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Information resource requirements for facility managers| A case study of Montana Deaconess Medical Center Engineering and Maintenance Department

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INFORMATION RESOURCE REQUIREMENTS FOR FACILITY MANAGERS: A CASE STUDY OF MONTANA DEACONESS MEDICAL CENTER ENGINEERING AND MAINTENANCE DEPARTMENT

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INTRODUCTION

Project Scope Overview

Facilities managers are searching for more efficient ways to provide their service to the organization. With all the emphasis on Computer Aided Drafting and Design (CADD) and its connection to relational databases, computers look like an answer. Facility management journals commit much space to articles extolling the virtue of these new systems and numerous advertisements present a plethora of packaged Computer Aided Facilities Management (CAFM) programs to the facility manager. Unfortunately, the view these software vendors have of the facility manager's job is being perpetuated throughout the entire field. Facilities managers should be demanding that vendors tailor their software to the manager's specific situation.

This project applies a business modeling technique, the Enterprise model, to the Montana Deaconess Medical Center's Engineering and Maintenance Department to determine their actual information needs.[1] This conceptual

statement will be compared to the software packages available today to determine how well they would meet the needs of the Engineering and Maintenance Department.

Facility Management Overview

According to the International Facility Management Association:

> Facility management coordinates the physical workplace with the people and work of an organization. It combines the best management practices with the most current professional and technical knowledge to provide humane and effective work environments.[2]

Put simply, facility managers are in charge of buildings, equipment, mechanical and electrical systems and the interaction of these support systems and the humans which inhabit the facilities.

Facilities managers are known by many different titles such as building manager, building engineering or maintenance and engineering director. They vary in sophistication from technicians to professional architects and engineers. They have staffs ranging from professional engineers and architects to boilermen and maintenance technicians. The departments vary according to the scope of their responsibilities and the amount of square footage their company maintains.

While the scope of the facility management function may vary, most departments include building maintenance,

building energy management, remodeling and design services and construction management. Many facilities departments even operate in-house construction crews to take care of the continuous upgrade and alteration projects.

Recently, as proper management of fixed assets has become imparative, responsibilities have expanded to include facilities planning. This type of planning attempts to ensure the most profitable use of the company's tangible assets.[3] Facilities managers use their expertise in buildings, building systems and facility design to advise management on the strategic strengths and weaknesses of their facilities. Top management is recognizing that a facility can be an asset or an inflexible liability in a competitive environment. Facility professionals are well equipped to offer this expert advice.

An analysis of Fortune 500 companies found that fixed assets--land, buildings and equipment--made up 25-50 percent of the total asset value of a firm.[4] Just as their other assets receive careful attention, facilities are enjoying renewed scrutiny. This refers to more than a developer's perspective on facilities. People are the most important asset of most organizations, and it is in the company buildings that these people perform their jobs. Peter Drucker has stated that facility managers will be seen "...not as managers of facilities, but as managers of people through facilities."[5] The image a company projects to its employees, whether formally planned and implemented,

is a strong and lasting one. Their safety, productivity and satisfaction are influenced by the quality of the facility and its upkeep. Managers typically buy the most advanced office equipment money can buy; the benefits are immediate and tangible. Unfortunately, these technological wonders are often used in poorly maintained and obsolete buildings. The paradox is obvious.

Customers are also affected by facilities. It is through and within company facilities that goods and services are rendered. The image goes beyond the interior. Facilities have a public face. The quality of the facility and its maintenance affect their surroundings be those urban or bucolic. Judgments about a company will most certainly be based in part on their facilities, grounds and total image.

Information Needs

Information is as important to facility managers in the performance of their duties as it is to all other managers. However, because the focus is on facilities and not standard business practices, facility management information is not as highly standardized. This is complicated by the varying responsibilities of the facility management function and its position in an organization. No matter the exact make-up the department, the facility

manager is multi-disciplinary by function; this affects the information requirements.

Facilities are documented in blueprint drawings and textual specifications. The specifics of the construction process are also documented in a different set of drawings and text. Finally, every piece of equipment and furniture that is installed in a facility carries its own documentation. These files, usually a combination of text and drawings, are very important to the successful maintenance of the facility. Facilities managers also refer to building, mechanical, and electrical codes, product literature and government regulatory requirements regarding hazardous waste and EPA requirements. In addition to these specialized documents, facilities departments also use common business information systems for personnel records, labor distribution charts, budgets and standard operating procedures.

One of the most difficult problems facing facility managers as they try to make some sense out of the varying information needs is the multitude of sources. The original construction documents were probably created by a external consultant who may or may not still have association with the company. The shop drawings were prepared by a construction contractor and his many subcontractors. The accuracy and thoroughness of these documents is usually in question. This is supposedly remedied by an "as-built" drawing which, although fairly

accurate, can not taken to be 100 percent accurate.

Equipment data comes from as many sources as there are pieces of equipment. It is usually an assemblage of manufacturer's product literature. It can be highly proprietary and may not give the objective information required for the day to day maintenance required to keep a facility and its systems operating properly.

Another unique type of information facility managers rely on is created by the buildings and facilities themselves. Dubbed Building Management-Energy Management Systems (BM-EMS), these signals tell the facility manager how a system is operating. This technology is being applied to fire detection and suppression systems, security systems, as well as mechanical and electrical systems. The objective of the BM-EMS system is to maximize the effectiveness of the facility's operating system and minimize the cost of operating and replacing the system; they accomplish this by automatically watching over, reporting on and controlling the facilities equipment.[6]

One of the major challenges is attempting to keep the plethora of facility information up to date. The variety of origins, types and accuracy of the data make this a monumental task. Maintenance takes place on a daily--hourly--basis, and the usual realities of keeping a demanding constituency satisfied take precedence over the mundane up-dating task.

Information Trends in Facility Management

Just as typical business managers, facilities managers benefit from computer applications. Word processing and spread sheets are important to daily operations; however, the biggest potential boon to the field has been the database. To date, the integration of all the types information used by the facility manager is not an easy thing to do, but it is forthcoming.

While the technology exists to integrate facility costs and budgeting, space accounting, and maintenance and operations it has not been employed by the majority of facility managers because the responsibility for these three divisions has often resided in separate departments.[7] The connection that excites the facility manager, however, is the integration of digitized graphics and a database.

Computer aided drafting and design (CADD) is becoming the standard among architectural and engineering consultants. The resulting drawings are stored on a floppy-disk and can be updated by facility managers on a computer work station. The extreme power of CADD is not its ability to draw, rather the power lies in the relational database that accompanies the graphic information which offers nearly unlimited potential to facility managers.

These databases store information on the wall types,

ceiling types, floor types, wall construction, finishes, square footage, as well as mechanical and elctrical systems.

Since facility managers usually participate in the selection of outside design consultants, they are in a strong position to mandate the format of deliverables from their consultants. As there are over 15,000 companies in the United States with over 500 employees and most of them considering some sort of automated facility management within the near future, consultants cannot afford to ignore the demands of these potential clients.[8] Large institutional facilities managers like the government now require that the architect and engineer use a specific type of program in their CADD process. These sophisticated clients have even written manuals specifying formatting of graphics and database information for facilities design and planning. With their leverage in numbers and the precedent set by major facility managers like the government, small facilities managers can buy microcomputer based CADD and database programs to make continuing use of the architects' information.

The same potential benefit for small facility managers exists for specifying the format of information provided by contractors and vendors. By applying their leverage as a customer, it may be possible to get standard shop drawings and equipment specifications for their files.

Hospital Facility Management

Economic pressures facing hospital facilities managers are acute. Today's healthcare environment is volatile. The industry is faced with an oversupply of beds and the entire reimbursement scheme from the government is changing.[9] In an effort to remain competitive, hospitals are making increasing demands on their existing facilities and their facility managers.

All the concerns of an office or factory facility manager are exaggerated for the hospital facilities manager. Hospitals are systems intensive. Their technical and energy demands are immense, and the consequences of a system failure are high. Few building types make such system demands nor go through quicker changes in technology.

A recent example of the impact of the technology cycle and its affect on hospital facilities revolves around the Magnetic Resonance Imager. The technology was rarely discussed several years ago; however, today many hospitals are scrambling to get into the business. Unfortunately the new equipment cannot just go in some empty space in the existing hospital, since no ferrous metal can be used in the structure. Copper shielding must be erected on all the walls, and a fence must surround the facility to prevent passers-by from being affected by the enormous magnetic

flux which is capable of clearing the operating programs of pacemakers. Such unique facilities must be planned, financed, contracted and constructed within very little time to maintain competitive advantage.

Whereas spending money for fancy facilities to support the demanding systems flexibility may seem desirable, hospital management is, understandably, more likely to spend money on the latest medical equipment to serve the needs of its physicians and patients. The facility systems are often upgraded only at the crisis stage.

Hospital Facility Manager Information Needs

Information needs for hospital facility managers are more extensive than those of their business relatives. Literally hundreds of pieces of medical equipment are used in a hospital. Each of these has a product literature file and requires periodic maintenance. Should the equipment break, someone must be able to go to the literature, or the manufacturer and find a fix. The last complication is that a human life may be depending on that piece of equipment operating at any given moment.

Most hospitals have data processing departments and computer support. Unfortunately, the facility manager is going to be about the last priority for computer time and

data processing support personnel time to help develop an application.[10] Accordingly, there is a tendency for hospital facility managers to look at ready made facility management packages and microcomputers. The difficulty comes in establishing which product is appropriate. This report uses the Montana Deaconess Medical Center as an example for a process to determine information needs for facilities managers.

Montana Deaconess Medical Center

Overview

Montana Deaconess Medical Center (MDMC),is a 288 bed, full service health care center in Great Falls, Montana. The complex includes a medical tower, an out-patient SurgiCenter, a skilled nursing center for the elderly--Deaconess Skilled Nursing Center (DSNC)--a professional office building and support structures. The complex, containing 375,000 square feet, is located on the southwest end of Great Falls, Montana, and covers 37.5 acres. MDMC employs over 1,100 people and serves as a regional medical center. Appendix 1 contains campus grounds plans and facility floor plans.

The Methodist church established MDMC in the late 1800s, but the hospital is now unaffiliated. It has

maintained its non-profit status, however, and issues no bonuses to the board. The organization has two major divisions: medical staff and the remaining support structure. The medical staff are not employees of MDMC while all the other functions are staffed by employees of the medical center. The corporate organization is illustrated Figure 1-1.

Engineering and Maintenance

MDMC's facility management department is titled Engineering and Maintenance. They report to the Vice-President of Clinical Support Services who is in charge of four other non-medical support functions: Dietetics and Food Service, Central Service, Housekeeping and Laundry and Purchasing. The Vice-President of Clinical Support Services reports directly to the chief executive officer of the medical center.

The department of Engineering and Maintenance is comprised of 36 professionals and technicians. They perform the majority of the facility management functions described above. Their major responsibilities are security, grounds, plant equipment, biomedical equipment, building maintenance and building remodeling. Specific responsibilities and organizational structure is shown in Figure 1-2 and will be described in detail in the business model (Chapter 3).

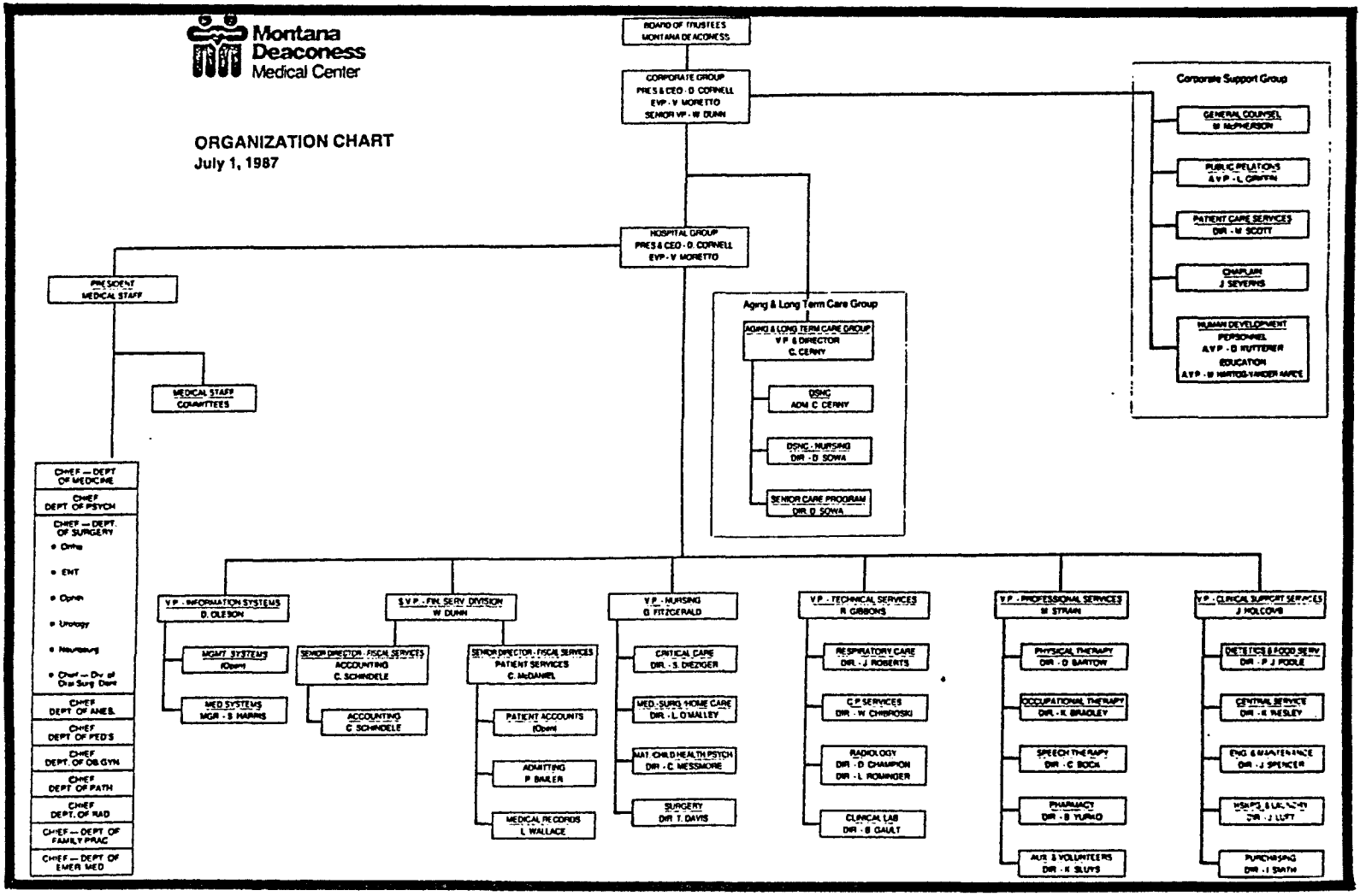

FIGURE 1-1

MDMC Organizational Chart

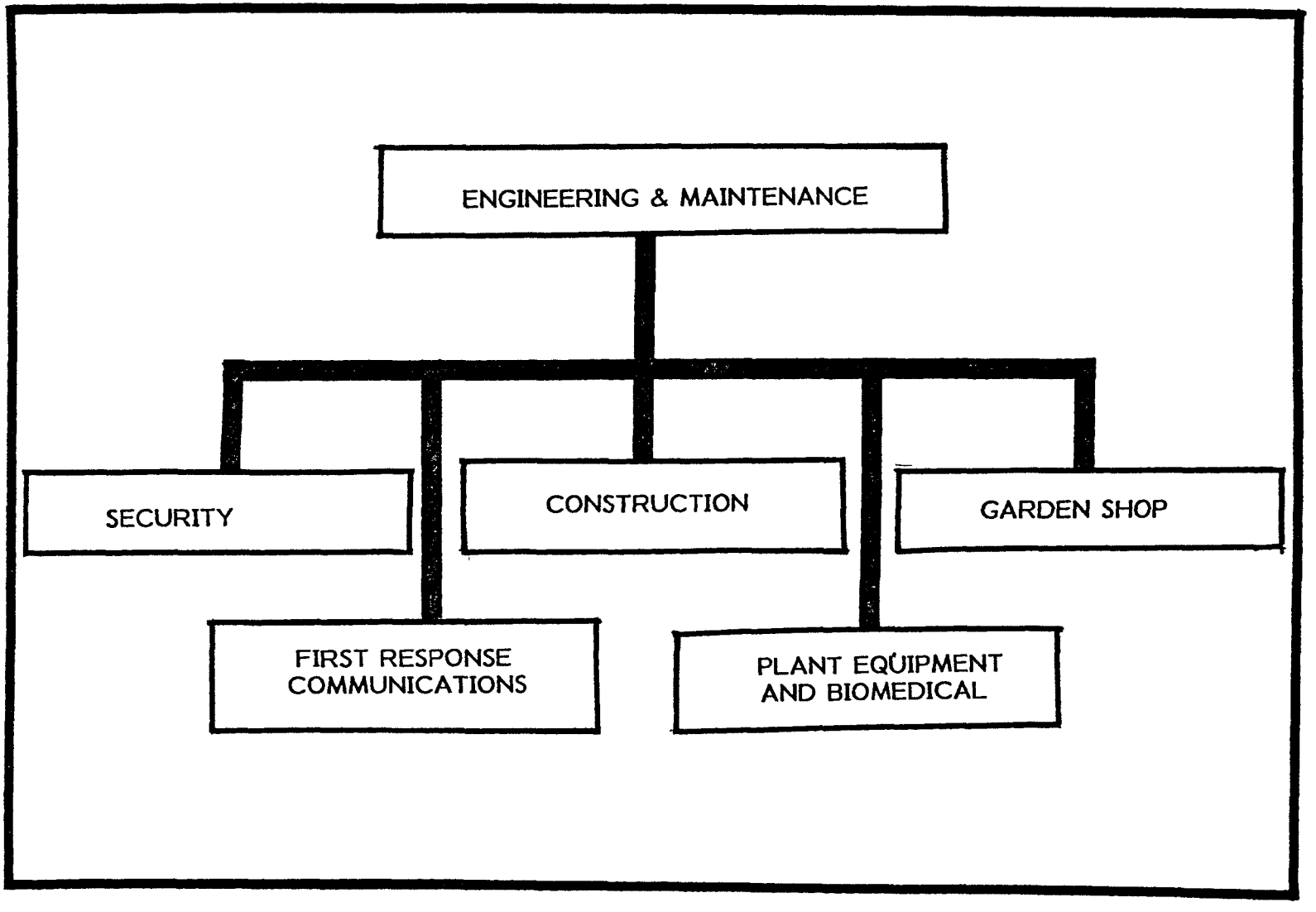

FIGURE 1-2

Engineering and Maintenance Organizational Chart

Engineering and Services receives computer support from the MDMC Information Systems Division. Information Systems is in charge of MDMC's IBM mainframe and provides software design and support for the entire organization. Engineering and Maintenance has several remote terminals and runs a number of applications through the mainframe. These applications include traditional accounting and personnel programs plus database applications set up to initiate and record preventive maintenance.

MDMC Engineering and Maintenance is fairly typical in the concerns and challenges they face. They are saddled with a very inflexible medical tower which makes even the most routine space reconfigurations a challenge. This same tower has inefficient windows and minimal exterior insulation. Their in-house construction team, which performs continuous upgrades of the interior, is familiar with the facility's idiosyncrasies. The physical plant is in good repair and is currently being upgraded to provide extra protection from a boiler failure. The backup power generation is newly replaced and provides 100 percent of the emergency needs. Emergencies are rare since Engineering instituted their successful preventive maintenance program which performs some 400 preventive maintenance items per month.

Problem

The problem is whether or not to automate the facility management function at MDMC. This problem statement must be preceded by the more important question--what are the information requirements of the Engineering and Maintenance department at MDMC and which could benefit from automation?

Like other facilities managers, the director of Engineering and Maintenance at MDMC has looked into programs that integrate graphic and database systems. While his preventive maintenance program is well managed with computer support from Information Systems, it is not tied into any of the facility drawings. The as-built drawings for the entire complex are only updated annually, and unfortunately, the drawings from the original facility have not been made available to the hospital for the on-going documentation of remodels and updates. This information gap makes maintenance technicians less efficient as they must piece together the current condition of the facility the majority of the year.

Scope of this Project

This project uses a business modeling technique, the Enterprise Model, to determine what the Engineering and Maintenance Department does and what information is necessary to do it. The completed model is used to

suggesting applications for automation.

Process of Modeling

The modeling is loosely based on the Information Resource Management process, but concentrates specifically on the departmental level. Even with the departmental emphasis, the modeling process begins at the very top of the organization where corporate goals are stated. After establishing the goals of the entire organization, the functions of the Engineering and Maintenance department are described in terms of these organizational goals.

The model moves from "why" things are done to "what" things are done in the next phase of the modeling. Each function must perform a series of processes in order to meet the goals of the organization. These are the on-going responsibilities of the function and, by definition, are continuous. Activities are discreet tasks performed within the process. They have a beginning and an end. Both processes and activities are determined by interviewing the Engineering and Maintenance director and the sub-department heads.

Both processes and activities have information requirements--what do people need to do in order to get the job done. The model records these requirements and attempts to assign a data type to each of them. Valid

types may be text, graphics, technical data, financial data and so forth. It is not until the data and data types are determined that any sort of automation will be considered.

Apply Technology Modeling

The business model provides a conceptual view of the information needs of the Engineering and Maintenance department. Now it is time to consider technology. This project looks at prepackaged software programs specifically made for facility managers and compare them to the information needs of MDMC department of Engineering and Maintenance and analyze their value in this specific case.

Make Recommendations

The recommendation may be one of three general types. It may be that no additional computer automation is appropriate. If automation is appropriate, the value of the existing programs will be judged, since they may be close enough to the Engineering and Maintenance department's needs that some tailoring could fix them. The last possibility is that the information needs of the department are so specific that, while automation is appropriate, it would be advisable to build the program from the ground up.

Parameters

The project focuses on the informational needs of the Engineering and Maintenance Department only. Common information will be acknowledged; however, the significant interface difficulty will not be addressed. A completely integrated information system for the Montana Deaconess Medical Center is an admirable goal buf is beyond the scope of this project.

The project concentrates on the information peculiar to the facilities management function. Montana Deaconess has a complete Information Systems Department which provides excellent support to the Engineering and Maintenance for traditional information products such as personnel records and financial data. Since the CAFM (Computer Aided Facility Management) packages on the market are built around the unique data used and produced by facilities managers, it will be most useful to the Engineering and Maintenance Department to know how well the existing packages apply.

Chapter Endnotes

[1]Stan Gordon abnd Alice Cain-Nelson, "End Product fo the Enterprise Model," User View, Volume No. 3, Issue No. 3, Fall 1985, p. 1-3.

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CHAPTER TWO

METHODOLOGY

Methodology Overview

This project was performed at the Deaconess Medical Center with complete cooperation of all levels of management. The project built a descriptive model of information used within the Engineering and Maintenance Department at the medical center. The remainder of this chapter describes the conceptual modeling technique employed and the actual mechanics of applying the model at MDMC.

Research Design

The research methods used in this case study are not a formal experimental design. The process is a hybrid based on a technique called the "enterprise" model.[1] The enterprise model is a technique used to establish information flows within an organization in an effort to design shared data use. The belief that information is a resource worthy of such careful attention is called

information resource management.

Information Resource Management

Information Resource management begins with the assumption that information is a resource worth managing just like people or material. Some people go as far as indicating that information is the resource of the eighties and that the enterprises that excel will be those that manage information as carefully as their other resources.[2]

Central to the concept of information resource management is the idea of centralized information control. Organizations need a department that is responsible for the information with the authority to enforce their organization-wide information management scheme. This is imperative to reduce redundant information. Organizations can ill afford to create information repeatedly or allow certain branches of the organization to run on outdated information simply because someone forgot to update their own cache of information.

Another unique aspect of the Information Resource Management idea is the orientation on information itself not computers or computer systems. According to Milt Bryce:

> ...the hardware and software used to implement information systems are secondary to the primary

task of defining what information is required.[3] This places special significance on the initial information programming, since instead of deciding what neat things computers can do, the information needs of the user must drive the systems design. With well stated requirements almost any computer department or vendor should be able to build a system to perform the necessary applications. In the past managers were concerned that the natural computer orientation of the vendor or data processing department prevented an open minded search for the right information to automate.

Modeling

One method to elicit important information needs is to apply a business model. The enterprise model is actually a collection of discrete models looking at the organization from different angles. Included in the enterprise methodology are functional models, data models, application models, and geographical models. The object of these models is to aid in understanding complex organizations and functions and provide a framework on which more detailed designs and implementation plans can be applied.[4] The specific models employed in this case study are described below.

Business Statement. To be useful, the information model must be supported by the highest level of the organization. Their position allows them to see the bigger picture. The modeling process recognizes this by determining the goals of a business at the very outset.[5] Senior management must define what business the organization is in. The business statement should include a description of the organization's product, market and customer. This becomes the basis for the entire model, since everything the organization does should be aimed at satisfying the business statement.

Functional Modeling. Functional models describe "what" is being done to meet the goals outlined in the Business Statement. It includes the functions, processes and activities the organization performs to meet the goals outlined in the business statement. These functions become the verbs of an organization.

Functions describe the way an organization operates. The first group of functions may be descriptions of the organization's departments, yet within individual departments there may be sub-functional areas with their own functional statement.

Processes. Processes are on-going actions required to carry out the functions. In the functional model the

processes are arranged hierarchically from most to least important in terms of the overall business statement.

In order to perform the processes, discrete activities must take place. Unlike processes, activities have an identifiable beginning and end.

Data Modeling

Whereas the functional model identifies the action words of the organization, the data model identifies the nouns. The model helps define what the company cares about--people, things, or concepts. These nouns are called entities, and for each entity, it should be determined who in the organization creates or uses the information. The answer to this question may well be that no one in the organization creates it. This category of information encompasses an important type of information created externally and adds additional complexity to the model.

Geographic Modeling. The location of the people who use and create information is an important consideration in the development of any information system. The geographical scope may be within a single facility or a campus of facilities. The complexity of the system increases if the geographic scope encompasses several states or countries.

In addition to solving the connection of system users, the geographical model helps answer important questions.

Where are the data needed? Where are the data created? Where should the system be to support it?

Technology Modeling. Up to this point, the model has only addressed the organization and its nouns and verbs. Once the functions, processes, activities, entities and locations are known it is time to consider the technological constraints. The technology model answers questions about specific computer hardware, operating systems and applications. This model also incorporates the geographical model to determine where the system should be located.

The technology phase of the enterprise model marks a shift in emphasis. Up to this point the modeling has focused on the businessman's or system designer's perspective. Now the mechanics of the information system are important.

Perspectives

As mentioned above, there are several significant perspectives being acknowledged in the modeling process. Each is valid and must be considered to create a meaningful information system design. The three parties involved in virtually all systems designs are the owner, designer and vendor.

John A. Zachman of International Business Machines has developed a useful analogy comparing the design process of classical architecture to the design of an information system.[6] A review of his ideas help validate the enterprise model and provide understanding of the systems design process and a definition of information systems architecture. Figure 2-1 shows the design process for classical architecture parallels information systems design.

Every project must begin with objectives. In most cases there will be a defined scope. For a building, the concept phase is the time the owner and the designer to define the general parameters of the project. The rooms and spaces to be included in the facility and their relationships will be determined. In systems design, too, the initial phase defines the objectives and scope. This is described by Mr. Zachman as the "ballpark" phase.[7] It insures the owner and designer are seeing the project the same way.

In architecture, this is followed by the preliminary stage. In this portion of work, the architect tries to show the building from the owner's point of view. The same process is true in system design. The system designer must put on his "owner" hat and depict the business and how information flows within it.[8]

According to Mr. Zachman's design process, the next phase incorporates the designer's perspective. In architecture the products of this phase are the working

GENERIC	BUILDINGS	INFORMATION SYSTEMS
"Ballpark"	Bubble Charts	Objectives/Scope
Owner's Representation	Architect's Drawings	Business Description
Designer's Representation	Architect's Plans	Information System Description (Conceptual Model)
Builder's Representation	Contractor's Plans	Technology Constrained Description (Physical Model)
Out-of-Context Representation	Shop Plans	Detailed Description
Machine Tool Representation	-	Machine Language Description (Object Code)
Product	Building	Information System

FIGURE 2-1

Classical Architecture Compared to Systems Architecture[9]

documents which includes all materials and methods necessary to construct the product. In information systems, the working document is the systems description; and, as are the architect's working documents, these are used to solicit bids from product suppliers.

When a supplier is accepted, the third party in the process is introduced. In architecture it is the contractor; in information systems it is the vendor. These parties prepare documents, plans and descriptions including technology constraints and schedule concerns which are immaterial to the owner and designer.

In both building and systems there are several additional perspectives that are beyond the scope of this discussion. This project only considers the owner and designer's perspective.

The description of the process outlined above ties in with the enterprise model in that, for each architectural perspective described above there are data, function and network models.[10] As shown in Figure 2-2, these models resemble the functional, data and geographical model of the Enterprise analysis.

Data Collection Methods

Information for the model was collected in a week of interviews at MDMC. With complete support of the Deaconess management, the researcher had access to all levels of

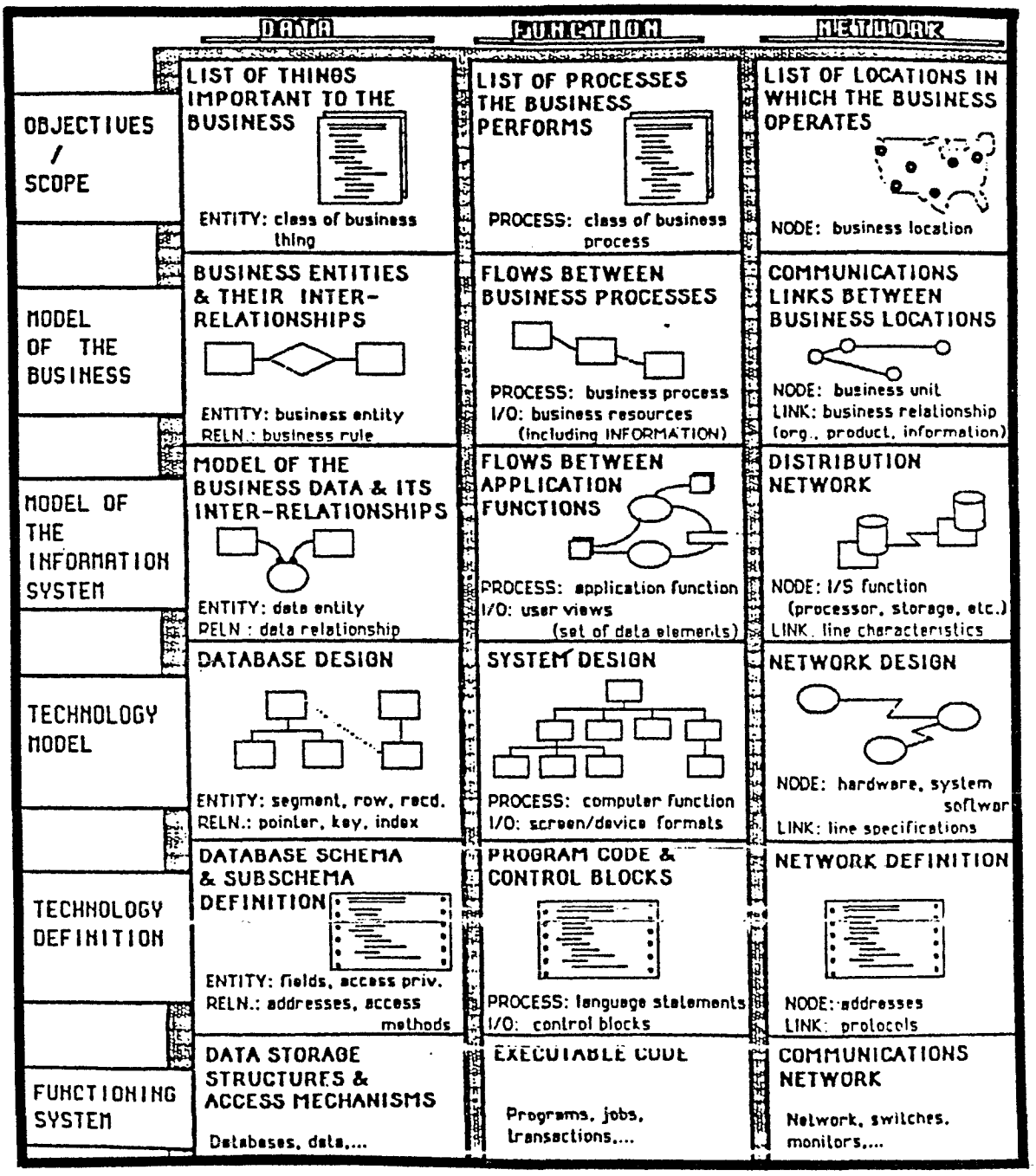

FIGURE 2-2

Descriptive Models for Information Systems[11]

management, financial information, scheduling information and a free roam of the medical complex itself.

Senior Management Interviews. International Business Machines recommends against any information modeling without top management sponsorship.[12] Fortunately, the Vice President of Clinical and Support Services was committed to the project. He arranged interviews with the chief executive officer, chief operating officer and several vice presidents in order to establish the business statement of MDMC. Their input was based on the corporate charter and senior management's understanding of the board of director's direction. They defined what the Deaconess organization is referring to when they discuss their customer. The interviews also focused on a top down statement of function for the Engineering and Maintenance function.

Interview Structure. The interviews with the director and first line supervisors of the Engineering and Maintenance Department were structured; however, topics outside the agenda were discussed as they arose. Once the business statement was established, the interviews at the lower levels were conducted to determine what functions are accomplished, and what processes and activities are necessary to perform the function. The interviews were

scheduled for thirty minute blocks.

Finally, after deciding what was being done, the interview turned to the information required to perform the processes and activities. The required information was recorded regardless of its origin or destination.

The processes, activities and data described by the first line supervisor were verified with the director of Engineering and Maintenance. He clarified responsibilities and provided a broader perspective.

Engineering and Maintenance. While the senior management provided the statement of purpose, the processes and activities of the Engineering and Maintenance department came from the director of the function and his staff. The majority of the week, three days, was spent interviewing the director and recording the nouns and verbs of his realm. The functions, processes and activities of his section were discussed in great detail. The discussion moved from functional area to functional area.

Tours of the plant and facilities provided perspective for the scope of Engineering and Maintenance operations and information for the geographic model.

Interviews with the first line supervisors provided insight into the actual demands of the job and the information necessary to perform them. Each of the interviews was structured as outlined above.

In addition to the extensive interviews, all the

forms, reports and computer applications currently used by the department were analyzed and are attached in Appendix 2.

Analysis

The interrelationships between the data created by and used by the facilities department are analyzed in a series of matrices. Each matrix isolates two variables for consideration in the system design.

Recording Results

Results of the model are recorded in a database developed for this case study. A file of functions, processes and activities is linked to a file of data determined necessary to perform the activities and a file describing the characteristics of the data itself. The information can be sorted and analyzed in a number of useful categories. This database leads to the creation of the conceptual statement of the system recommended for the MDMC.

Comparison

After creating a conceptual statement of systems requirements, a determination of the appropriateness of

automation will be made; and if automation is appropriate, systems will be compared.

Chapter Endnotes

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[3]Milt Bryce, "The IRM Idea," Datamation, April 15, 1987, p. 89.

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[6]John A. Zachman, "A Framework For Information Systems Architecture," International Business Machines, March 1986, p. 10

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[8]Zachman, p. 10.

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[12]International Business Machines, "Business Systems Planning," First Edition, November 1978, p. 7.

CHAPTER THREE

RESULTS

Application of Models

Business Statement

Montana Deaconess Medical Center

Simply stated, the goal of Montana Deaconess Medical Center is to be a leader in health care.[1] Furthermore, it is in the physician's eye that they wish to be perceived as the leaders. In recognizing the physician as their customer, MDMC works to fulfill the physician's needs. While this orientation may seem unusual for a hospital, it should be noted that physicians often make recommendations to their patients regarding appropriate hospitals for specific medical procedures. While a patient is free to choose exactly which hospital they will enter, they usually follow the physician's recommendation. Physicians "serve as distributors of the hospital's services," and are being

recruited by many hospitals.[2]

The Montana Deaconess Corporate Charter describes a number of additional goals that define what it takes to be a leader in health care. These are listed in Appendix 3 and include providing care for the sick and injured, advancing scientific knowledge in health care, furthering education and promoting health in the community.[3] One goal stated in the by-laws relates specifically to the Engineering and Maintenance department,the focus of this project:

> establish and maintain physical and attitudinal environment within which these purposes may be accomplished with the utmost efficiency and economy but without in any way distracting from the quality of the care and service provided.[4]

Engineering and Maintenance Department

As indicated in the corporate by-laws, the facilities of the hospital are an important contributor to the accomplishment of the overall statement of purpose. Senior managers echoed this view by mentioning the importance of the physical image of Montana Deaconess Medical Center on people's perception of the hospital. The Chief Executive Officer (CEO) even had a goal for the Engineering and Maintenance department to remodel the hospital from the inside out to create the perfect image.

More generally, however, the CEO saw the job of the

Engineering an Maintenance department as supporting senior management's initiatives. According to Mr. Cornell, the strategic thinking he advocates is opportunistic. To support this corporate vision, the facilities department has to be flexible enough to meet shifting objectives based on new opportunities.

The Chief Operating Officer outlined much more concrete and immediate demands of his facilities professionals. According to Mr. Morretto, the Engineering and Maintenance department must maintain the hospital to perform the function for which it was designed. Under this concept, alteration is necessary only as the function of space changes. Necessary alterations are identified by senior management and carried out by the Engineering and Maintenance department.

The business statement for the Engineering and Maintenance department is intertwined with management's goals for the medical campus itself. Montana Deaconess' image has been carefully considered and implemented. Just as print advertisements, signs, and employee nametags must provide a homogeneous image, so must the campus itself. Within the consistent fabric of the medical campus, however, each facility must project its own image. This is necessary since each facility appeals to a specific user and function. For example, while the professional building looks like an office building, the DSNC facility is a low building with sloped roofs and bay windows. The latter is

projecting an image of "hominess" to potential residents; the former is designed to attract physician tenants.

While there is room for some unique expression in exteriors, Deaconess' interiors are much more uniform. Specific colors and materials have been chosen to represent the Montana Deaconess Medical Center. This image is displayed on the signs, advertisements, employee keychains and mandatory nametags all featuring the Deaconess logo in the blue and magenta colors that identify the corporation. Interior colors were picked specifically to present a homey--non-institutional-- image.

Functional Model

Engineering and Maintenance

The Engineering and Maintenance Department is under the major department called Clinical and Support Services, and it fits into the business statement of purpose as stated above. In order to best accomplish the goals and purposes assigned, the department is broken into sub-departments (see Figure 1-2) and within each of these distinguishable functional areas are several other divisions. While the divisions outlined below were designed to optimize the Engineering and Maintenance function, they have no bearing on the functional model

which cares only about what the organization does and what information is necessary to perform the do it.

Organizational Divisions

Management Function. The management section corresponds to the "Engineering and Maintenance" box on the organizational chart and provides planning, organizing, control and leadership for the entire department. The emphasis at this level of management, stated hierarchically, is controlling, leading, organizing and planning. In addition to the director, the section includes administrative and material control support for the entire department.

Security. This section provides security guards and electronic surveillance for the facility. The unarmed, licensed guards are responsible for the safety and security of the campus. Parking lot patrols are conducted on a regular basis, and the guards are available to escort hospital personnel to their cars after late shifts. In addition to these routine tasks, the guards are available to address any security problems as they arise.

Garden Shop. The condition of the 37.5 acre campus is the responsibility of the Garden Shop. In spring, summer and fall, they are responsible for maintaining the grounds. In

the winter months, the Garden Shop provides snow removal services. Busy with more than just grounds maintenance, the Garden Shop provides construction project support by landscaping and planting for new construction.

Plant Equipment and Biomedical Shop. As the name implies, the Plant Equipment and Biomedical Shop maintains and repairs all the equipment in the hospital. This function is broken into three sub-areas: management, equipment and biomedical.

Management provides planning, organizing, controlling and leadership for the equipment and biomedical shop. The major responsibility lies in controlling and leading employees.

The equipment group within the section is responsible for all the building systems. These include systems such as boilers, chillers, pumps, electrical distribution systems, electrical back-up generation systems and the washers and dryers in the commercial laundry at Deaconess.

Biomedical repairs all electronic equipment in the hospital except x-ray machines. In addition, they provide repair and maintenance for the building control systems involving microprocessors.

First Response. Just as the name implies, First Response's major responsibility is to respond immediately to maintenance requests within the hospital. Like the Plant

and Biomedical Equipment Section, First Response is broken into three sub-areas: management, first response and communications.

Management provides planning, organizing and leadership for the section. This first line supervisor spends the majority of his time controlling and leading his employees.

The first response section must respond immediately to any maintenance request twenty-four hours a day, seven days a week. When not involved in an actual response, workers are assigned preventive maintenance and repair on the hospital.

Communications monitors and controls all the telephone installations and moves within the hospital and keeps the master phone list current. They are also responsible for all intercoms, hand held radios and beepers.

Construction. The construction section performs actual construction projects. The scope of the projects handled by the section depends on the job complexity, multiple trade requirements and work load. The section management acts as the general contractor preparing project cost estimates and scheduling work for his multi-disciplinary workers. When not involved in projects, construction workers perform preventive maintenance on the facilities.

Processes and Activities

Unlike the divisions described above, the functional model goes outside existing departmental divisions to define processes and activities and the information required to perform them. In this business model, the Engineering and Maintenance department is considered the parent function (see Figure A4-1 in Appendix 4). Its business statement has been outlined above and the major processes and activities necessary to fulfill the obligation to the Montana Deaconess are described below. A complete list of processes and activities is shown in Figure A4-2a and A4-2b.

Facility Development Planning Process

Listed first in precedence, this process lays the long-range plans for facilities, plant and equipment. The plans include building and system repairs, renovations and modifications which drive much of the maintenance job/project planning process by providing the list of work to be accomplished. More than the other functions, this process is influenced by senior management.

Senior management outlines plant and facility requirements. With this input, the Engineering and Maintenance function determines how to best provide the facilities to support management, and with management's

cooperation and advocacy funding and scheduling requirements are assessed.

Maintenance Request Planning

As discussed earlier, consequences for non-operable plant and equipment in a hospital are serious. The maintenance request planning function plans for the response to non-routine maintenance requests telephoned in from departments in the hospital. Since action must be taken nearly immediately, this function works to anticipate manpower and material requirements and set up shifts accordingly.

The maintenance request planning function also establishes policies and procedures for proper first response action.

Maintenance Request Performance Process

Once the shift is manned as planned in the maintenance request planning function, the workers wait for a request. Upon receiving a request, they perform first response maintenance. The actual response includes following established troubleshooting and maintenance procedures and referrals if the problem is beyond the abilities or scope of the First Response technicians.

Maintenance Request Control Process

The Maintenance request cycle is completed when the results of the first response visit are recorded. Disposition of the problem and action taken are recorded as well as the labor hours and materials required to perform the task. Any follow-up or remedial work necessary is referred to the maintenance job/project planning process.

Maintenance Planning

Completely different than the unplanned response of maintenance requests, maintenance planning establishes planning documents and maintenance specifications for recurring maintenance. It works to reconcile maintenance work with the available resources to insure facilities, plant and equipment are adequately maintained.

Recurring maintenance identification is a prime responsibility of the maintenance planning process as is adding new equipment to the maintenance lists.

Maintenance/Project Job Planning

Although the scope of maintenance jobs and projects are different, the processes required for both are similar and are treated the same for modeling purposes. From the master maintenance plan created in the preceding process,

short range maintenance plans are developed. These include detailed job or project work plans, coordination of resources and maintaining preliminary job history.

In projects, the detailed project plan includes cost estimates and materials requisitions and project schedule. The schedule shows the critical path of work and materials and scheduling work from all the trades necessary to perform the job.

Maintenance/Project Job Performance

This process represents the actual maintenance and project work. The process starts with the allocation of resources including material and manpower. Following the detailed work plan provided in the planning process, workers perform the tasks required to complete the work. Any necessary permits or quality tests should be accomplished during this stage.

Maintenance/Project Job Control

The control process tracks the job from scheduling through completion. Actual material and manpower costs are compared with projected or standard costs to determine efficiency, and qualitative measures are taken. Any discrepancies uncovered in the control process are referred

to the proper function for correction.

Security Process

Security planning, performance and control are provided in this process. By monitoring past security incidents, personnel and surveillance cameras are scheduled and placed based on this information.

Snow Removal Process Action plans including manpower recalls and plowing priorities are prepared anticipating snow storms. In addition to snow removal planning, this process includes the actual removal.

Energy Management Process

As the department in charge of the operations of the plant and facilities, the Engineering and Maintenance department establishes energy usage policies. These include creating project design criteria regarding energy conservation for current and future projects, initiating energy savings maintenance and upgrades and establishing thermostat setbacks for building systems.

Existing plant and facilities are equipped with complex systems control devices which monitor energy usage. The feedback from these units is monitored by this process as is the operation of all systems to maximize efficiency.

Finally, this process analyzes utility bills and rate structures. Their goal is to negotiate for the most favorable rate from utility suppliers, and operate building systems to keep in the lowest possible rate structure.

Hazardous Waste Management Process

This process develops policies for hazardous waste management within regulatory guidelines. Responsibilities include keeping the hospital's master hazardous substance list, maintaining records on all hazardous substance disposal and offering monitoring hazardous substance handling procedures.

Equipment Disposition Process

As the maintainers of plant and equipment, the Engineering and Maintenance technicians are in the best position to identify equipment disposal requirements and alternative uses. The equipment disposition process works with the accounting function on the disposition of equipment.

Data Modeling

Data modeling takes the nouns of the company and categorizes them in general terms. Figure A4-3 in Appendix

4 shows data used by the Engineering and Maintenance department by data classification while Figure A4-4 shows an integrated functional and data model. The following is a short discussion of each of the data classifications.

Data Types

One unique aspect of the information world associated with facility management is the reliance on graphic information, called as-built drawings and construction documents, in the day- to-day conduct of business. For this reason, the first major division of information in the data model is graphic information. Non-graphic data are more common in the business world and represents the other major classification. Non-graphic information can be subdivided by specific qualities of the information itself and the type of information manipulation required. For this project, the additional sub-categories are text and text/numbers. Figure 3-1 shows the two major divisions of data and their relationship to the major functions of a facility management organization.[5] The following provides a short description of data classification, the manipulation required and examples of these data type in this model.

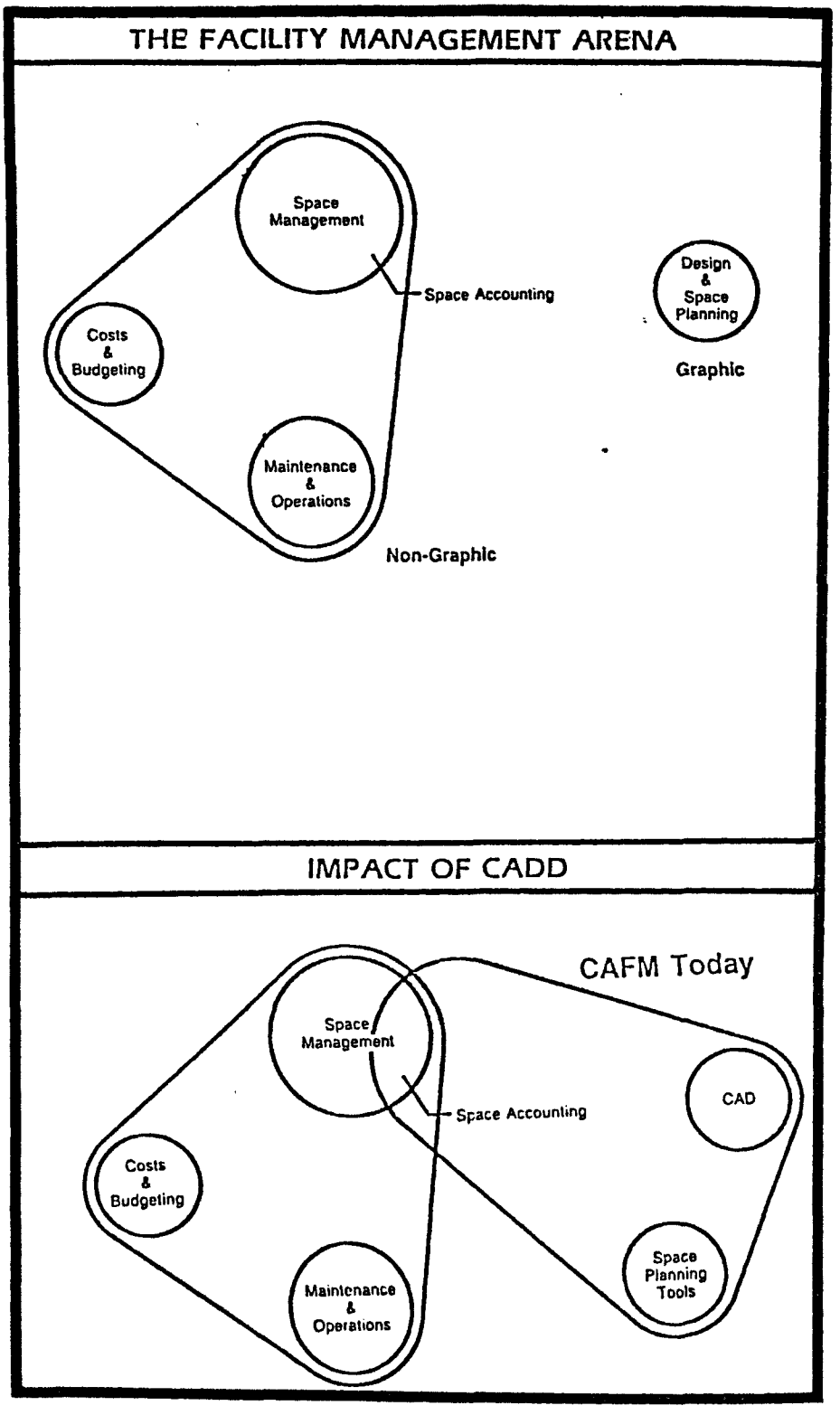

FIGURE 3-1

Facility Management Information Types[6]

Non-Graphic Data

Text. Textual data include written documents. The only manipulation of the data is done by common word processing. Examples of text include policies and procedures, equipment technical data and correspondence.

Text/Number. Text/number data include alpha numeric characters. The data represented in by these characters must be manipulated by mathematical or logical operators. An example of text/number data would be spreadsheets depicting a budget, spreadsheets tracking costs on a job or a project cost estimate.

Graphic Data

Graphic data use symbols in addition to alpha numerics to describe buildings, systems and construction requirements. Traditionally prepared on large sheets of reproducable velum paper or mylar film, building graphics are now being represented by digital information on a CADD program which can plot the data on reproducable sheets. The drawings themselves are a miniature database using many layers of information for each drawing. And as in data base design, a well crafted set of computer generate design drawings should maximize use of common information. The

floor plan of a facility created by an architect on CADD becomes a digital file. This digital file is used by the structural engineer to prepare the framing plan; the mechanical engineer to prepare the heating air conditioning and ventilation plan and the electrical engineer to create the power and lighting plans. The advantages of this data base are similar to the data base of text and numbers, in that, when the architect moves a wall, the other engineer's floor plans immediately reflect the change, so they can take appropriate action.

More important to the facility manager however, these computerized drawings also contain hidden databases of information. The databases can carry information about material types, quantities and inventories. As is evident in the integrated model, this type of information is important to the day-to-day operations of the facility manager.

Integrated Model

Create/Use. In addition to showing all the processes and activities and the information used to perform them, the integrated model in Figure A4-4 in Appendix 4 shows what happens to the information at the function. Information is either "used" or "created" within a process. More complex models add two other categories called "update" and "delete." In our model no information is deleted by the

Engineering and Maintenance department, and "update" is considered a subset of "use."

Internal/External. The final important attribute of the information considered in the model is to recognize that some information is created outside the organization. This appears on a column in the integrated model and becomes important when considering which information can be assimilated into a organizational data base.

Geographic Modeling

Office Locations

Engineering and Maintenance personnel offices and workshops are on the first floor of the Montana Deaconess Medical Center (See Appendix 1). The only exception are the cabinet makers in the Construction section located in a rented space on 10th Avenue South in Great Falls. Administration and Material Control offices are the center of much of the record keeping operations as they exist today. In today's schemes these offices contain the computer link to Montana Deaconess's main frame computer.

Information Location

Technical information is presently split between the archive room and the Plant Equipment and Biomedical work area. The archives contain a single set of non-reproducable as-built drawings in a tall flat-file. A small work table allows the technicians to lay out the drawings to look them over, but there is no provision for taking reproductions of the information on maintenance and repair runs.

In the Plant Equipment and Biomedical Shop, one wall of cabinets houses the complete equipment technical library. This library includes all the manufacturer's information as well as suggested maintenance intervals and procedures.

System Location

Computer support for the Engineering and Maintenance department is provided from a main frame computer located on the second floor of the hospital. There are three terminals in the department located in the Administrative, Material Control and Equipment areas.

Chapter Endnotes

[1]David Cornell, interview at Montana Deaconess Hospital, Great Falls, Montana, February 9, 1988.

[2]"Labor Letters," Wall Street Journal, April 12, 1988, p. 1 c. 5.

[3]Montana Deaconess Medical Center Corporate By-Laws.

[4]Montana Deaconess Medical Center Corporate By-Laws.

[5]Peter S. Kimmel, AIA, "Computer Aided Facility Management: Today and Tomorrow," Buildings, March 1987, p. 79.

[6]Kimmel, p. 79.

[7]Michael L. Sena and Eric Teicholz, "Computers: Facility Management is Fertile Ground for Automation," Architectural Record, February 1986, p. 35.

[8]Sena and Teicholz, p. 35.

CHAPTER FOUR

ANALYSIS AND CONCLUSION

Analysis

Geographic Analysis

Proximity of Data Users to Data

As the Engineering and Maintenance department operates today, important information is stored only in specific locations. As such, it appears that the information is not for consumption--that is, the information in not supposed to leave the archive room or the immediate area of the technical library. Any automation of the facility drawings and equipment should decentralize retrieval of the information and include provisions for copying the data. Drawings of a specific system or room should be easily drawn from the mass of data available which is not the case today. The first line supervisors and technicians should be information consumers who have access to any information they need to perform their function.

Although remote, the cabinet makers of the Construction shop work almost exclusively from construction documents. Since preparation of the construction documents incorporates all the existing conditions information necessary to perform the cabinet work, additional access to as-built or equipment information should not be necessary.

System Location

No specific requirement for system location is suggested by the model. As it operates today, computer support for the Engineering and Maintenance department is provided by a main frame computer located on another floor of the hospital. This arrangement poses no apparent problems.

Integrated Model

Process/Activity

While the model was developed primarily to determine the information needs of an organization, the process of modeling may uncover other areas of interest. In the Enginering and Maintenance department, people from several different departmental sub-divisions are performing related or identical tasks. This may not be bad, yet it deserves

attention to determine if the divisions implemented by the organization are the most efficient divisions possible.

Data Type

Non-Graphic Data. MDMC's Information Systems department has developed an extensive data base of non-graphic information to support the Engineering and Maintenance department. Applications include equipment inventories, equipment maintenance records, preventive maintenance items and preventive maintenance records. These maintenance and inventory applications are in addition to the traditional business data applications of accounting and personnel files. Because the non-graphic system is operating well, this project analysis focuses on the currently unautomated non-graphic information and all graphic information. Before addressing the efficacy of integrated graphic and non-graphic systems, it needs to be determined if automated graphic information is necessary for for effective operation of the Engineering and Maintenance department.

Graphic Data

According to the division of information for facility management described earlier, only the design and space planning functions use primarily graphic information.[1] The Engineering and Maintenance department at MDMC does not

have any design or space planning responsibilities. Both functions are performed by an outside architect acting as a consultant. Since the consultant works with the hospital on a continuous basis, they might benefit from automation; however, spending money to install automated graphics just to benefit a consultant is feeble justification. The business model should provide more specific uses of graphic information within the Engineering and Maintenance Department at MDMC.

Graphic information is required for eight of the thirteen processes identified by the model. This alone is not justification, since it is more important to know what is being done with the graphic information.

Create Facility Drawings. The facility development process creates graphic information in the form of new projects. After the construction documents are used by the construction contractor to build a facility, the information is stored in the archives and becomes reference for the daily operations and maintenance of the facility.

Propose Changes to Facility Drawings. The maintenance job control process and, to a lesser extent, the maintenance request control process forwards requests to alter graphic data contained in the facility as-builts. The changes result from first response maintenance, maintenance jobs or

maintenance projects. The changes are recorded by the facility development planning process.

Use Facility Drawings. Finally, maintenance request performance, maintenance planning, maintenance job planning, maintenance job performance, snow removal and security processes all use the facility and site drawings for reference. In these processes, a graphic depiction of the facility, its systems and attributes provides varied important information: parking lot locations for snow removal, disturbance location for security, facility system descriptions for the first response and maintenance technicians and background data for construction planning.

Frequency and Scope of Changes. Facility managers refer to turn-over in spaces as the churn rate--the percentage of space altered in one year--and categorize these rates from low to high.[2] With a churn rate of less than 10 percent Montana Deaconess' rate is considered low. The churn rate is an important number when considering graphic automation, since it indicates how often facility documents will be altered. This index indicates less need for automated graphics.

Existing Facility Drawings. As more architects and engineers prepare construction documents on CADD, users will be able to take the digital product in lieu of

traditional as-built drawings. To make the drawings useful in facility operations, users will demand that CADD drawings include an attribute-database compatible with their own computer system.[3] In order to meet this demand, design CADD systems will include digital databases as a standard product. This is not the case today though. Worse yet, since MDMC's as-builts are traditional drawings, to work in a graphic system, they would have to be digitized. This is a costly proposition for as-built drawings that are changed so infrequently.

Graphics Created Externally. The other graphic information used in the processes includes as-builts and technical documents created outside the organization. It is very difficult to alter the form of this data to make it work in the organizational information system. Unlike the architectural or engineering contractor who seeks futher commissions with an organization vendors of equipment have less invested in a given job. Consequently, establishing an automated information standard and expecting these vendors to adhere to it is unlikely.

Appropriate Applications

As stated earlier in the analysis, databases created by the Information Systems department provides a number of maintenance applications as well as traditional business

data. Figure A4-5 in Appendix 4 lists all the data identified by the model and indicates whether the existing system provides automated applications. The following discussion addresses the non-graphic information not currently automated.

Energy Data. Currently, the computerized energy usage control is limited to microprocessors associated with each individual building. Although interface is possible and would be beneficial, these are to tied back into Building Management-Energy Management System (BM-EMS). Such systems monitor the operation of mechanical systems, record energy usage and provide a means to control systems for some goal--such a lowering peak demand for electricity by selective load shedding. In addition to the energy savings possible with BM-EMS software, "lower maintenance costs through more efficent operations."[4]

As-Built Index. Montana Deaconess Medical Center was built over many years under several separate construction projects. In addition to projects providing complete new facilities, some extensive remodel projects changed entire floors. The existing as-built system requires the user to know which project to look for to show the most current facility condition. Although a set of "one-line" drawings show a consolidated floor plan and several systems plans, some information can only be found on complete construction

documents. A computerized as-built index keyed by room number, project number, system type and applicable projects would make the archives more negotiable.

Available Package

Orientation

Throughout the project the unique aspects of hospital facility management have been discussed. With this in mind, it should be noted that the majority of the CAFM packages available were developed for office buildings. Inherently, these packages emphasize space planning for high churn rate open office space, not the systems driven changes of hospitals.

The programs for office building facility managers evolved along two separate lines whose orientation is helpful to describe their strengths and weaknesses. One system was evolving from the ranks of relational databases while the other came from CADD producers; the former worked well with alpha numeric applications, the latter worked best with graphics.[5] Although integrated systems are being introduced, they often compromise both the data handling and graphics capabilities. For economical small systems, the choice is still between non-CADD and CADD-only systems.

CADD-Only Systems. Some of the applications provided by CADD-only automated facility management programs are graphic database, space layout, space inventory, furniture inventory, and working drawings.[6] Since MDMC Engineering and Maintenance provides no space planning or design work, the only useful applications provide database connection with the graphics.

Non-CADD. The applications provided by a packaged non-CADD automated facility management package are very similar to the applications designed in-house specifically for the Engineering and Maintenance department Montnana Deaconess' Information Systems department. Any software package would have to be customized to fit the specific operations at Montana Deaconess and may never be as nice a fit as the custom programs used currently.

Best Fit The Engineering and Maintenance Department is currently operating with a very applicable database oriented, non-CADD automated facility management system.

Recommendations

The following recommendations are listed in order of priority.

Automated Graphics Requirements

Engineering and Maintenance does not have space planning and design responsibilities nor numerous changes and as-built updates to justify automated graphics. With the low organizational churn rate, the minor modifications generated by maintenance are incorporated by a part-time draftsman who only works summers. Finally, the entire as-built set of drawings would have to be digitized to benefit from the integrated graphics and database software that will be perfected in the coming years. This expense is not justified; however, they can begin digitizing all future projects.

Since many architects are producing construction documents on CADD anyway, MDMC should encourage their architecture and engineering consultants to use CADD for any future major projects. Their long-term relationship with the architect should allow them to participate in the design of the associated database accompanying the computerized construction drawings. The goal should be to create a set of working documents whose usefulness doesn't stop at the end of construction. As Deaconess grows and computer graphic hardware and software becomes less expensive, the digital record of facility construction may be transferable to a future computerized facility management system.

Non-Graphic Data

Information Systems has done a fine job creating a maintenance database system to support the operations of the Engineering and Maintenance department. Any packaged non-CADD software will show the office bias and require customization. The resulting system would probably be less suitable to the hybrid structure of MDMC's facility managers than their current system. The Engineering and Maintenance department should, however, consider altering the current system as described below.

Energy Package

The energy intensive operations of a hospital would probably benefit from a Building Management-Energy Management System. The newer mechanical systems in the hospital already have sensors and microprocessors which could be wired into a packaged unit. Even if no energy savings are realized, the central system would monitor the remote systems and alert of any problems early.

Drawing Index

As-built drawings contain a wealth of information if the information is easily found. Since the use of the

current as-built set of drawings requires background knowledge into construction phasing over the last twenty years, a computer program indexing by facility, room, upgrade project, most recent alteration, system type and original project would help new users find the most current information.

Data Storage and Retrieval

The technical data and as-built drawings are in a central locations and available for review, however, there is no way for users of the information to take it with them. The Engineering and Maintenanace Department should consider installing a copy machine. The copied information could accompany the technician to the equipment location or the plumber to the plugged toilet. Having accurate information at the actual maintenance location should help technicians with timely, efficient repairs.

If the as-built indexing program were implemented, a computer terminal would need to be installed in the archives room available for anyone's use.

Material Use Records

The apparent missing link in the otherwise elegantly simple maintenance work order system, is that the cards do

not allow linking maintenance records to the material and benchstock ordering system. New fields should be added to the existing database to incorporate these items.

Limitations of Study

The modeling technique employed to elicit information needs of the Engineering and Maintenance department was developed to be applied to an entire organization for a completely integrated database design. While it helped break across the organizational lines within the Engineering and Maintenance department, the full benefit of the modeling tool was not realized.

The results of the study are very specific to the Engineering and Maintenance department at Montana Deaconess Medical Center and applicable only to this department. No conclusions should be made regarding the applicability of graphics based CAFM or implementation of CAFM software packages outside this narrow focus.

Conclusions

Before asking which computer system is appropriate, it is necessary to ask if a computer system is necessary at all. The enterprise model provided a useful framework to describe what the Engineering and Maintenance department does and what information it takes to do it. The usefulness of graphics based systems is questionable in all

but the highest churn rates with active construction design and space planning responsibilities. As it turned out the systems do not apply here.

Montana Deaconess can take steps now, to reap future benefits from graphic based CAFM packages by demanding that construction documents be prepared to their digital specifications. In addition, several non-graphic applications could enhance the useful system in place today.

Chapter Endnotes

[1]Peter S. Kimmel, AIA, "Computer-Aided Facility Management: Today and Tomorrow," Buildings, March 1987, p. 78.

[2]Michael L. Sena and Eric Teicholz, "Computers: Facility Management is Fertile Ground for Automation," Architecural Record, February 1986, p. 35.

[3]Sena and Teicholz, p. 35.

[4]George N. Webb, F.A.S.H.E. "Building Monitoring Systems for Hospitals," American Society for Hospital Engineering Technical Document Series, Number 055849, April 1984, p. 1

[5]Kimmel, p. 78.

[6]Barbera M. Brennan, "Computerized Facilities Planning, Design and Management Options for Today's Offices," Industrial Engineering, May 1985, p. 73.

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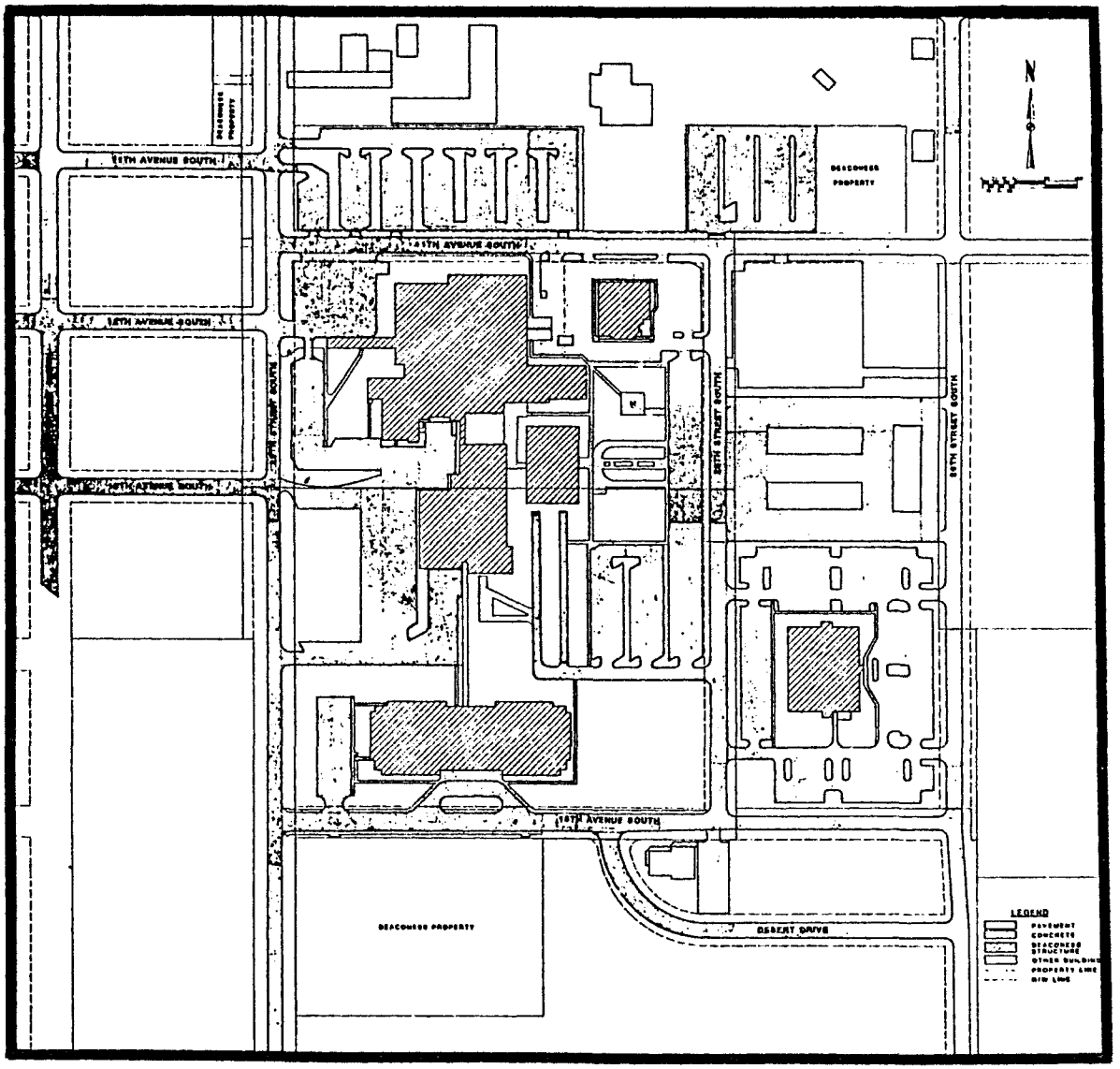
APPENDIX 1

CAMPUS PLANS AND FACILITY PLANS

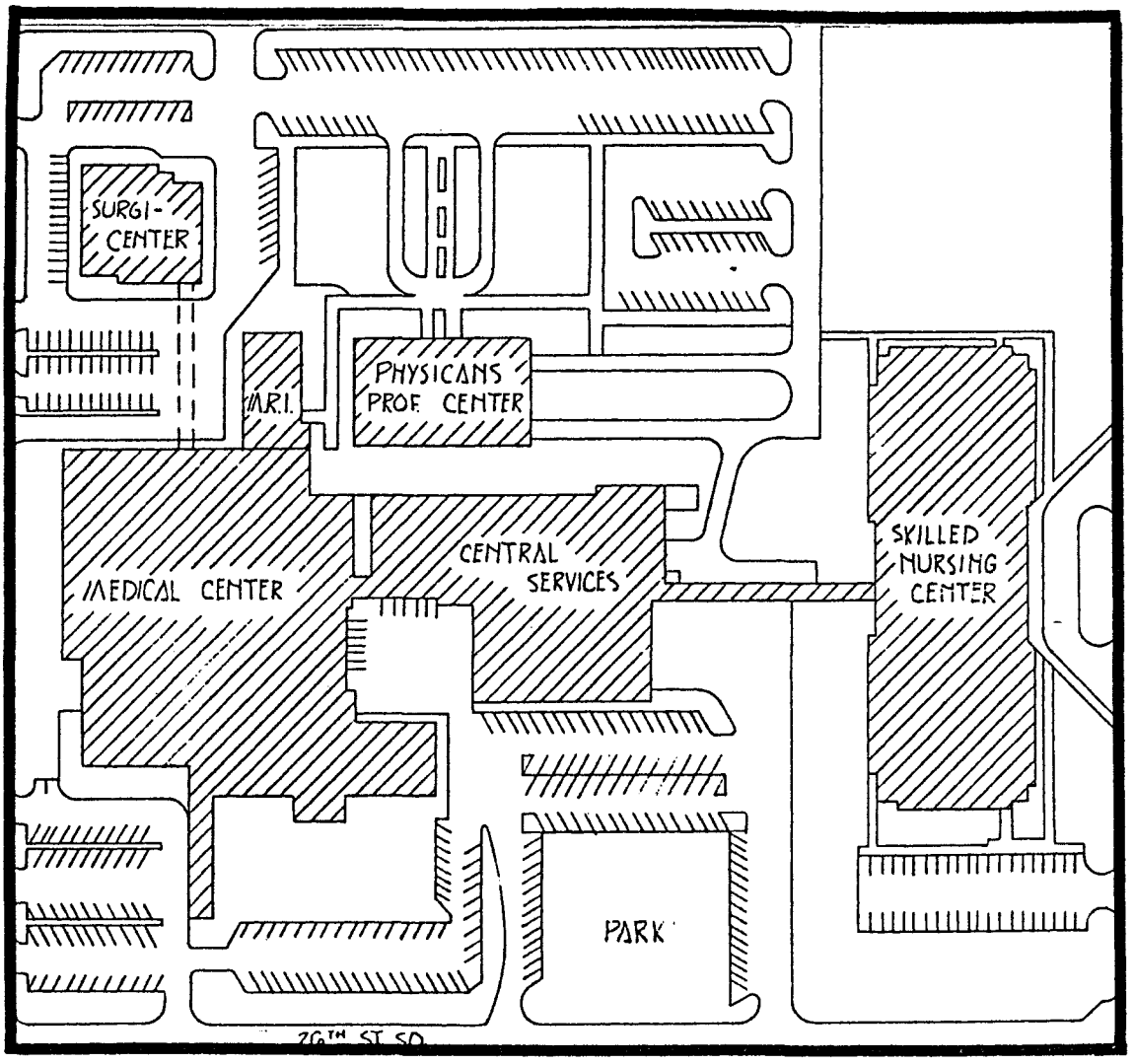
Medical Campus



APPENDIX 1

CAMPUS PLAN AND FACILITY PLAN

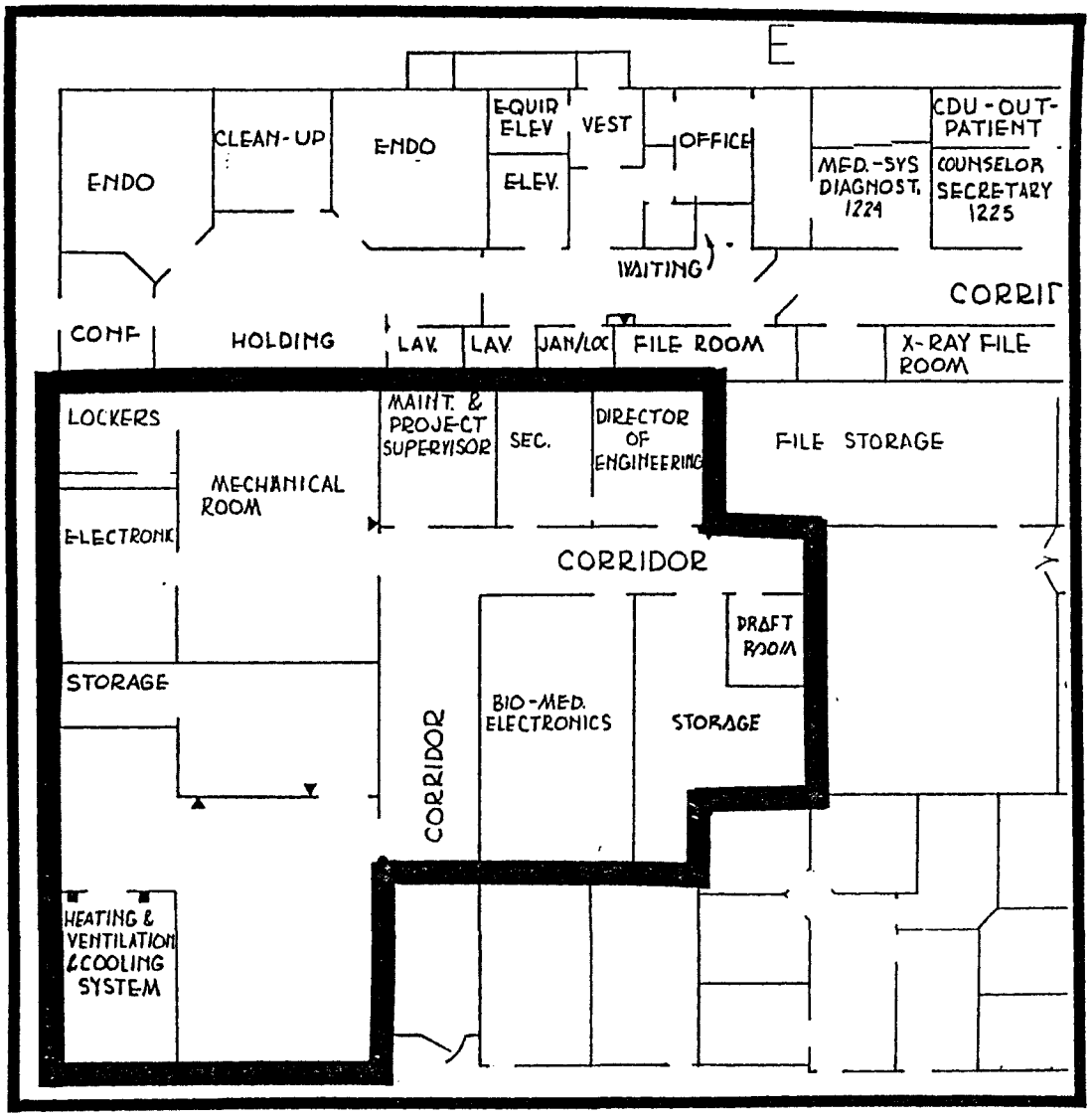
Facilities



APPENDIX 1

CAMPUS PLAN AND FACILITY PLAN

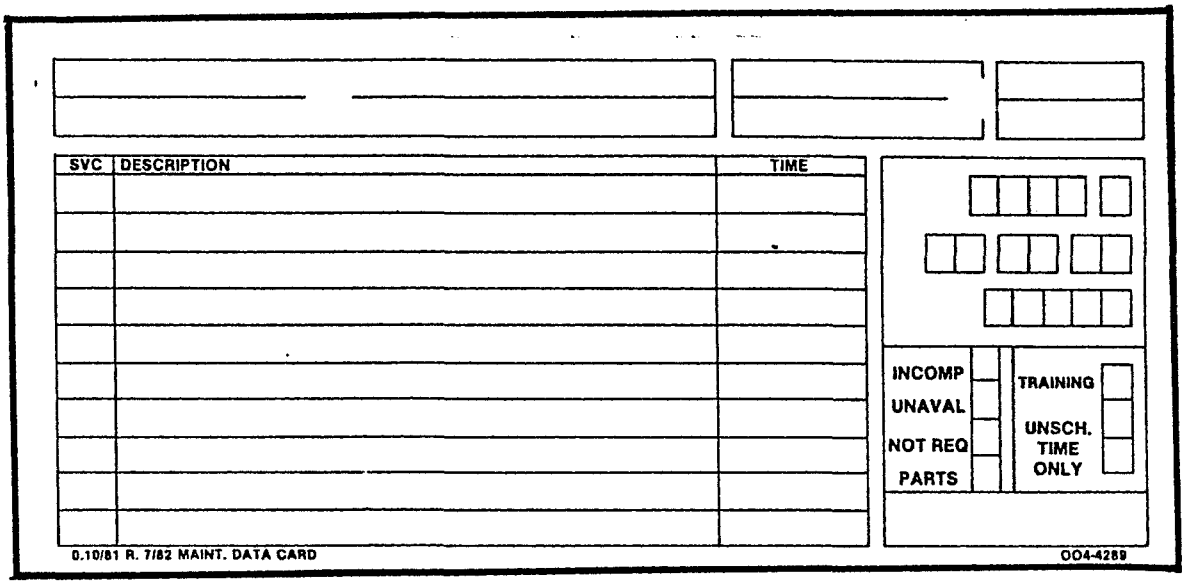
Engineering and Maintenance Area



APPENDIX 2

ENGINEERING AND MAINTENANCE FORMS

Maintenance Data Card



12	ACTION TAKEN / HISTORICAL INFORMATION
1	
2	
3	
4	
5	
6	

APPENDIX 2

ENGINEERING AND MAINTENANCE FORMS

Maintenance Requisition and Work Order

MONTANA DEACONESS MEDICAL CENTER
Great Falls, Montana

MAINTENANCE REQUISITION & WORK ORDER

DEPT. OR UNIT REQUESTING	REQUESTED BY	CONTACT PERSON	DATE	GEN. LEDGER ACCT. #

DESCRIPTION OF WORK REQUESTED: ______

AMT. BUDGETED FOR PROJECT $

DATE RECEIVED	JOB NUMBER	IF CONTRACTED (CONTRACTOR NAME)	DATE STARTED	DATE COMPLETED

ESTIMATED COST		LIST OF PROJECT REQUIREMENTS	ACTUAL COST	
MANHOURS	MATERIALS		MANHOURS	MATERIALS

TOTAL ESTIMATED PROJECT COST:

TOTAL ACTUAL PROJECT COST:

APPROVALS:

DEPT. HEAD or SUPERVISOR ______ DATE: ______

DIR. of ENGINEERING & MAINT. ______ DATE: ______

ADMINISTRATIVE DIRECTOR ______ DATE: ______

ADMINISTRATOR ______ DATE: ______

JOB INSPECTED & ACCEPTED: DATE:

COMMENTS:

PROJECT TO BE SCHEDULED:

DISTRIBUTION:

R. 5/82

DISTRIBUTION:
ORIGINAL (WHITE) RETAINED BY MAINTENANCE

APPENDIX 2

ENGINEERING AND MAINTENANCE FORMS

Telephone Change Request

MONTANA DEACONESS MEDICAL CENTER

TELEPHONE CHANGE REQUEST

RETURN TO DIRECTOR OF ENGINEERING AND MAINTENANCE

DATE:_____ CONTACT:_____ DEPT:_____ DEPT#:_____

CONTACT PHONE#:_____ ROOM #(WHERE PHONE TO BE CHANGED IS LOCATED):_____

TELEPHONE # OF SETS INVOLVED: 1._____ 2._____ 3._____ 4._____ 5._____

SET # OF BUTTON SET INVOLVED: 1._____ 2._____ 3._____ 4._____ 5._____

EXPLANATION OF REQUESTED CHANGE:_____

_____

_____

_____

_____

APPROVAL OF DEPARTMENT HEAD:_____ DATE:_____

MAINTENANCE DEPARTMENT USE ONLY

DIRECTOR OF ENGINEERING AND MAINTENANCE:_____

DATE:_____ APPROVED:_____ DENIED:_____

COMMENTS:_____

_____

_____

TELCO SERVICE REQUIRED: YES_____ NO_____ DATE TELCO SCHEDULED:_____

MAINTENANCE SERVICE REQUIRED: YES_____ NO_____ DATE MAINT. SCHEDULED:_____

NOTES:_____

_____

_____

_____

_____

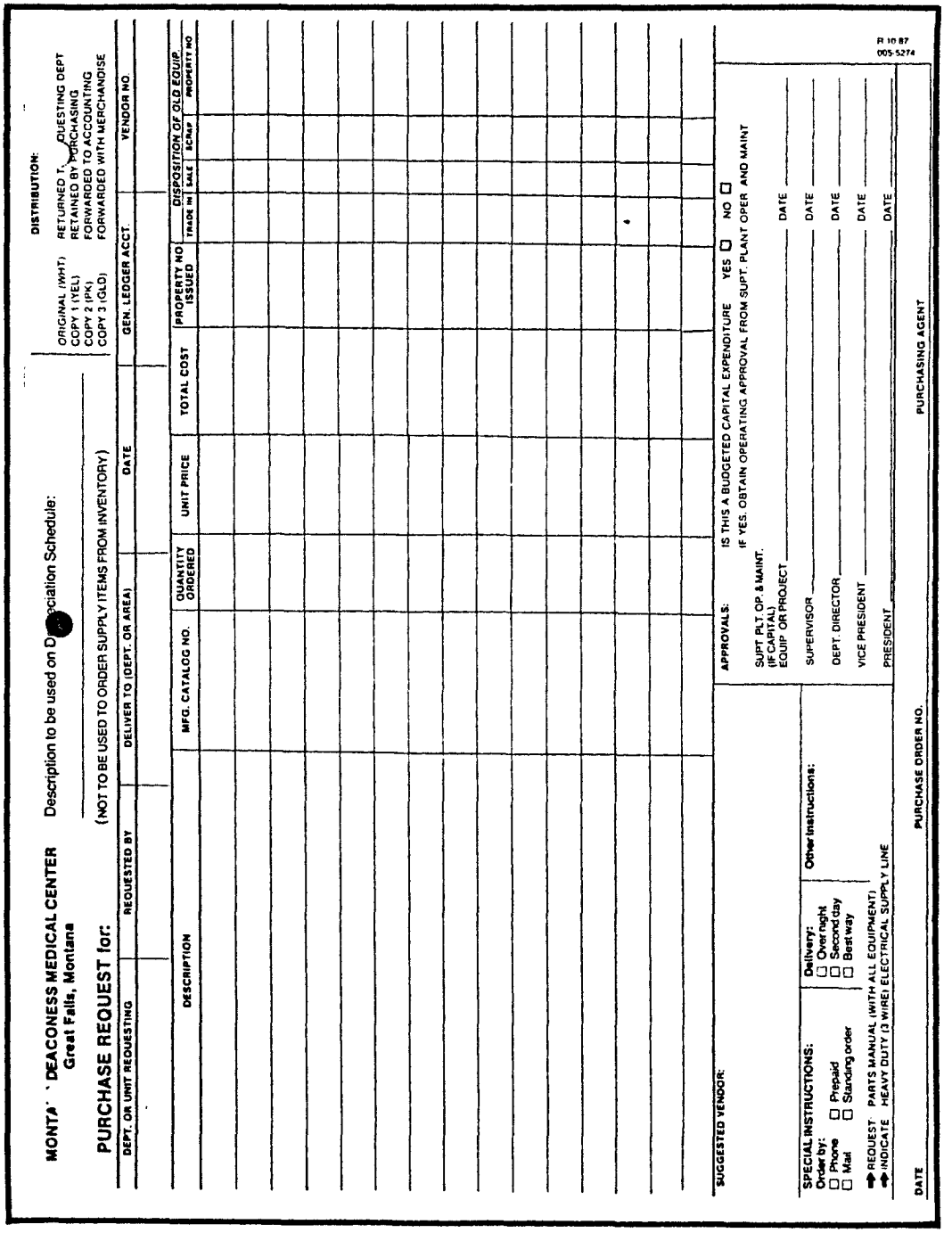
DATE WORK COMPLETED:_____ TELCO BY:_____ MAINT. BY:_____

NOTE: NO REQUESTS WILL BE PROCESSED WITHOUT PROPER APPROVAL

APPENDIX 2

ENGINEERING AND MAINTENANCE FORMS

Purchase Request



MONTA[illegible] DEACONESS MEDICAL CENTER
Great Falls, Montana

PURCHASE REQUEST for: _____

Description to be used on D[illegible]ociation Schedule: _____

(NOT TO BE USED TO ORDER SUPPLY ITEMS FROM INVENTORY)

DISTRIBUTION:
ORIGINAL (WHT) RETURNED T[illegible] QUESTING DEPT
COPY 1 (YEL) RETAINED BY PURCHASING
COPY 2 (PK) FORWARDED TO ACCOUNTING
COPY 3 (GLD) FORWARDED WITH MERCHANDISE

DEPT. OR UNIT REQUESTING | REQUESTED BY | DELIVER TO (DEPT. OR AREA) | DATE | GEN. LEDGER ACCT. | VENDOR NO

DESCRIPTION	MFG. CATALOG NO.	QUANTITY ORDERED	UNIT PRICE	TOTAL COST	PROPERTY NO ISSUED	DISPOSITION OF OLD EQUIP. TRADE IN	SALE	SCRAP	PROPERTY NO

SUGGESTED VENDOR:

APPROVALS: IS THIS A BUDGETED CAPITAL EXPENDITURE YES ☐ NO ☐
IF YES, OBTAIN OPERATING APPROVAL FROM SUPT. PLANT OPER AND MAINT

SUPT. PLT. OP. & MAINT. (IF CAPITAL) EQUIP OR PROJECT _____ DATE _____
SUPERVISOR _____ DATE _____
DEPT. DIRECTOR _____ DATE _____
VICE PRESIDENT _____ DATE _____
PRESIDENT _____ DATE _____

SPECIAL INSTRUCTIONS:
Order by:
☐ Phone
☐ Mail
☐ Prepaid
☐ Standing order

Delivery:
☐ Overnight
☐ Second day
☐ Best way

Other instructions:

➡ REQUEST: PARTS MANUAL (WITH ALL EQUIPMENT)
➡ INDICATE: HEAVY DUTY (3 WIRE) ELECTRICAL SUPPLY LINE

DATE _____ PURCHASE ORDER NO. _____ PURCHASING AGENT _____

R 10 87
005-5274

APPENDIX 2

ENGINEERING AND MAINTENANCE FORMS

Project Evaluation

MONTANA DEACONESS MEDICAL CENTER
MAINTENANCE DEPARTMENT

DATE:

TO:

FROM: John Spencer: Director of Engineering & Maintenance

SUBJECT: PROJECT EVALUATION

Your construction/renovation project #_____,
is now complete. In order to better serve your future needs, we ask for your help in evaluating this project.

1. Were you given the opportunity to review plans and specifications prior to starting the project? YES___NO___.
2. Were plans and specifications adequate to meet your needs? YES___NO____.
3. Was the quality of work satisfactory? YES____NO____.
4. Was the work done efficiently? YES____NO____.
5. Were you regularly advised of the status of the project? YES____NO____.
6. In your opinion was the project done in a cost effective manner? YES____NO____.
7. Was the over-all project completed to your satisfaction? YES____NO____.
8. COMMENTS: (Please use the back of this form.)

If this project has not been completed to your satisfaction or you have questions or concerns that require immediate attention, please contact me at ext. 5130.

This Project Evaluation form should be mailed to: Director of Engineering & Maintenance.

APPENDIX 3

GOALS FROM CORPORATE CHARTER

From Montana Deaconess Medical Center Corporate By-Laws

1. To render care to the sick and injured.

2. To advance scientific knowledge in health care.

3. To further health education of all participating in its work.

4. To take an active part in the promotion of general health in the community.

5. To cooperate and affiliate with persons and organizations having similar purposes.

6. To establish and maintain a physical and attitudinal environment within which these purposes may be accomplished with the utmost efficiency and economy without in any way distracting from the quality of the care and service provided.

APPENDIX 4-1
ENGINEERING AND MAINTENANCE FUNCTION

TITLE	DESCRIPTION
ENGINEERING AND MAINTENANCE	A SUPPORT FUNCTION WHICH PLANS, BUILDS AND MAINTAINS PLANT AND EQUIPMENT

APPENDIX 4-2a
ENGINEERING AND MAINTENANCE PROCESSES

PROCESS	DESCRIPTION
FACILITY DEVELOPMENT PLANNING PROCESS	A process which plans for the aquisition, modification and disposition of facilities
MAINTENANCE REQUEST PLANNING	A process which schedules, coordinates job resources and compiles maintenance request history for unscheduled maintenance requests
MAINTENANCE REQUEST PERFORMANCE PROCESS	A process which performs first response maintenance on plant and equipment from allocation of resources to job completion
MAINTENANCE REQUEST CONTROL	A process which tracks maintenance requests from the time the request is called in through request close-out, includes initiating corrective actions and analyzing job performance
MAINTENANCE PLANNING	A process of planning for the maintenance of plant and equipment by preparing planning documents, maintenance specifications, and identifying resource requirements
MAINTENANCE/ PROJECT JOB PLANNING	A process which authorizes work, prepares detailed job plans, coordinates job resources and maintains job history
MAINTENANCE/PROJECT JOB PERFORMANCE	A process which maintains plant and equipment from allocation of resources through job completion
MAINTENANCE/PROJECT JOB CONTROL	A process which tracks jobs from the time the job is scheduled through job close-out, includes gathering resource data, initiating corrective actions and analyzing job performance
PROJECT PLANNING	a process which authorizes and schedules projects, provides detailedproject plans, coordinates job resources and maintains project history
PROJECT PERFORMANCE	A process which performs construction projects from allocation of resources through project completion
PROJECT CONTROL PROCESS	A process which tracks projects from the time a project is scheduled through project close-out, includes gathering resource data, initiating corrective actions and analyzing project performance
SECURITY PROCESS	A process which provides plant security beginning with scheduling resources
SNOW REMOVAL PROCESS	A process which provides snow removal beginning with preparation of sonw removal plans
ENERGY MANAGEMENT PROCESS	A process which develops energy management policies and reports and monitors energy usage
HAZARDOUS WASTE MANAGEMENT PROCESS	A process which develops policies, implements government policies and monitors hazardous waste
EQUIPMENT DISPOSITION PROCESS	A process which identifies disposition and performs retirement of equipment

APPENDIX 4-2a
ENGINEERING AND MAINTENANCE PROCESSES

PROCESS	DESCRIPTION
FACILITY DEVELOPMENT PLANNING PROCESS	A process which plans for the aquisition, modification and disposition of facilities
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HAZARDOUS WASTE MANAGEMENT PROCESS	A process which develops policies, implements government policies and monitors hazardous waste
EQUIPMENT DISPOSITION PROCESS	A process which identifies disposition and performs retirement of equipment

APPENDIX 4-2b
ENGINEERING AND MAINTENANCE ACTIVITIES BY PARENT FUNCTION

PARENT	ACTIVITY	DESCRIPTION
FACILITY DEVELOPMENT PLANNING PROCESS	FACILITY DEVELOPMENT PLANNING PROCESS	
FACILITY DEVELOPMENT PLANNING PROCESS	ACCESS FUTURE FACILITY AND PLANT REQUIRMENTS	Review existing programs, new business opportunities, and construction project request justifications for facility requirement
FACILITY DEVELOPMENT PLANNING PROCESS	MAINTAIN EXISITNG FACILITY DOCUMENTATION	Maintain documentation on current facilities, their capabilities and present utilization
FACILITY DEVELOPMENT PLANNING PROCESS	PREPARE CURRENT YEAR FACILITY PROJECT PLANS	Prepare current year facility project plans taking into consideration current funding constraints, emergency projects and customer priorities
FACILITY DEVELOPMENT PLANNING PROCESS	OBTAIN APPROVAL FOR CY PROPOSED FACILITY PROJECTS	Obtain management approval of prioritized facility project plans prior to development of design
FACILITY DEVELOPMENT PLANNING PROCESS	MANAGE PROJECT CONCEPTUAL DESIGN	Manage design for each approved facility project including project documents and construction cost estimate
MAINTENANCE REQUEST PLANNING	MAINTENANCE REQUEST PLANNING	
MAINTENANCE REQUEST PLANNING	RECEIVE MAINTENANCE REQUESTS	Receive requests to perform first response maintenance from the user
MAINTENANCE REQUEST PLANNING	COORDINATE JOB RESOURCES	assign job skills
MAINTENANCE REQUEST PLANNING	PREPARE CURRENT WORK SCHEDULE	Schedule current requests in the system. Forward schedule and requests to technician
MAINTENANCE REQUEST PERFORMANCE PROCESS	MAINTENANCE REQUEST PERFORMANCE PROCESS	
MAINTENANCE REQUEST PERFORMANCE PROCESS	ALLOCATE RESOURCES TO THE JOB	Allocate manpower, tool, materials and equipment to job
MAINTENANCE REQUEST PERFORMANCE PROCESS	START REQUEST	Obtain tools, materials, equipment and any approvals necessary to begin work on the request
MAINTENANCE REQUEST PERFORMANCE PROCESS	PERFORM MAINTENANCE REQUEST	Perform maintenance tasks
MAINTENANCE REQUEST PERFORMANCE PROCESS	COMPLETE PERFORMANCE OF REQUEST	Check in tools and materials
MAINTENANCE REQUEST CONTROL	MAINTENANCE REQUEST CONTROL PROCESS	
MAINTENANCE REQUEST CONTROL	TRACK JOB	Analyze performance of tasks, monitor costs, schedule, inspections and tests

APPENDIX 4-2b
ENGINEERING AND MAINTENANCE ACTIVITIES BY PARENT FUNCTION

PARENT	ACTIVITY	DESCRIPTION
MAINTENANCE REQUEST CONTROL	GATHER TASKS PERFORMED AND DISPOSITION OF REQUEST	gather the action taken by technician and the outcome of the first response
MAINTENANCE REQUEST CONTROL	INITIATE CORRECTIVE ACTION	Request correction of unresolved maintenance requests
MAINTENANCE REQUEST CONTROL	CLOSE-OUT MAINTENANCE REQUEST	Summarize resource usage data, close-out maintence request card, update plant and equipment specs, drawings, etc.
MAINTENANCE REQUEST CONTROL	ANALYZE JOB PERFORMANCE	Compare actual to standards, analyze workmanship, administer customer survey
MAINTENANCE PLANNING	MAINTENANCE PLANNING PROCESS	
MAINTENANCE PLANNING	PREPARE LONG RANGE MAINTENANCE PLANS	Identify long range requirements and develop long range plans to satisfy these requirements
MAINTENANCE PLANNING	PREPARE ANNUAL MAINTENANCE PLANS	Review long range plans, available funding and maintenance backlog to identify work to be performed during current year
MAINTENANCE PLANNING	IDENTIFY PROGRAM MAINTENANCE REQUIREMENTS	Identify program manitenance requirements based upon program work schedules, maintenance backlogs, planned modifications to program-dedicated facilities, necessary recalibrations, etc.
MAINTENANCE PLANNING	DEVELOP MAINTENANCE CURRENT WORK PLANS	Analyze current and program maintenance requirements, prioritize requests, develop current work plan and initiate maintenance work orders based on current work plan
MAINTENANCE PLANNING	DETERMINE MAINTENANCE CRAFT REQUIREMENT	Determine crafts required and allocate crafts to satisfy maintenance requirements
MAINTENANCE PLANNING	ESTABLISH MAINTENANCE STANDARDS AND PROCEDURES	Develop work standards, time standards, maintenance intervals, maintenance tasks and procedures, and calibration information
MAINTENANCE/ PROJECT JOB PLANNING	MAINTENANCE JOB PLANNING PROCESS	
MAINTENANCE/ PROJECT JOB PLANNING	RECEIVE AND VERIFY MAINTENANCE REQUESTS	Receive requests to perform maintenance from the current maintencance plan and for emergency work. Verify that work is required

APPENDIX 4-2b
ENGINEERING AND MAINTENANCE ACTIVITIES BY PARENT FUNCTION

PARENT	ACTIVITY	DESCRIPTION
MAINTENANCE/ PROJECT JOB PLANNING	PREPARE INTEGRATED JOB PLAN	Prepare preliminary job cost and schedule, compile bill of materials, order material, write detailed work procedures, complete work requirements including safety and quality issues
MAINTENANCE/ PROJECT JOB PLANNING	COORDINATE MAINTENANCE JOB RESOURCES	Stage materials, identify and schedule equipment and tools, and assign skills to job
MAINTENANCE/ PROJECT JOB PLANNING	PREPARE MAINTENANCE CURRENT WORK SCHEDULE	Prepare detailed job estimates and schedule current jobs within the system. Forward schedule and work packages to foreman
MAINTENANCE/PROJECT JOB PERFORMANCE	MAINTENANCE JOB PERFORMANCE PROCESS	
MAINTENANCE/PROJECT JOB PERFORMANCE	ALLOCATE RESOURCES TO MAINTENANCE JOB	Allocate tools, materials, equipment to job
MAINTENANCE/PROJECT JOB PERFORMANCE	INITIATE MAINTENANCE JOB	Obtain tools, equipment, and any approvals necessary to begin work on the job
MAINTENANCE/PROJECT JOB PERFORMANCE	PERFORM MAINTENANCE JOB	Perform maintenance tasks outlined in detailed procedures within the integrated job plan
MAINTENANCE/PROJECT JOB PERFORMANCE	COMPLETE MAINTENANCE JOB	Check in equipment and tools, turn in excess material, clean-up work area and close out permits
MAINTENANCE/PROJECT JOB CONTROL	MAINTENANCE JOB CONTROL PROCESS	
MAINTENANCE/PROJECT JOB CONTROL	TRACK JOB	Analyze each maintenance job, monitor cost and schedule and monitor inspections and tests
MAINTENANCE/PROJECT JOB CONTROL	GATHER RESOURCE USAGE DATA	Compile data on material and manpower expended on a daily basis
MAINTENANCE/PROJECT JOB CONTROL	INITIATE CORRECTIVE ACTION	Request correction of discrepancies discovered during inspections and tests
MAINTENANCE/PROJECT JOB CONTROL	CLOSE-OUT JOB	Summarize resource use data, close out work order number, update plant and equipment specs, drawings, etc. and prepare design modification requests
MAINTENANCE/PROJECT JOB CONTROL	ANALYZE JOB PERFORMANCE	Compare actual to standards (estimates), analyze workmanship
SECURITY PROCESS	SECURITY PROCESS	

APPENDIX 4-2b
ENGINEERING AND MAINTENANCE ACTIVITIES BY PARENT FUNCTION

PARENT	ACTIVITY	DESCRIPTION
SECURITY PROCESS	PLAN SECURITY REQUIREMENTS	Assess security requirements based on incident reports, select hidden camera locations, schedule guards
SECURITY PROCESS	PROVIDE SECURITY	Perform asssigned security shifts
SECURITY PROCESS	ANALYZE VIDEOTAPES	View and analyze videotapes from hidden cameras when camera location possibly relate to an incedent
SECURITY PROCESS	ANALYZE SECURITY EFFECTIVENESS	Compare incedent statistics before and after security guard, camera emphasis
SNOW REMOVAL PROCESS	SNOW REMOVAL PROCESS	
SNOW REMOVAL PROCESS	PLAN SNOW REMOVAL REQUIREMENTS	Based on past year requirements and current year projections, prepare a snow removal plan including removal priorities and additional personnel processes in the event of a major snow
SNOW REMOVAL PROCESS	PROVIDE SNOW REMOVAL	Allocate resources accoriding to snow removal plan
SNOW REMOVAL PROCESS	ANALYZE EFFECTIVENESS OF SNOW REMOVAL	Monitor complaints and accident rates
ENERGY MANAGEMENT PROCESS	ENERGY MANAGEMENT PROCESS	
ENERGY MANAGEMENT PROCESS	MANAGE AND/OR PERFORM ENERGY STUDIES AND AUDITS	Manage and/or coordinate studies and audits to identify energy saving opportunities and assess the degree of compliance with standards and regulations
ENERGY MANAGEMENT PROCESS	MONITOR AND REPORT ENERGY USAGE	Prepare monthly usage reports and forcasts based on monthly usage
ENERGY MANAGEMENT PROCESS	DEVELOP ENERGY PLANS	Develop energy reduction plans and long-range operations plan
ENERGY MANAGEMENT PROCESS	REVIEW DESIGNS FOR ENERGY CONSERVATION	Review upgrade and construction designs for energy efficiency, suggest design alternatives where appropriate to achieve conservation goals
ENERGY MANAGEMENT PROCESS	DEVELOP ENERGY MANAGEMENT POLICIES AND PROCEDURES	Develop policies and procedures to conserve the use of energy
ENERGY MANAGEMENT PROCESS	IDENTIFY ENERGY MANAGEMENT PROJECTS	Identify and evaluate energy saving projects from studies and audits. Forward energy management project proposals to the plant and equipment planning process
ENERGY MANAGEMENT PROCESS	FORECAST POWER DEMAND	Determine electrical power requirements and forecast the demand to identify usage peaks and valleys

APPENDIX 4-2b
ENGINEERING AND MAINTENANCE ACTIVITIES BY PARENT FUNCTION

PARENT	ACTIVITY	DESCRIPTION
ENERGY MANAGEMENT PROCESS	PERFORM PEAK LOAD SHEDDING	Level electrical power consumption to minimize the effects of peaks and valleys in the power billing structure
ENERGY MANAGEMENT PROCESS	ASSIST IN POWER CONTRACT NEGOTIATION	Provide data to assist customer in power contract negotiations with utility companies
HAZARDOUS WASTE MANAGEMENT PROCESS	HAZARDOUS WASTE MANAGEMENT PROCESS	
HAZARDOUS WASTE MANAGEMENT PROCESS	COMPILE HAZARDOUS SUBSTANCE LIST	Based on input from all departments compile a list of all hazardous substances used in the hospital
HAZARDOUS WASTE MANAGEMENT PROCESS	MAINTAIN MATERIAL SAFETY DATA SHEET INDEX	Maintain index of material data sheets which are posted in the department using and storing the hazardous waste
HAZARDOUS WASTE MANAGEMENT PROCESS	RECEIVE/ RECORD HAZARDOUS WASTE DISPOSAL REPORTS	Record the quantity and type of hazardous waste disposed of by each department
HAZARDOUS WASTE MANAGEMENT PROCESS	SURVEY COMPLIANCE	Perform periodic inspections of all departments using and storing hazardous waste. Question personnel on proper procedures for hazardous material use and disposal
HAZARDOUS WASTE MANAGEMENT PROCESS	PROVIDE HAZARDOUS WASTE TRAINING	Provide hazardous waste training outlining material safety data sheets, proper use and disposal of hazardous materials and proper record keeping procedures
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DISPOSITION PROCESS	
EQUIPMENT DISPOSITION PROCESS	CHARACTERIZE CONDITION OF EQUIPMENT	Determine operating condition, safety and security, and determine if equipment is reusable
EQUIPMENT DISPOSITION PROCESS	REVIEW POSSIBLE REUSES	Determine if a requirement exists for excess equipment and review all possible reuses
EQUIPMENT DISPOSITION PROCESS	DETERMINE METHOD OF DISPOSAL	Determine how equipment will be disposed of (I.E. sold, scrapped, cannibalized) and obtain necessary concurrence
EQUIPMENT DISPOSITION PROCESS	IMPLEMENT DISPOSAL PROCEDURES	Dispose of item based on method determined
EQUIPMENT DISPOSITION PROCESS	UPDATE RECORDS	Update records to reflect disposition

APPENDIX 4-3
ENGINEERING AND MAINTENANCE DATA TYPES

DATA TYPE	DATA TITLE	DESCRIPTION
GRAPHIC	SHOP DRAWINGS	MANUFACTURER/ SUPPLIER DETAILED DRAWINGS OF ACTUAL EQUIPMENT AND COMPONENTS INSTALLED DURING FACILITY CONSTRUCTION
GRAPHIC	FACILITY AS-BUILTS	AS-BUILT CONDITION OF FACILITIES INCLUDING ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL AND ELECTRICAL SYSTEMS
TEXT	QUALITY REQUIREMENTS	QUALITY INSPECTION AND TESTING REQUIREMENTS
TEXT	MANPOWER REQUIREMENTS	ORGANIZATION, SKILL, JOB TITLE, SCHEDULE (DURATION OF NEED)
TEXT	SAFETY REQUIREMENTS	SAFETY REQUIREMENTS
TEXT	FACILITY SPECIFICATIONS	MATERIAL AND PROCEDURE SPECIFICATION FOR FACILITY CONSTRUCTION
TEXT	EQUIPMENT MAINTENANCE DATA	MANUFACTURER/ SUPPLIER RECOMMENDED MAINTENANCE PERIODS AND PROCEDURES
TEXT	CUSTOMER SATISFACTION SURVEY	SURVEY RECORDING CUSTOMER SATISFACTION WITH THE MAINTENANCE AND REPAIR WORK PERFORMED
TEXT	DESIGN CODES AND STANDARDS	REGULATORY DESIGN CRITERIA PREPARED BY CODE AGENCIES
TEXT	EQUIPMENT OPERATING PROCEDURES	EQUIPMENT TYPE, OPERATING CHARACTERISTICS, OPERATING PROCEDURES AND INSTRUCTIONS, EQUIPMENT ID
TEXT	CONSTRUCTION ESTIMATING DATA	COST STANDARDS FOR CONSTRUCTION MATERIALS, CONSTRUCTION LABOR
TEXT	ACCIDENT REPORT	REPORT ID, ACCIDENT DESCRIPTION, DATE, LOCATION
TEXT	EQUIPMENT AQUISITION PLAN	LONG-RANGE AND BUDGET YEAR PLANS RELATING TO THE AQUISISITON OF CAPITALIZED EQUIPMENT
TEXT	MANUFACTURER'S ITEM DATA	OPERATIONAL MANUALS, MAINTENANCE MANUALS, AS-BUILTS OF MANUFACTURED HARDWARE
TEXT	SECURITY INCIDENT REPORT	REPORT ID, INCIDENT DESCRIPTION, LOCATION, DATE
TEXT	DEPARTMENT POLICIES AND PROCEDURES	POLICIES AND PROCEDURES SET BY THE DIRECTOR OF ENGINEERING AND MAINTENANCE GOVERNING THE CONDUCT OF BUSINESS WITHIN THE DEPARTMENT
TEXT	MAINTENANCE PLAN DATA	LONG TERM, SHORT TERM, CURRENT MAINTENANCE PLANS
TEXT	MAINTENANCE STANDARDS/ SPECS /PROCEDURES	WORK STANDARDS, TIME STANDARDS, MAINTENANCE INTERVALS, MAINTENANCE PROCEDURES, CALIBRATION INFORMATION
TEXT/GRAPHIC	DESIGN DESCRIPTION UPDATE REQUEST	EQUIPMENT/ PLANT ID, SPECIFICATION DRAWING ID, CHANGE REQUIRED

APPENDIX 4-3
ENGINEERING AND MAINTENANCE DATA TYPES

DATA TYPE	DATA TITLE	DESCRIPTION
TEXT/GRAPHIC	FACILITY AQUISITION DATA	FACILITY CONFIGURATION, FACILITY IDENTIFICATION AND DESCRIPTION, CONSTRUCTION MATERIAL AND LABOR USED
TEXT/NUMBER	WORK ORDER LABOR AND MATERIALS DATA	ALL LABOR AND MATERIALS EXPENDED ON A JOB INCLUDES WORK ORDER ID, LABOR HOURS, SKILLS USED, FACILITY OR EQUIPMENT WORKED ON
TEXT/NUMBER	WORK ORDER JOB DATA	FACILITY/ EQUIPMENT ID, DETAILED WORK PROCEDURES, LABOR ESTIMATES, SKILLS REQUIRED, SCHEDULE, QUALITY AND SAFETY REQUIREMENTS, WORK ORDER ID
TEXT/NUMBER	WORK ORDER PERFORMANCE RESULTS	WORK ORDER ID, ACTUAL LABOR, ESTIMATED LABOR, STANDARD HOURS
TEXT/NUMBER	WORK ORDER SCHEDULE DATA	CURRENT WORK IN PROGRESS, DUE DATES, BACKLOG
TEXT/NUMBER	EQUIPMENT MAINTENANCE DATA	ID, WORK ORDER NUMBERS, ACTION TAKEN, LABOR USED, MATERIALS/SUPPLIES USED
TEXT/NUMBER	DETAILED JOB BUDGET	JOB/PROJECT NUMBER, COST ELEMENTS, AMOUNTS
TEXT/NUMBER	EQUIPMENT USAGE DATA	ID, TOTAL USAGE (MILES, HOURS, ETC.), PERFORMANCE AND RELIABILITY STATISTICS
TEXT/NUMBER	INSPECTION AND TEST RESULTS DATA	OBJECT OF TEST BY ID NUMBER, TEST ID, TEST RESULTS, IDENTIFIED DISCRANCIES
TEXT/NUMBER	LABOR COST	LABOR COST, ORGANIZATION, CHARGE NUMBER
TEXT/NUMBER	WORK ORDER REQUEST DATA	WORK REQUEST ID, WORK DESCRIPTION, REQUESTED COMPLETION DATE
TEXT/NUMBER	RECEIPT DATA	P.O. NUMBER, VENDOR, LINE ITEM, UNITS, QUALITY INSPECTION DATA
TEXT/NUMBER	CALENDARS	WEEKS PER MONTH, PAYROLL HOURS PER MONTH
TEXT/NUMBER	FINANCIAL REPORTING	ACTUAL COSTS, BUDGETED AMOUNTS
TEXT/NUMBER	EQUIPMENT DISPOSAL DATA	ID, CURRENT USE, PROPOSED USE, PROPOSED DISPOSITION
TEXT/NUMBER	MATERIALS AND SUPPLIES COST	COST ELEMENTS, AMOUNTS, CHARGE NUMBER, PERFORMING ORGANIZATION
TEXT/NUMBER	EQUIPMENT/ FACILITY DEFICIENCY DATA	EQUIPMENT/ FACILITY ID, PROBLEM
TEXT/NUMBER	FACILITY PROJECT PLAN	LONG-RANGE, SHORT TERM AND BUDGET YEAR PLANS RELATING TO THE AQUISISTION, MODIFICATION, AND DISPOSITION OF FACILITIES
TEXT/NUMBER	ITEM REQUEST	DESCRIPTION, VENDORS, ESTIMATED COST, SOURCE OF PROCUREMENT, NUMBER OF UNITS, INSPECTION REQUIREMENTS
TEXT/NUMBER	FACILITY DESCRIPTION DATA	FACILITY ID, AREA MANAGER, STATUS, CONDITION, USE
TEXT/NUMBER	FACILTY MAINTENANCE DATA	FACILITY ID, WORK ORDER ID'S, TASKS PERFORMED, LABOR EXPENDED, MATERIALS/SUPPLIES USED, MAINTENANCE TYPE

APPENDIX 4-3
ENGINEERING AND MAINTENANCE DATA TYPES

DATA TYPE	DATA TITLE	DESCRIPTION
TEXT/NUMBER	EQUIPMENT DESCRIPTION DATA	
TEXT/NUMBER	FACILTIY AS-BUILT INDEX	DRAWING ID, FACILITY ID, DATE LAST UPDATED
TEXT/NUMBER	PROJECT SCHEDULING	PROJECT ID, TASKS, EARLY START DATE, LATE START DATE, ESTIMATED COMPLETION DATE
TEXT/NUMBER	EDUCATION AND TRAINING	EMPLOYEE ID, TYPE, LEVEL, DEGREE, SCHOOL, DATE OF TRAINING, CERTIFICATION DATE, CERTIFICATION RECALL DATE, SEMINARS/ WORKSHOPS ATTENDED, DATES
TEXT/NUMBER	EQUIPMETN OPERATING DATA	EQUIPMENT ID, NOMENCLATURE, TIME FRAME, HOURS/MILES USED, CUSTODIAN ID, QUANTITY USED, RUN TIME, DOWN TIME
TEXT/NUMBER	FACILITY ENERGY USE DATA	FACILTY ID, FUEL TYPE, AMOUNT CONSUMED, WHEN CONSUMED
TEXT/NUMBER	CAPITALIZED PLANT AND EQUIPMENT COST	UNIT COST AMOUNT TO BE CARRIED IN THE ASSET ACCOUNTS
TEXT/NUMBERS	MANPOWER REPORTS	
TEXT/NUMBERS	CAPITAL AUTHORIZED FUNDING	
TEXT/NUMBERS	PROJECT STATUS	PROJECT ID NUMBER, PROJECT DESCRIPTION, ESTIMATED COST, ACTUAL COST TO DATE, PERCENT COMPLETE, START DATE, COMPLETE DATE

APPENDIX 4-4
ENGINEERING AND MAINTENANCE INTEGRATED MODEL

PROCESS	DATA TITLE	CREATE	USE	EXTERNAL
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.T.	.F.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
SECURITY PROCESS	DESIGN CODES AND STANDARDS	.F.	.T.	.F.
SNOW REMOVAL PROCESS	EDUCATION AND TRAINING	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
HAZARDOUS WASTE MANAGEMENT PROCESS	PROJECT SCHEDULING	.T.	.F.	.F.
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DESCRIPTION DATA	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.T.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.T.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.T.
SECURITY PROCESS	DESIGN CODES AND STANDARDS	.F.	.T.	.T.
SNOW REMOVAL PROCESS	EDUCATION AND TRAINING	.F.	.T.	.T.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.T.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.T.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.T.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.T.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.T.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.T.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.T.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.T.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.

APPENDIX 4-4
ENGINEERING AND MAINTENANCE INTEGRATED MODEL

PROCESS	DATA TITLE	CREATE	USE	EXTERNAL
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.T.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.T.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.T.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	F.
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DESCRIPTION DATA	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.T.	.F.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.T.	.F.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DESCRIPTION DATA	.T.	.F.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DESCRIPTION DATA	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.T.	.F.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.T.	.F.	.F.

APPENDIX 4-4
ENGINEERING AND MAINTENANCE INTEGRATED MODEL

PROCESS	DATA TITLE	CREATE	USE	EXTERNAL
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.T.	.F.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.T.	.F.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.T.	.F.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.T.	.F.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.T.	.F.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.

APPENDIX 4-4
ENGINEERING AND MAINTENANCE INTEGRATED MODEL

PROCESS	DATA TITLE	CREATE	USE	EXTERNAL
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.T.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.F.	.T.	.T.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
		.T.	.F.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.T.	.F.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
FACILITY DEVELOPMENT PLANNING PROCESS	DEPARTMENT POLICIES AND PROCEDURES	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE PLANNING	FACILITY AS-BUILTS	.F.	.T.	.F.
MAINTENANCE/ PROJECT JOB PLANNING	FACILITY SPECIFICATIONS	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
MAINTENANCE REQUEST PLANNING	PROJECT STATUS	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB PERFORMANCE	SHOP DRAWINGS	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.T.	.F.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.T.	.F.	.F.
MAINTENANCE REQUEST PERFORMANCE PROCESS	MANPOWER REPORTS	.F.	.T.	.F.

APPENDIX 4-4
ENGINEERING AND MAINTENANCE INTEGRATED MODEL

PROCESS	DATA TITLE	CREATE	USE	EXTERNAL
SECURITY PROCESS	DESIGN CODES AND STANDARDS	.T.	.F.	.F.
SNOW REMOVAL PROCESS	EDUCATION AND TRAINING	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
EQUIPMENT DISPOSITION PROCESS	EQUIPMENT DESCRIPTION DATA	.F.	.T.	.F.
MAINTENANCE REQUEST CONTROL	CAPITAL AUTHORIZED FUNDING	.F.	.T.	.F.
MAINTENANCE/PROJECT JOB CONTROL	EQUIPMENT MAINTENANCE DATA	.F.	.T.	.F.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.T.
ENERGY MANAGEMENT PROCESS	CONSTRUCTION ESTIMATING DATA	.F.	.T.	.F.
HAZARDOUS WASTE MANAGEMENT PROCESS	PROJECT SCHEDULING	.F.	.T.	.T.
HAZARDOUS WASTE MANAGEMENT PROCESS	PROJECT SCHEDULING	.T.	.F.	.F.

APPENDIX 4-4
NON-AUTOMATED, NON-GRAPHIC INFORMATION

DATA TYPE	TITLE	AUTOMATED
TEXT	QUALITY REQUIREMENTS	.F.
TEXT	SAFETY REQUIREMENTS	.F.
TEXT	FACILITY SPECIFICATIONS	.F.
TEXT	EQUIPMENT MAINTENANCE DATA	.F.
TEXT	CUSTOMER SATISFACTION SURVEY	.F.
TEXT	DESIGN CODES AND STANDARDS	.F.
TEXT	EQUIPMENT OPERATING PROCEDURES	.F.
TEXT	CONSTRUCTION ESTIMATING DATA	.F.
TEXT	ACCIDENT REPORT	.F.
TEXT	MANUFACTURER'S ITEM DATA	.F.
TEXT	SECURITY INCIDENT REPORT	.F.
TEXT/GRAPHIC	DESIGN DESCRIPTION UPDATE REQUEST	.F.
TEXT/NUMBER	CALENDARS	.F.
TEXT/NUMBER	FACILTIY AS-BUILT INDEX	.F.
TEXT/NUMBER	FACILITY ENERGY USE DATA	.F.
TEXT/NUMBER	HEATING AND COOLING DEGREE DAYS	.F.
TEXT	HAZARDOUS WASTE MANAGEMENT REGULATIONS	.F.
TEXT	HAZARDOUS WASTE MATERIAL MASTER LIST	.F.