has 5 Regional Maintenance Overhaul & Technical Support Centers that provide management assistance to divisional maintenance personnel.

In Fiscal Year 1986 (FY 86), the Facilities Department offices initiated approximately 6800 repair and alteration projects at a cost of $276 million. Such type of work is usually accomplished under a term contract, established by the Facilities Department offices with a number of commercial contractors. Also in FY 86, about 11.5 million hours of in-house USPS maintenance labor was consumed in facility maintenance and upkeep - a labor cost of almost $200 million. The projected FY 88 Repair & Alteration capital budget is in the vicinity of $280 million with new construction projected at $1.6 billion.

Timely and comprehensive information is required to effectively manage and monitor a program of this size. At the present time four different national management information systems are used to record and track actions relating to facility upkeep. They are the Facility Management System, Project Authorization Control System, National Maintenance Information & Control System and the Bulk Mail Center Management Information System. These systems run on different hardware and operating systems, the files used are not compatible, and they are expensive to maintain. To correct these deficiencies the systems are being, or will be, replaced by integrated, relational data base supported systems, that will have the compatibility to pass information to each other and to any other system requiring it. Development work on the Facility Management System and Project Authorization Control System is scheduled to begin in FY 89. The National Maintenance Information and Control System and Bulk Mail Center Management Information System will be replaced by the Integrated Logistic Support System. It is being developed in two phases, a local system and the national host system. The local system is currently being tested

and will be implemented nationally starting in April 1988 with the host system going on line in December 1988.

The Integrated Logistic Support System is a totally integrated, menu driven system, that encompasses the procurement, supply management, and maintenance functions at both local and national levels (see Figure 1). It will be operating as a stand-alone system on mini computers at 306 locations with communication hook ups to the national data base at the St. Louis Postal Data Center. The local system is supported by an ORACLE Version 5.1 relational data base management system and applicable 4GL tools. Through the national system, data can be transferred to or from other systems located at the various Postal Data Centers. With this system in place local managers will have detailed information available concerning expenditures, work load requirements and resource availability. They will also have comprehensive historical data for planning and forecasting local requirements. With the SQL query language, local and national managers can also access the national and other selected local data bases to obtain required information. SQL provides each user the capability to select the parameters and formats desired for their specific requirements (see Figure 2). Updates to the Facility Management System or other related systems will be used to update specific data elements in the Integrated Logistic Support data base. When these systems are operational the USPS will have the required data to adequately support the overall facility maintenance program.

If we are to operate and maintain our facilities in an efficient and cost effective manner, facility maintenance concepts and procedures must keep abreast of the changing technologies. Techniques used in other industries, such as the aviation and space communities, should be reviewed and utilized to improve our current programs. New materials and processes that will reduce labor and material costs need to be tested and implemented where feasible. Not very far into the future is the "smart building", with systems that tells us that something is moving out of the norm and will require some type of maintenance action. These are diagnostic systems that will trouble shoot the problem and provide the mechanic with enough information to correct the discrepancy with minimum effort and cost. A good integrated information system is required to support these

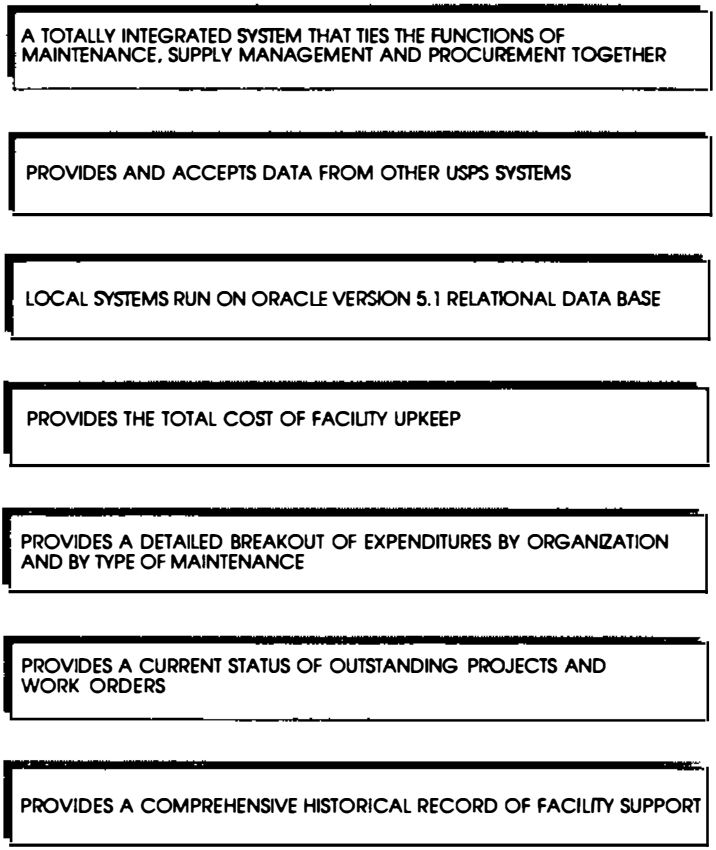

FIGURE 1. What is an Integrated Logistics Support System and What Will It Do

concepts. The system must also have the capability to change with the times and to meet the ever changing requirements of the maintenance community. The Integrated Logistics Support System meets these requirements.

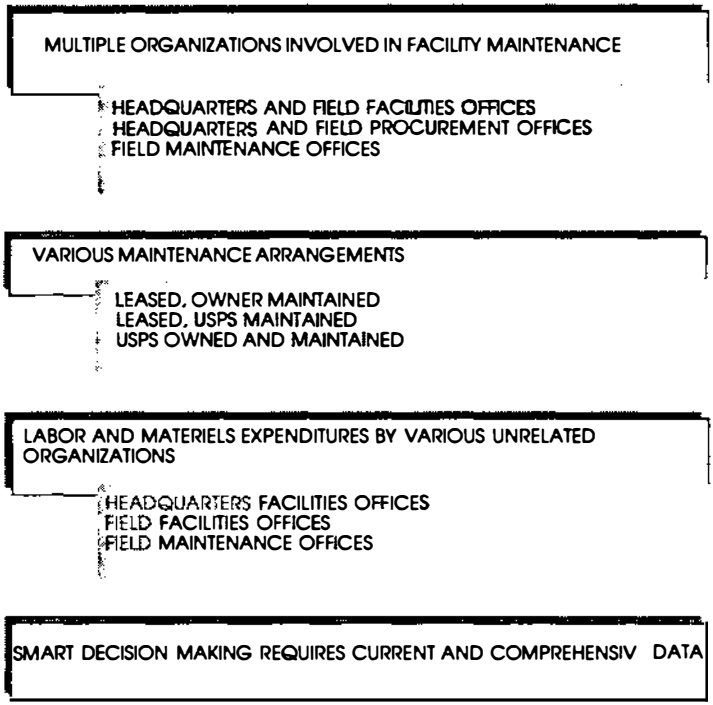

FIGURE 2. Why an Integrated Logistics Support System is Required

4

U.S. AIR FORCE FACILITIES MAINTENANCE AND REPAIR

Malcolm Junkin
U.S. Air Force, Directorate of Engineering and Services

Budgeting for the "mundane" tasks of operating and maintaining facilities and preserving them for future missions constantly competes with the more glamorous new construction programs. From various perspectives, the importance of taking care of the physical plant is truly "different things to different people."

But given the political and bureaucratic environment that we work within, the current engineering "art" of forecasting requirements is not without its shortcomings. While the operation and day-to-day maintenance and repair requirements can reasonably be estimated from recent historical experience, such is not the case with the major maintenance and repair necessary to revitalize and preserve our facilities for the future. Simply stated, we do not know what it takes to adequately preserve our physical plant for the long haul.

We can reason that the need to revitalize a facility is a function of age, type of construction (materials, quality, etc.) and the history of maintenance and repair on the facility. However, neither the construction nor the M&R history information is readily available for analysis for such a large and diverse facility plant like the Air Force's.

Recently there has been a great deal of interest in identifying life cycle costs and deterioration rates for facilities. Many believe that we are on the verge of making considerable progress in this area. But we must recognize that there is still a missing link. Facilities have not all been maintained to the same level. Assessing the current condition is as important as life-cycle cost models in enabling us to forecast future funding requirements.

While we and others in our community are working on developing the life-cycle costs, we are also devoting considerable effort to developing a methodology for measuring the condition of facilities. Our first efforts (see Figure 1) will be static snapshots, but we hope the future will find us using easily available data to provide a nearly continuous evaluation of the condition of our physical plant.

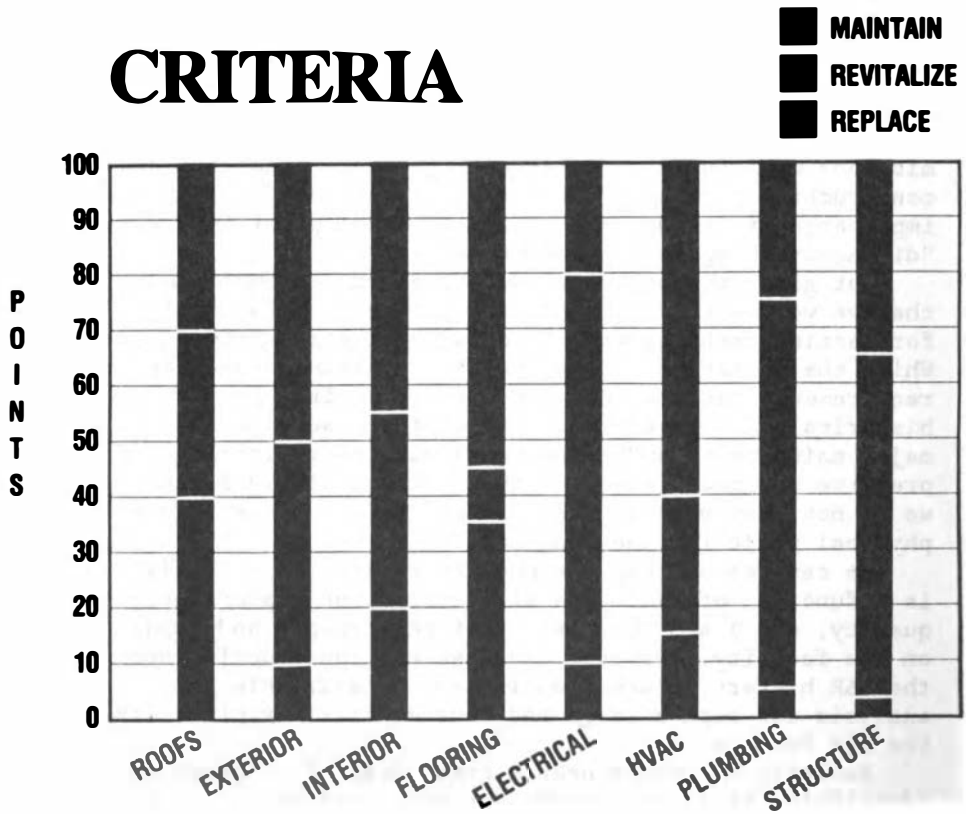

FIGURE 1. Maintenance and Repair Decisions Should Reflect Current Conditions (Expressed in Points).

5

PREDICTING THE IMPACT OF NEW CONSTRUCTION AND EQUIPMENT INSTALLATIONS ON FUTURE PLANT MAINTENANCE COSTS

Richard Stockton
Mason & Hanger-Silas Mason Co, Inc.

It has been apparent to those of us who have dealt with maintenance programs the last twenty years that proper and safe maintenance must be placed in the mainstream of importance to top management in private industry, local, state, and federal governments, and international companies around the world. If we as responsible individuals do not shoulder and solve the maintenance challenges already before us, we will be placing unreasonable burdens on our future maintenance personnel.

There are many things maintenance managers in the U.S. Department of Energy need to do at the present time to meet the challenges of reduced maintenance budgets, and demands to improve efficiency, and to respond to the impacts of increased security and environmental requirements. One of the things we need to do is to predict and advise our management of the impact of proposed new facility and equipment installations on future maintenance costs. We especially want to know if the scope of future projects necessitate the development of maintenance capabilities that are not currently available at the plant. This presentation discusses the approach used by Mason & Hanger to forecast future maintenance costs at the Pantex Plant.

The history of past maintenance activities is the backbone supporting the forecasting of future maintenance requirements. In order to establish and maintain a reliable maintenance history file, it is necessary to keep records of the maintenance done on equipment, systems, and structures. Our company has developed a "Computerized Maintenance System" to compile, report and analyze maintenance history information. A mainframe

system is used for collection of information such as: identification of equipment and equipment location, craft time and cost to perform preventive maintenance and repair on equipment, and the expected usable life of the equipment.

There are seventeen craft shops in the Mason & Hanger maintenance department at Pantex Plant, and mainframe terminals are provided in each shop area for the input of maintenance data. The same format is used by each shop so the information is easily combined to give us the latest maintenance history on items in the system at any time. Reports are generated from this information to assist each maintenance section in the performance of its assigned responsibilities.

We selected the Personal Computer software program "Symphony 1.1" for our records system because it has the capability to manipulate large amounts of data on spread sheets. Our records system is designed such that all equipment attached to a structure becomes a part of the the record for that structure. Any time a craftsperson performs maintenance on equipment or a structure, information on what was done is entered into the computer. This information includes: what the item was, where the item is located, who performed the maintenance, what was done, and the time used to do the work. A selected number of items, equipment, and structures in our maintenance system are selected as prototypes and used for comparison with proposed new items, equipment, and structures to forecast future maintenance requirements.

When the final drawings and specifications for a project are submitted, we document specific information pertaining to that project. The proposed structure information (purpose, functions, size, square feet, number of bays, cells, offices, equipment, utilities, fire protection and security alarm systems, etc.) are entered in the estimating section of the file. Our files are then accessed for the maintenance information of a prototype structure which can be compared with the proposed new structure. After a prototype structure is selected, the maintenance information for that structure is also copied to the estimating section of the file. The computer compares the data and calculates by fiscal year quarter the craft skills and hours needed to provide support for that project. In order to summarize the approximate dates of need for maintenance support,

the program lists all proposed projects by start and completion dates, and totals, by fiscal year quarter, of the craft skills and hours required to support each project.

Four different type reports are generated from this information:

1. Craft labor needed for construction support by fiscal quarter, and craft labor needed for maintenance of new facilities by fiscal quarter.
2. Craft labor needed for construction support by fiscal year, and craft labor needed for maintenance of new facilities by fiscal year.
3. Craft labor needed for the replacement of worn equipment and installation of new equipment by fiscal quarter.
4. All projects that have been estimated showing the crafts skills needed and time required to bring these projects on stream and maintain them for one fiscal year.

This program has been in effect since 1982 with past history maintenance records available since 1971. The information developed from this program is used for budget input, preparation of impact statements, and presentations to management. Comparison of previous forecasts with actual impacts of new projects have shown our approach is accurate within plus or minus 5 percent.

6

FACILITY DIAGNOSTICS FOR CAPITAL RENEWAL

John H. Myers
Georgia Institute of Technology

There are vast numbers of aging buildings in the United States, both in public and private ownership. Much of this building stock has been subjected to deferred maintenance, in some cases for decades. Much of the building infrastructure, both old and new, has problems with failure of materials and systems. One projection says that in major universities alone, there is a base of over $200 billion of building assets at placement costs, and that there is a $40 billion capital maintenance backlog in this population. Planning and estimating for capital renewal is an increasingly critical issue, and many property owners and managers are running out of patience with programs and staff who cannot present an accurate comprehensive picture of capital improvement needs.

One recent institutional and market response to this frustration has been a proliferation of maintenance management programs and computer software to put facility systems on a regular maintenance cycle. The failure of this approach is in not recognizing that much of the aging building infrastructure has been neglected through continued "deferred" maintenance. Implementing sound routine maintenance procedures on systems which are worn out or nearing failure is a cost intensive and futile task. There may be occasional savings when operational irregularities are discovered and corrected, but often substantive resources are expended to catch up on maintenance across the board and the systems continue to operate inefficiently or fail. For this reason owners and management often become disenchanted with maintenance management system programs. They fault the programs for not being cost effective, when the real fault lies in not

understanding how and when to implement such programs. Good money is thrown after "no money" as the years of neglect catch up and begin to exact a price. Those responsible for property management often feel helpless to gain control of the cycle.

The general failure of maintenance management alone to resolve the problems is being manifested today with the shift toward programs of "capital renewal." Managers in both government and the private sector are recognizing the futility of blindly investing in maintenance, without knowing the type, age and condition of systems; and without a comprehensive look at the implications of all the components in the system. Chief executive officers, agency heads, and especially those in charge of financial and budgetary matters are demanding accurate and comprehensive information on their real property. I often hear upper level managers say "I just want someone to tell me what we have and what condition it is in." Simple as it sounds, the fact that this is a major problem for government agencies and large real property holders is testimony to the fact that in the U.S. we have no well established, comprehensive methodologies for condition assessment. Inspections and condition assessments are notoriously single-focused on one issue such as fire and life safety, public health, or some other burning issue of the day. Facility managers are often subjected to multiple inspections, which recur continuously without consideration for any interdisciplinary coordination of either the findings or the inspection time. It should come as no surprise then, that managers have difficulty making sound decisions on the allocation of maintenance and capital improvement funds since they often have only partial information, which is uncorrelated and comes from different points in time.

While all the answers to the dilemma do not exist, there are many things which can be done to gain control of the information on the condition of real property. We were charged with addressing this problem for a major federal agency and the results can be a guide to any property owner faced with the same concerns. The critical issues and resulting program are described below. Every facility owner will face these issues and may experience a feeling of deja vu as they read on.

The first step in the process is to know what to call the process. The terms which have emerged for comprehensive assessment of real property are "building

diagnostics" and more recently "facility diagnostics." The latter term recognizes that many other aspects of management, siting, services, and functionality must be at least recognized to provide the bottom line to the owner/manager. One current term for an overall program addressing these issues is "Capital Renewal and Replacement."

The second step is to understand that facility diagnostics can be very broad and/or very deep. The owner/manager wanting accurate data should recognize that professional field data collection, based on comprehensive inspections, can get expensive. In order to control the time and cost of a data collection effort, managers must limit or define the scope of assessment programs. This is done not by limiting the focus but by directing the focus and limiting the depth of analysis. Our program defined nine areas of coverage:

Site
Exterior architecture
Interior architecture
Fire-life safety
Public health
Handicapped accessibility
Electrical
Heating, ventilating and air-conditioning
Plumbing

In each of these areas a specific number of elements was identified and defined. Not every building will have all of the standard elements and conversely the standard elements will not cover all of the features found in buildings. "General" elements were placed at the end of each division to accommodate unique features not addressed in the standard list.

Another issue, computerization, is fundamental to storage, retrieval and manipulations of data if the owner/manager has many buildings. The standard element structure alone represents a standard structure for a computer data base file. The rapidly increasing speed and capacity of microcomputers means that virtually any size property owner can manage the data with a personal computer. Our program uses the IBM PC as the standard and is designed around powerful off-the-shelf data base management systems (DBMS). There is no need for complex custom software when such existing DBMS have procedural

languages to enable total control of the data. Even with computers, it is necessary to group data logically. Vast amounts of data can be collected in the assessment process. A colleague recently told me his company did assessments, summaries, and utility assessments on 37 university buildings and the resulting data required 17 megabytes on a PC hard drive.

The owner/manager must also recognize that selectively combining the often fragmented aspects of inspection and assessment is a multi-disciplinary affair. No single professional has the broad practical perspective to address all the issues, but neither can a client afford to field and support one or more teams of a dozen specialists. After some experimentation we settled on field teams of two or three people, generally backed up by specialists who can be consulted on an "as needed" basis for the difficult issues. The field teams generally consist of an architect with some historical and code evaluation experience and an electrical engineer with some mechanical experience. Actual team composition should vary depending on the direction set up by the owner/manager, probably based upon the distribution of building types. Flexibility is critical in establishing the team structure. We evaluated and experimented with dedicated professional teams, teams of university faculty, and teams of subcontractors. One scenario included recruiting retired professionals, even husband and wife architect/engineer teams, who were affordable and unencumbered for extensive travel. Creative but technically sound options must often be explored when the problem is institutional and the scope is extensive.

Condition assessments on a large scale can be both time consuming and expensive. One aspect of our program looked ahead to agency-wide site inspections, and developed responsive, cost effective methods of delivering service. The Mobile Resource Laboratory (MRL) was a fully self-contained, mobile architectural office to support field teams in the performance of "turn key" inventory/inspections. The MRL was a retrofitted GMC mobile home containing the following:

Architectural drafting station
Technical library
Onboard computer and office supplies
Remote data communications for data and voice
Conference area

Camera systems
Rear screen slide system for training and review
Plan storage
Personal support area
Rooftop storage of inspection equipment.

The MRL was a support vehicle for a team of an architect, engineer and technician to visit and fully assess a complete site, then move on to another. A series of such vehicles could support a powerful and productive regional or national assessment program. Costs are lower than for professional subcontractors, and results are superior in many cases to evaluations conducted by on-site staff.

The program we developed for one federal agency was fundamentally driven by a life safety concern. Credibility was also an issue since appropriation requests for funds for rehabilitation had been difficult to justify. Our system reached its goal of producing a one-page cost summary representing national agency needs, but the system also could provide a one-page detailed breakdown on each building, if required. Other important issues which had to be addressed included:

Sampling all buildings vs. statistical sampling
Destructive testing vs. non-destructive testing
Level of graphic and photographic detail needed
Cost effectiveness on a large scale
Distributed vs. centralized data management
Code normalization
Cost estimating standards

In conclusion, it is important to approach building condition assessments with common sense, flexibility, creativity and an interdisciplinary "mind set." Utilize and combine available methods, tools and procedures prior to initiating new research and development; in other words, avoid reinventing the wheel. Bear in mind that the human factors are as important as the technical ones, and this is true for both the performers of assessments and the recipients of the data. Involve users at all levels in the formulation of assessment programs, and avoid layering cumbersome requirements on field personnel. With attention to these issues, and careful management, condition assessment programs can serve the

needs of many levels in an organization, and produce accurate, reliable data from which to implement successful capital renewal programs.

7

INDIAN HEALTH SERVICE "DEEP LOOK SURVEY SYSTEM"

Thomas M. Bedick
Indian Health Service

In May 1970, the Department of Health, Education and Welfare, now the Department of Health and Human Services (DHHS), determined that there was an urgent need to maintain a current, easily accessed data bank of information on the condition of facilities operated by its agencies. A particular interest existed in knowing more about the condition of structures managed by the Indian Health Service (IHS) since that agency's buildings were widely scattered, often in remote locations from Barrow, Alaska to Sells, Arizona, and Neah Bay, Washington, to Cherokee, North Carolina. Furthermore, there had never been a comprehensive detailed evaluation of IHS facilities.

The Office of Facilities Engineering and Construction, which has since become the Office of Engineering Services, was created to develop and implement a Department-wide system that would ensure a recurring analysis of all DHHS structures and a means to document deficiencies identified during the surveys. A "Deep Look Survey System" was developed to ensure an in-depth survey of all IHS facilities every five years.

The driving factors for establishing a Deep Look Survey System included:

1. The need for basic information that would enable the IHS to anticipate maintenance problems before "breakdown" and provide data necessary for developing a comprehensive facilities management program. There were no historical data from which to develop a sound operation and maintenance plan for IHS facilities.

2. The fact that plant management programs in place at IHS facilities ranged from primitive to highly sophisticated. They had developed without direction or consistency, and it was difficult, if not impossible to compare one to another.
3. The need to use limited manpower and facility maintenance funds effectively and efficiently. It was imperative that operation and maintenance resources be used most appropriately to maintain the physical condition of IHS facilities to meet the requirements of medical staff and patients.

The Deep Look approach requires site visits by a team of engineering and architectural professionals (e.g., architect, electrical engineer, mechanical engineer, structural engineer and civil engineer). When appropriate, the team may also include plant management specialists, safety officers, program analysts, institutional sanitarians, and facility managers. The Deep Look survey team conducts a comprehensive evaluation of each facility. The scope of the survey includes:

1. The building's physical condition;
2. The extent of code and accreditation deficiencies;
3. The manner in which facilities operation and maintenance functions are managed; and
4. The existence of adverse environmental conditions within the facility which may affect the health and/or safety of patients, employees, and/or visitors.

Deficiencies identified during Deep Look surveys are assigned one of the following deficiency codes:

1. Patient Care - e.g., replace nurse call, install medical gas system, etc.
2. Fire and Life Safety - i.e., NFPA 101 deficiencies.
3. Safety - e.g., tripping hazards, etc.
4. Environmental Quality - e.g., housekeeping, bathroom exhausts, etc.
5. Program Requirements - i.e., changes to meet program needs.
6. Handicapped - i.e., GSA accessibility standards
7. Energy Management - e.g., insulation, etc.
8. BEMAR Structural - e.g., replace roofing, etc.
9. BEMAR Mechanical - e.g., HVAC, plumbing, etc.

10. BEMAR Electrical - e.g., building services, lights, etc.
11. BEMAR Utilities - e.g., services five feet outside building.
12. BEMAR Grounds - e.g., landscaping, parking, etc.
13. BEMAR Housing - i.e., all aspects of quarters needs.
14. Real Property Installed Equipment - e.g., replace boilers, chillers, etc.
15. Plant Management - e.g., staffing needs, training needs, etc.

Each deficiency identified during the survey is documented separately on a "Work Estimation and Approval Form." On this form, the surveyor writes a narrative description of the problem, recommends a solution, and provides a cost estimate. This information is entered into the computerized facilities condition survey data system in abbreviated form. At present, all data is maintained on a mainframe computer in Albuquerque, New Mexico. Pre-formatted reports are generated quarterly using this data. The IHS uses the Deep Look survey data as a tool at all management levels; e.g., work plans for day-to-day operations are developed at individual hospitals, justifications for new hospitals are developed at Area Offices, and forecasts for maintenance and repair budgets are generated at Headquarters.

Information obtained through the five-year cycle of Deep Look surveys is supplemented by annual general inspections which are conducted in fiscal years between Deep Look surveys by one or two professionals. During this site visit, the following is accomplished:

1. The existing deficiency listing is reviewed to determine which deficiencies in the Deep Look inventory have been corrected and, therefore, can be deleted from the data system;
2. Additional deficiencies identified by hospital staff are noted;
3. Obvious problems which can be identified without extensive investigation are identified;
4. Recommendations from previous Deep Look surveys are reviewed for adequacy and the effectiveness of actions taken on those recommendations is evaluated;
5. On-going operation and maintenance activities are observed and their impact is assessed.

The Deep Look system has proven extremely valuable for identifying facilities-related deficiencies. However, its usefulness has been limited by a lack of direct user access to the data. The present system does not allow for rapid, convenient individual user data input or extraction. Data verification may be possible in as little as one week or may take as long as 90 days.

Because the IHS Facilities Engineer works in a health care environment, it is essential that data on identified needs for critical equipment and system repairs be available on a daily basis. To resolve the data access problem, the IHS is adapting its Deep Look data base for use with personal computers. When this is accomplished, we will have a facilities condition monitoring system capable of meeting the needs of our routine maintenance and capital improvement programs.

8

HOW FACILITIES MAINTENANCE AND REPAIR COST ARE BUDGETED BY FIRST ATLANTA CORPORATION

Roland O. Downing
First Atlanta Corporation

I'm delighted to be one of your symposium speakers today. Thank you for inviting me to appear before such a distinguished group. Indeed it is a great honor for me, my Corporation, and The Building Owners and Managers Association International, of which we are members. Your concerns for proper budgeting of expenses covering maintenance of your facilities is of real interest to me. Like it or not, good sound budgeting is the yardstick that top management uses to measure our actual performance. Budgeting well can get your agency's goals and yours off the ground and into the works, with maximum efficiency and results. Budgeting poorly can make you achieve less and lose management credibility.

Budgeting preventive maintenance dollars is the key to efficient operations and longevity of your agencies fixed assets. Proper maintenance will help reduce the need for sudden large capital expenditures and will enable you to establish a more orderly replacement of fixed assets within your facilities. Good budgeting of capital dollars will help ensure you of getting those replacements you need, provided you have maintained the old assets and captured their full life through proper budgeting of maintenance dollars. Like all good tax payers, you and I want to make sure our government gets the maximum use of its facilities for the dollars expended, and proper maintenance budgeting can do just that.

MISSION

You have often heard the following: "you pay me now or you will surely pay me later." This statement is very true as it relates to maintenance of facilities. The two most important assets of any organization are its employees and facilities, they both need to be maintained. Our Bank's assets amount to $8 billion and our budget for maintenance of 160 facilities is $2.4 million. We have a staff of 16 employees and service the entire State of Georgia with our maintenance program. Our staff consists of maintenance people, painters, carpenters, and administrators.

The First Atlanta Corporation has established a Facilities Operations and Maintenance Section which has overall responsibility for all maintenance pertaining to real estate occupied or operated by the Corporation and its subsidiaries. The section is responsible for:

- Maintaining, in good operating condition, all life and property protection systems, mechanical, plumbing, electrical, and elevator systems, parking areas, and grounds;
- Negotiating, maintaining and controlling outside (third party) contracts, which are necessary for proper property maintenance (such contracts may include, but are not limited to, cleaning, landscaping, and maintenance of vaults, and security equipment);
- Controlling and approving all expenditures and costs associated with operations and maintenance of bank-occupied banking facilities and automatic teller machines (ATM's); and
- Maintaining all inside and outside lighting, mechanical, electrical, gas and water/sewer systems;
- Installing and maintaining signage and energy conservation programs.

Job objectives in maintaining and operating corporate banking facilities are to protect the Corporation's real estate investment, to enhance our public image, to establish a standard program of maintenance, and to maintain a comfortable working environment.

OPERATIONS

Services provided to both Metropolitan Atlanta and statewide banking locations include, but are not limited to, interior cleaning, exterior painting, landscaping, maintenance of heating, ventilating and air-conditioning (HVAC) equipment, vault and visual auto teller (VAT) maintenance, trash removal, parking lot maintenance, ATM maintenance, roof repairs, directional signage, special woodwork items, door lettering, as well as small miscellaneous (key and cabinet) repairs, emergency service, and the purchase of standard light bulbs.

OPERATIONAL MANUAL

Our maintenance manual contains guidelines and directives of the Facility Operations and Maintenance Section. It is designed to serve as a working guide for banking facilities managers, supervisors and staff personnel in the day-to-day administration of the respective banking facilities.

These written standards should, with the cooperation of all involved, increase understanding, eliminate the need for personal decisions on matters of maintenance standards, and help ensure uniformity throughout the banking facilities of the First National Bank of Atlanta.

General statements cover elevator service, arboriculture, air conditioning and heating service, conveyor systems, vault maintenance, waste pick-up service, confidential paper retention and destruction, photographic surveillance, landscape maintenance, janitorial service, water treatment service, fire alarm service, and other general matters affecting the Facility Operations and Maintenance Section.

MAINTENANCE BUDGET PROCESS

Our Corporation budgets annually in the third quarter of each year. We use a "Zero Base Budget" operation; that is, every year we build our budgets from the ground up, and we completely justify each maintenance expenditure. We prepare our budget in great detail, line by line, and it goes before our Corporate Budget Review Committee for approval. When our budget has been

approved, we know we have the full support and backing of management.

During the budgeting process we budget for the maintenance services discussed previously. These services may be performed by our in-house staff or by third party contractors (using their employees). Receiving your money's worth for maintenance begins with, and revolves around, a well-executed set of specifications covering the service to be performed.

Among the routine services typically performed under contract are: Elevator service, arboriculture, HVAC service, pest control, waste pick-up, conveyor systems service, vault maintenance, confidential paper retention and destruction, photographic surveillance service, landscape maintenance, janitorial service, water treatment service, parking lot sweeping service, fire extinguisher service; and ATM maintenance.

Among the services usually performed in-house are:

- Repairs to buildings: minor repairs to roofs, electrical repairs, plumbing work, installation of ceiling tiles, door stops and peepholes, welding, water blasting, sand blasting.
- Ground maintenance: Parking lots, repairing pot holes, and stripping.
- Painting: Inside and outside of building and installation of wall coverings.
- HVAC work: Filter changes, adding freon, motor repair and replacement, and repair/replacement of equipment as needed.
- Sign work: Production/repair/replacement of posters, directional signs, door signs, open/close signs, and functioning hours signs, and maintenance of logo signs.
- Miscellaneous: Furniture repairs, pest control, and construction of wooden shelving, bins, etc.

Occasionally the work load becomes too great for the Facility Operations and Maintenance Section to perform quickly and efficiently; consequently, some jobs must be contracted to specialty companies--especially major time-consuming jobs and other jobs where outside assistance is required to complete a task.

SUMMARY

Proper budgeting maintenance is one of the key factors for the efficient operation of our corporation and its growth. Without proper budgeting of dollars for maintenance we could lose customers and profits because of failure of corporate assets. Remember "pay me now or you will surely pay me later" is a real watch word for success in the maintenance program for your facilities. Thank you for allowing me to present our approach to budgeting for maintenance.

BUDGETING FOR MAINTENANCE AND REPAIR OF FACILITIES

Ronald L. King
General Accounting Office

Rather than addressing budgeting directly, this talk focuses on the broader issue of facility management because the level of funding provided to maintenance and repair activities is directly related to how facilities are viewed by top management. Studies commissioned by the President have concluded that there are inherent weaknesses in present-day federal agency real property management which can result in inadequate funding for maintenance activities and inefficient use of real property assets. Comments are the authors personal views based on his work, and are not necessarily the official position of the General Accounting Office.

WHAT IS FACILITY MANAGEMENT?

While the term facility management has been around for many years, it still means different things to different people, and organizations are often structured quite differently to carry out facility management responsibilities. The Library of Congress defines facility management as "the practice of coordinating the physical workplace with people and the work of the organization, integrating the principles of business administration, architecture and the behavioral and engineering sciences."

LEVELS OF FACILITY MANAGEMENT

There are basically three levels of facility management. The level at which facilities are managed

has a direct bearing on the level of funding top management is willing to provide for maintenance and repair of facilities.

At the most basic level, facilities are viewed simply costs, and therefore, most of management's attention is focused on cost containment and reduction, and not on managing the facilities for maximum benefit. Actions are normally reactive rather than proactive. Preventive or planned maintenance is the exception rather than the rule at this level of management.

At the second level, facilities begin to be viewed as an asset to be managed. Preserving and enhancing the value of these assets becomes a priority.

Finally, at the most sophisticated level, facilities are seen, used, and managed as tools of the organization. Emphasis is placed on how they facilitate or impede the programs and work processes of the organization.

CURRENT CONDITIONS IN FEDERAL AGENCIES

Facility management has been the focus of two Cabinet-level study groups over the last three years: the President's Cabinet Council on Management and Administration, Real Property Management Working Group (1985) and the President's Council on Management Improvement Task Force on Real Property (1987). The principal criticism to emerge from these reports was that no clear lines of accountability and authority for the management of facilities exist within the agencies. Agencies or departments may have several offices with real property interests, but they lack an asset-oriented, holistic, top management perspective on the real property holdings of the agency.

Recognizing the deficiencies in facility management and noting the lack of "accountability to the President and to the public" in this area, two actions have been recommended by the Cabinet Council on Management and Administration. First, it has recommended that GSA delegate building management responsibilities to tenant agencies wherever possible. And second, it has recommended that a senior executive within each agency be assigned responsibility for policy formulation and oversight of real property.

This Real Property Executive would be responsible for, among other things, ensuring that the agency's budget reflects its goals for efficient management of its real property holdings, and developing and improving the agency's inventory, cost, and income data to better manage and control agency facilities.

INFORMATION REQUIREMENTS?

Facility managers and top management need a comprehensive facility management accounting system to provide them with essential information needed to (1) operate, maintain, and repair the real property assets of the organization; (2) evaluate facility performance and cost effectiveness; (3) assure that the mission needs of the organization are met through effective, efficient, and economic use of facilities and (4) make adjustments in existing and future facilities; to improve their performance and responsiveness.

WHAT NEEDS TO BE DONE

Many things remain to be done in order to move federal agencies into the highest level of facility management. The information and data requirements of the facility manager and top management need to be more clearly defined.

Researchers and systems developers in the facility management area have found the problem to be that the corporate world and federal agencies have not yet defined what really comprises the bottom-line, let alone how to integrate the various cost results of many activities to arrive at significant summary unit-cost and total-cost data about operations.

10

HOW A LARGE HEALTH CARE ORGANIZATION MANAGES AND FUNDS ITS MAINTENANCE AND REPAIR

Michael Higgins
The Washington Hospital Center

Financial considerations have always been important to hospital management. However, in today's environment of reduced health care reimbursement, it is receiving more attention. One such area targeted for immediate action by hospital administrators is maintenance and repair expenses because they are generally viewed as variable costs. The Washington Hospital Center, a 871-bed urban, tertiary care, teaching hospital, decided to deal with maintenance and repair expenses from a long-range approach. This not only includes the establishment of a formal process to authorize funding, but also the implementation of a computerized management system as well.

MANAGEMENT

Before maintenance and repair can be managed, they must first be defined. Maintenance and repair at the Washington Hospital Center are not interchangeable terms. Repair is defined as the immediate solution to a problem, while maintenance is defined as the maintaining of equipment/facilities so no repairs are necessary.

There are basically three areas which effect the management of maintenance and repair of the hospital. The first area is the Engineering Department where the day-to-day operation is managed. The second area is the Capital Resource Allocation Committee (CRAC) where all funding requests, including maintenance and repair proposals/requests, are examined. The third area is Administration where funding and final approval is given.

The Engineering Department is responsible for the coordination of activities relating to maintenance and repair. This coordination is directed by the Chief Engineer through the following four functions:

1. Emergency repair
2. Facility maintenance
3. Preventive maintenance
4. Inventory control

The first three functions are managed with the assistance of a computerized maintenance and repair system. The fourth function is subsequently managed by a separate computerized inventory control system.

The first function of the system is emergency repair. It is facilitated through a 24-hour a day call-in system and is predominantly devoted to patient care. All emergency calls are routed to a control desk which is staffed 24 hours a day by maintenance personnel. Each call is then immediately logged into the computer and prioritized according to the level of urgency. The maintenance person at the control desk assigns tradesmen (planners, electricians, etc.) to respond to the call. Because problems in patient care areas are considered the highest priority they should be completed within two to three hours. Should an emergency occur during off-hours, the maintenance supervisor on duty has the authority to call in additional personnel or outside contractors.

The second function is facility maintenance. It is facilitated through a team of two maintenance personnel who are specifically assigned to perform continuous maintenance rounds throughout the Hospital. This team is responsible for making inspections of all areas with the aid of a computerized check list. This check list is produced for each area/room of the Hospital and consists of items ranging from the changing of light bulbs to the calibration of thermostats. All minor repairs are completed and logged into the computer so as to maintain an accurate Hospital maintenance history. If there are items which requires more extensive repair, they are logged into the computer and referred to the appropriate tradesman for follow-up.

The third function is preventive maintenance. This is the most important component of the system, because of the potential for long range positive effect on cost savings. Preventive maintenance is facilitated through a

weekly preventive maintenance work schedule generated by the computer. This schedule consists of various items (i.e., equipment name, location, identification number, manufacturer, the trade and work to be performed, estimated time of completion, etc.) and is based on the manufacturer's suggestions, maintenance/repair history and the environmental conditions of the equipment location.

The final function is inventory control. This function, which is managed through a separate computerized management system, will be installed in the near future. This system will record all parts used during a project and will automatically produce purchase orders when a stock level hits a predetermined level. This system will also produce a detailed history of each part (i.e., frequency of use, cost, vendor, etc.).

FUNDING

The CRAC is responsible for examining all requests for capital including maintenance and repair during the annual budget process. The committee is multi-disciplinary with representatives from Nursing, Engineering, Finance, and Medical Staff. After receiving a proposal/request for capital funding, the CRAC reviews the justification of the proposal/request by examining various outlying factors (i.e., patient care, age of equipment/plant, hospital industry regulations and accreditations, technology, productivity, efficiency, etc.). The committee then reviews a cost benefit analysis, which is required of all proposals/requests. The committee then makes recommendations to Administration based on the priorities resulting from the above review process. Administration will then make final decisions based on the recommendations of the CRAC and the availability of funds.

ADVANTAGE/OPPORTUNITIES

Since the Hospital Center initiated this long-range approach it has achieved several successes. The Facility Maintenance program has reduced the number of emergency/repair calls thus increasing patient satisfaction. The number of full time employees required to respond to

emergency calls has been reduced by 25 percent. This has enabled the Hospital to shift personnel from the emergency repair staff to the preventive maintenance staff.

The preventive maintenance program has reduced the amount of time and paper work required for processing work orders in the Engineering Department. It is also anticipated, although undocumented as yet, that the Hospital can reduce the frequency of equipment breakdowns and achieve longer life spans for its equipment. This should reduce the Hospital's overall capital expenses.

When the inventory control program is implemented the Hospital expects an additional decrease in Engineering Department paper work. It also expects a reduction in inventory shortages and overstocks.

As a member of Medlantic Healthcare Group, a multi-institutional health system, the Washington Hospital Center can take advantage of special opportunities. These include a greater ability to create shared service arrangements with affiliate hospitals, which enables us to reduce fixed costs and overhead. The Engineering Department can schedule system-wide meetings to share information on facility maintenance histories in addition to discussing various options to handle maintenance and repair problems. The Hospital also has the ability to increase its financial base by joining with system affiliates to obtain larger lines of credit, lower interest rates and better bond ratings.

CONCLUSION

As the revenues of a hospital gradually decrease due to increased governmental and business constraints, and the expenses of day-to-day operations continually increase, hospitals must make a concerted effort to manage economically. The Washington Hospital Center believes it is making this effort especially in the area of maintenance and repair expenses. These expenses are no longer looked upon as "necessary evils," but are now considered to be categories of expenses which must be and can be managed economically. Although the Hospital views its decision to establish a formal process to authorize funding and implement a computerized management system a success, it is continually examining the process to ensure the safe, dependable and efficient operation of the Hospital's plant and equipment.

11

IDENTIFYING AND BUDGETING FOR MAINTENANCE AND REPAIR OF NAVY FACILITIES

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The Navy's facility assets are managed by base commanders who perform a wide range of mission assignments. These facilities, valued in excess of $80 billion, have an average age exceeding 40 years. It is critical that facility assets be immediately responsive to the mission demands imposed. In this vein we annually spend about $1 billion to insure they are maintained at a level consistent with their use. Accordingly, the more essential a facility is to mission the greater is management's attention to its physical maintenance and repair (M&R) needs.

M&R REQUIREMENTS IDENTIFICATION

The Navy's M&R budget is driven by requirements identified by the Continuous Inspection (CI) Program. Priorities are assigned to facility problems based on how critical the deficiency is in relation to the base mission. Resource allocations decisions are made based on the priority assigned by the base facility inspector and top down guidance related to the Navy's long range Facility Condition Objectives.

The CI program is the backbone of the Navy's Maintenance Management System and specifically the Work Generation function. The CI program systematically feeds priority work to the Work Control function. This function plans and programs for effective accomplishment of the right work at the right time by the right media, either contract or in-house forces. The management loop is closed via the Appraisal function both during and after the work is accomplished. Effective appraisal

determines if we did what we intended, in the way we planned and if not, why not. Corrective action is taken to prevent recurrence of poor performance or planning practices.

The CI Program consists of three (3) separate but complimentary types of inspection. Together they insure that facilities and equipment are operated and maintained in the most effective manner and at the proper level for mission support. The types of inspection are:

- Operator Inspection (OI) of facilities/equipment that require full-time operator attendance. M&R deficiencies beyond the capability of the operator are input to Work Generation.
- Preventive Maintenance Inspection (PMI) of equipment for which no operator is assigned. PMI provides for examination, lubrication and minor M&R to equipment which, if disabled, would interfere with an essential operation.
- Control Inspection is the scheduled structural, mechanical and electrical examination of facilities to determine physical condition, identify problems at an early stage and recommend corrective surgery consistent with the malady.

M&R requirements generated from the CI program provide systematic work input for shop or contract accomplishment. The CI program also serves as the source for identifying budget requirements and provides "feeder" information for the "Annual Inspection Summary" (AIS). The AIS provides facilities managers with an annual "snapshot" of facility condition. It is used by base commanders to assess the impact of facility condition on their ability to perform the assigned mission; i.e., "Base Readiness." A "BASEREP" report is made annually. The CI program is where special repair projects are born, command level priorities are assigned, and projects are included on a Special Project Summary List for resource planning programming and execution decisions.

M&R RESOURCE BUDGET PLANNING & EXECUTION

The M&R budgeting process involves two distinct and separate phases. The first phase is budgeting and planning the effective utilization and execution of

available M&R resources. This is done during the annual "NAVCOMPT" budget exercise (conducted in the June time frame). Two other exercises occur later which fine tune the NAVCOMPT--and ultimately becomes part of the Department of Defense Congressional Budget. This exercise requires facility managers to carefully plan the use of M&R funds 2 years in advance of the current year (a 3 year M&R funding picture). The exercise involves:

- Up-dating current year planned spending based on known requirements.
- Fine tuning (within control limits) the plan for the upcoming year (lst out year) into a final executable operating plan that provides for:

  . Recurring M&R requirements. (These include emergency service, cyclic maintenance, and operator and PMI inspection support.)
  . Facilities maintenance engineering and maintenance shop supervision.
  . Satisfying requirements associated with changing mission and/or supporting newly constructed facilities.
  . Development of a Maintenance Action Plan (MAP) consisting of priority M&R project type work (non-recurring) identified via the control inspection phase of the CI program.

- Preparing a M&R budget plan for the 2nd out year. This considers all of the items listed above but looks a year further downstream.

Imbedded in the M&R budget development process is guidance regarding the refocusing of available resources to selected primary emphasis areas. These are high investment areas consisting of mission-essential facilities with a high level of critical M&R backlog for which command-level decisions have been made to reverse the deterioration. These decisions result in formally established Facility Condition Objectives based on AIS and BASEREP reports.

The second phase of the budgeting process is directed to acquiring additional funds to satisfy new requirements that cannot be absorbed within the constrained resource limits of the budget base. This is done through the Program Objective Memorandum (POM) process and

accompanying issue papers. POM issues apply only to the years beyond the Presidents budget. POM issues provide the only opportunity to effect a change in budget control amounts; i.e., "put more money in the bank." POM issues are prepared for example, to identify funds needed to support new facilities included in the long range construction program or correct existing deficiencies due to mission changes (e.g., due to the introduction of a new plane or ship). The POM process considers and projects:

- When a new facility will be on line and require support
- The type of support needed; i.e., maintenance, utilities, etc.
- How much the support will cost and when the dollars will be needed
- The impact of inflation
- The impact of not providing funding

The success of the POM issue determines if the funds will be in the bank to maintain the new facility when it comes on line.

This process provides the Navy's Facilities Managers with a system that can produce a requirements-based budget that is both credible and fully defensible as well as a management program to insure that resources received are effectively and efficiently planned and used.