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Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Management of Maintenance Programs

Although considerations for maintaining educational facilities should begin during the programming phase, actual maintenance practices should be implemented just prior to new buildings being occupied. From this point forward, the maintenance process will continue throughout the useful life of a building and will vary according to its specific needs over time. In order to ensure maximum utility from educational facilities and to ensure they remain in good functional order, administrators must put in place a comprehensive program for effectively managing the full range of maintenance services required at each institution.

Like any other building asset in constant use, educational facilities depreciate and deteriorate over time. However, good maintenance practices that address the total building envelope (e.g., walls, roof, and floor), major systems, equipment, and other critical features will significantly decrease the number of problems, add value, and shorten the rate at which a structure shows signs of functional obsolescence. As part of any comprehensive approach to facility maintenance, administrators should also be aware of constant hindrances posed by the following conditions for each type of structure within a school facility's inventory.

- Weather: the effects of temperature, humidity, rain, wind, and direct sunlight. In most instances, moisture from rain and other sources poses a constant and major threat to educational facilities.
- Frequency of use: both the normal “wear and tear” on a school facility and its equipment, as well as the extent of excessive usage.
- Improper use: incorrect or inappropriate use of building spaces, fixtures, and equipment.
- Age: advancement of educational buildings and components towards functional obsolescence and physical deterioration.

- Neglect: inattention or indifference to maintenance procedures required to keep a facility in good working order.
- Breakage: intentional or unintentional harm to facilities and equipment.
- Vandalism: willful breakage, defacing, or destruction of educational facility property.

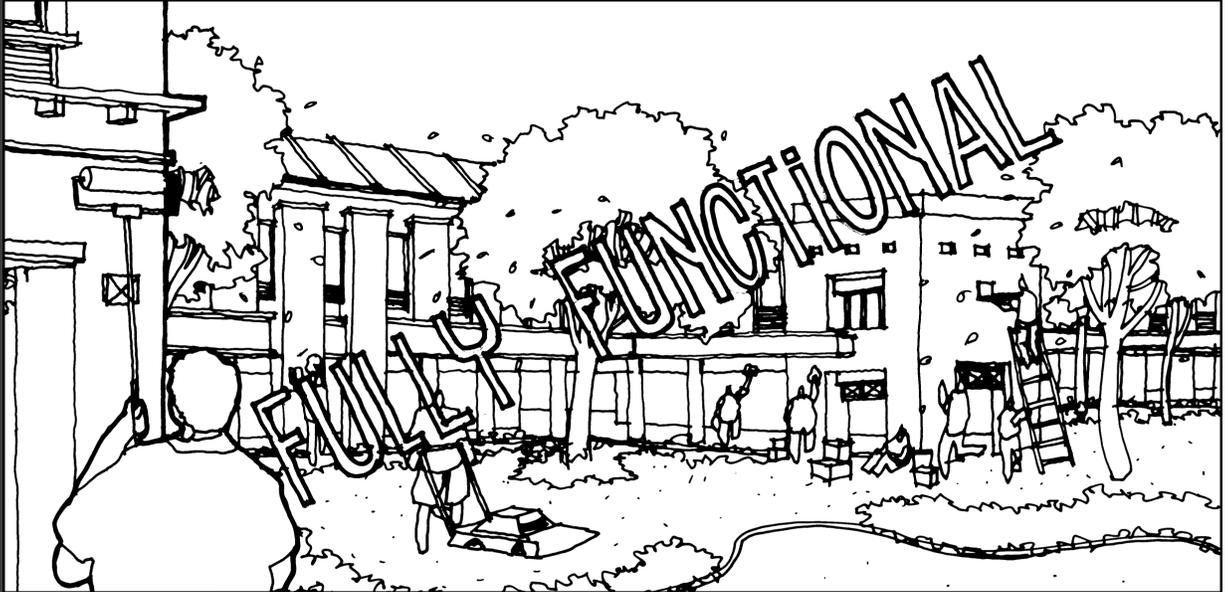
Although new challenges to maintaining school and community college buildings emerge on a regular basis, administrators should rely on a combination of the following tools to overcome these obstacles:

- Predictive measures: measures such as inspections and conditions assessments to identify the likelihood of potential problems.
- Preventative measures: proactive procedures that are taken to reduce the risk or potential for maintenance-related problems.
- Repair: measures taken to fix a problem after it has already occurred.
- Renovation: measures taken to modify, improve, upgrade, or modernize existing building conditions to improve functionality.
- Replacement: procedures aimed at “changing out” broken, inoperable, or obsolete fixtures, equipment, or building components.

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Goals and Objectives of Maintenance Program



Maintenance organizations provide a comprehensive range of services that are essentially designed to keep educational facilities in good working order – a condition that is critical for success of the educational/instructional process and extending the useful life of building and other facility assets. Maintenance of educational facilities generally require the coordinated management of a variety of individual trades and crafts, support-related functions, as well as contracted services necessary to fulfill a facility's intended purpose. The scope of work for any maintenance program encompasses the building envelope, fixed equipment, other components of a facility's infrastructure and, in recent years, includes a variety of technical and support functions as well. Among other objectives, a comprehensive maintenance program is necessary at each facility to:

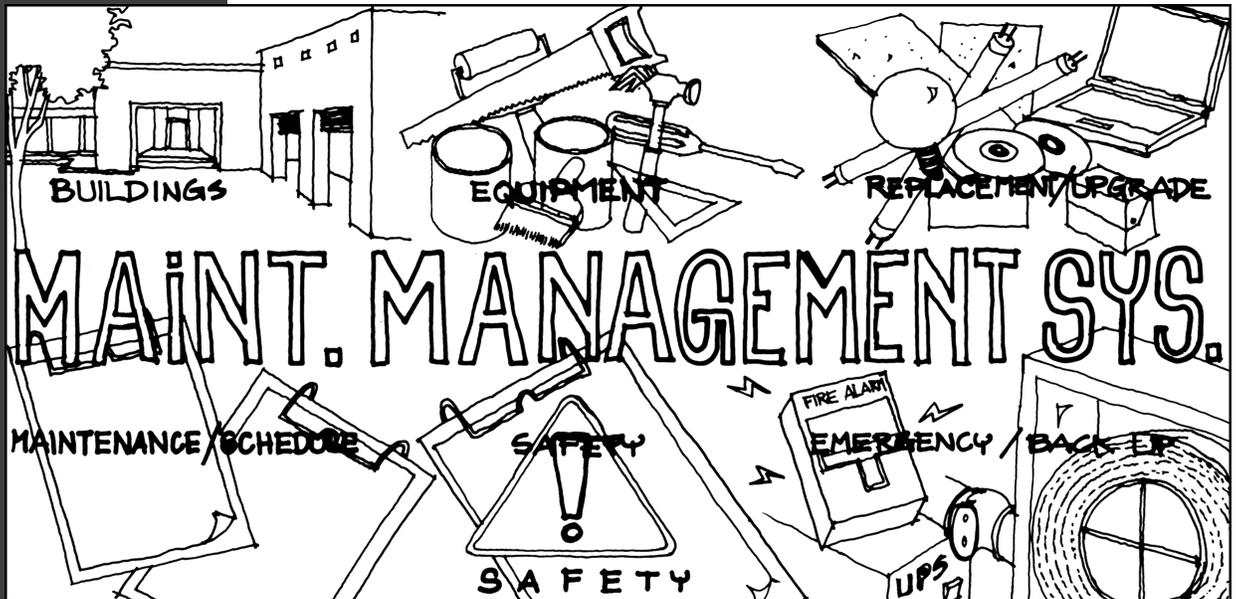
- Keep buildings, equipment, and fixtures reasonably close to original operating condition.
- Provide overall service requirements (e.g., preventive/predictive maintenance; routine maintenance; minor, major, and emergency repairs; alterations and improvements; equipment testing; inspections and monitoring; etc.).

- Define the manner in which the work will be implemented.
- Provide necessary modifications to accommodate customer needs, upgrades, and new technologies.
- Match appropriate staff, tools, and other resources to accomplish work tasks.
- Ensure ongoing customer satisfaction and support of the educational process.

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Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Maintenance Management Programs



Each school district and community college should have in place an effective program for managing all required maintenance activities. This program should be tailored to local conditions and comprehensive in scope. To accomplish this, administrators should implement a systematic or structured maintenance program that focuses on existing facilities, but will accommodate new facilities and components that will be added in the future. Because maintenance requirements for educational buildings are ever present and likely to increase over time, it is essential that maintenance programs include inspections, preventative measures, routine service activities, work order activities, repairs, upgrades, enhancements, and renovations as primary functions.

Planned maintenance, as opposed to responding to maintenance problems after they occur, should be implemented as a proactive strategy by all administrators and supervisors at Florida’s various educational facilities. The sheer number of buildings within the state’s school inventory and the diverse types of equipment and components housed suggest the need for a maintenance management program that meets or exceeds its responsibilities. The benefits of this approach are numerous and proven to be effective in maintaining

the general functional utility of educational buildings on an ongoing basis. Although the specifics of individual programs may vary, broad-based planned maintenance approaches should also integrate a variety of administrative and support activities such as planning, budgeting, implementation, and assessment.

When establishing a maintenance management program or modifying an existing one, administrators should consider the full spectrum of maintenance-related issues associated with individual buildings and entire campuses. These issues should be recognized as part of a continuous cycle that necessitates the following actions:

- Inventory of facilities and equipment to be maintained: document through surveys, inventories, building manuals, etc., all facilities and equipment requiring maintenance services, and essential information for maintaining them.
- Conditions assessment of facilities and equipment: determination of the current serviceable or working condition of facilities, fixtures, and equipment.
- Definition of goals, objectives, standards, and required levels of service: defining the level of planned maintenance and maintenance priorities.
- Definition of required financial, human, and material resources: identifying the appropriate budget, labor pool, equipment, and supplies necessary to maintain a facility.
- Comparison of required funding versus available funding: detailed budgeting procedures to determine fiscal limitations.
- Establishment of priorities for maintenance functions: defining priority tiers for various maintenance tasks.
- Resource allocation: designating funds for specific purposes.
- Adapting the work effort to fiscal realities: coordination of the overall maintenance workload with available budget allocations.
- Development of a master maintenance schedule: time frame that defines when various types of scheduled maintenance should be performed.
- Establishment of work control methods: control center for coordinating all maintenance-related work tasks.
- Development of procedures gauging effectiveness of maintenance programs and customer feedback: assessment of maintenance department's success in achieving its objectives and providing adequate services to educational customers.
- Implementation of maintenance work programs: perform various types of maintenance tasks throughout the facility.
- Providing methods for generating management reports.

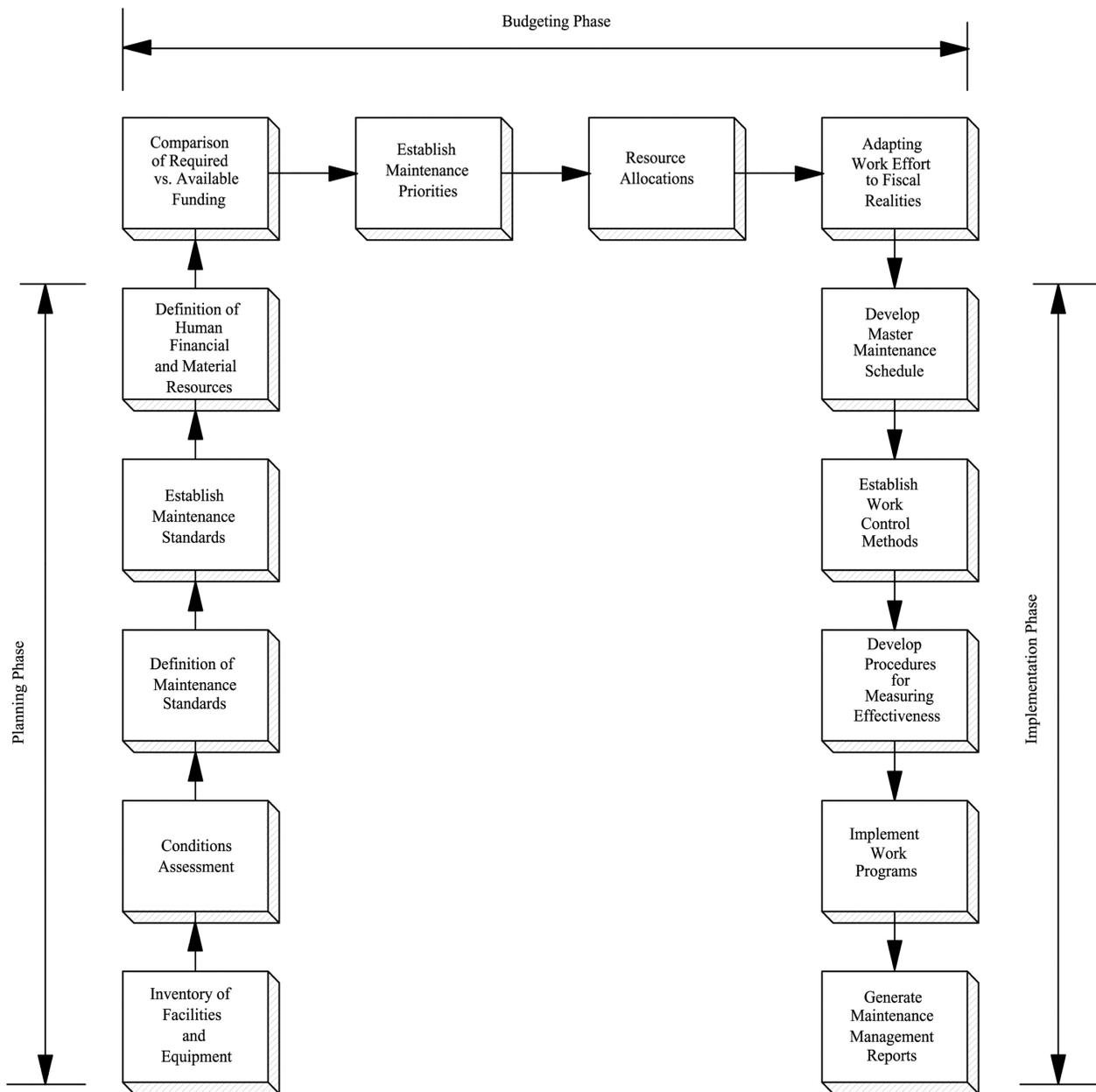


Figure 6.1: Flowchart for Implementing a Maintenance Management Program.

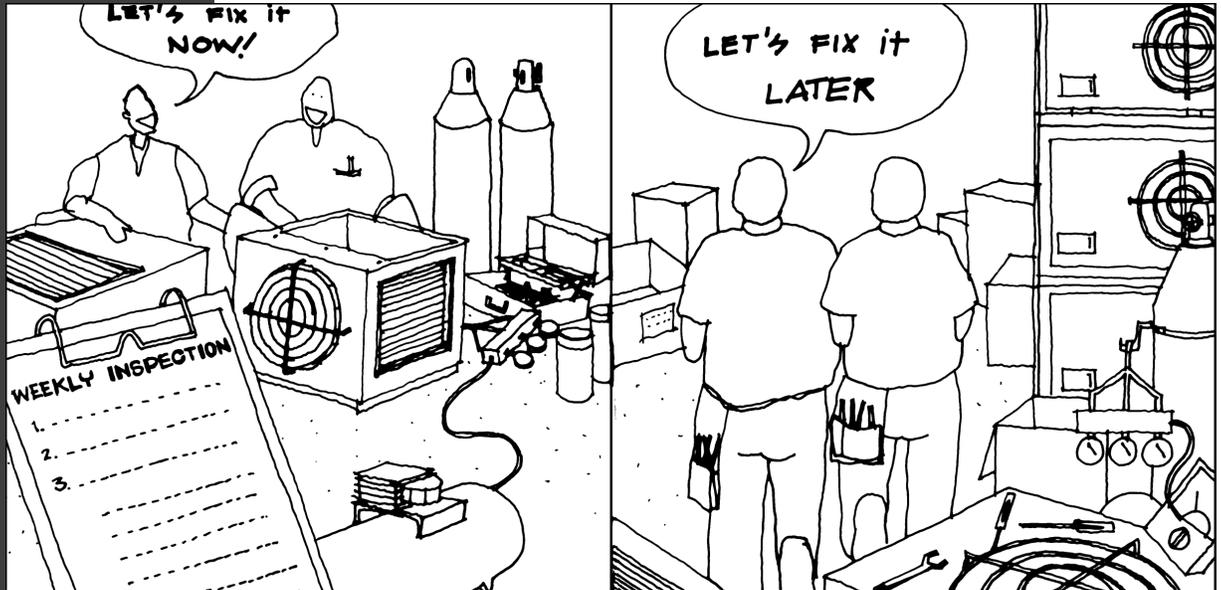
In recent years the ability to establish and implement maintenance management programs has been assisted by the development of several computer software programs and programs “custom-tailored” for individual maintenance and operations departments. Many of the “off the shelf” programs, which tend to vary in their ability to manage diverse administrative and maintenance tasks, may be specifically designed for use in a facilities management capacity, or may be adapted and modified to fit the needs

of educational facilities. New proprietary software being developed specifically for managing facilities and maintenance activities at schools and community colleges will provide administrators with a greater number of options for automating these procedures. For additional information on this subject, see 9.4 Computerized Facilities Management Systems.

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Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Maintenance Approaches



The combination of varied physical conditions, recurring personnel issues, expanding service responsibilities, and budgetary constraints faced by administrators and supervisors at Florida's many educational institutions requires the implementation of a "tailored" maintenance approach that best meets the needs of individual facilities and adheres to sound business practices. Structuring a new maintenance program or modifying an existing maintenance program establishes several key aspects of a maintenance organization. It defines the general operational methods used to achieve the department's goals and objectives, establishes a systematic method for resolving technical and management problems, and develops a method for measuring the department's effectiveness; in many instances, the chosen approach will have a direct influence on the "departmental culture" of the maintenance organization.

Over the last few decades, the facilities management industry has adopted a number of different maintenance approaches that are derived from local circumstances, economic conditions, and refinements in business practices and procedures. Many of these approaches directly reflect the realities of maintaining different types of educational facilities.

Some of the conventional maintenance practices in current use are as follows:

- **Predictive/Preventive Maintenance:** This approach is intended to identify maintenance-related issues early on and address them before they lead to costly repairs. It is based on life cycle projections and is intended to prevent equipment and systems breakdowns.
- **Routine Maintenance:** This approach focuses on the day-to-day upkeep of facilities, systems, and equipment. It includes, among other tasks, minor repairs, servicing, and improvements.
- **Cyclical/Programmed Maintenance:** In managing educational facilities, certain maintenance functions have to be performed on a scheduled or cyclical basis. This approach addresses maintenance requirements that are part of a monthly, periodic, or annual cycle.
- **Deferred Maintenance:** Deferred maintenance generally describes a process for putting off or delaying current maintenance requirements until another time. This approach creates workload backlogs that can result from scheduling priorities, inadequate funding, staff shortages, and low worker productivity.
- **Breakdown/Emergency Maintenance:** This approach focuses on maintenance activities that are required as a result of unforeseen equipment failure or emergencies.
- **Service work order request:** This approach is used to prioritize and define a significant portion of a maintenance department's workload. It relies on service requests and work orders that are generated by maintenance staff, as well as other educational facility customers.

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Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Maintenance Staffing



A qualified and diverse staff is the cornerstone of any maintenance organization. The successful coordination of front-line employees, those who perform a variety of maintenance-related services and tasks, ultimately determines the success of the department. Staffing a maintenance organization in a school district or community college requires a keen understanding of the nature of the facilities and equipment to be maintained, their overall maintenance requirements, and the types of skills and knowledge necessary to deliver a range of maintenance services in an efficient and professional manner. Staffing ultimately becomes the process of selecting the various trades, crafts, and support personnel required to carry out the department's mission and keep the school facility in good working order.

In most school districts and community colleges, maintenance staff includes a combination of certified professionals, skilled crafts people, unskilled laborers, and a variety of support personnel. There are generally two types of organizational structures in use today: the "trade-centered" organizational structure and the "customer-centered" or zone organizational structure. The "trade-centered" structure groups personnel according to the

major maintenance trades or shops such as electrical, carpentry, and air-conditioning. The “customer-centered” or zone structure groups staff into service teams that provide a range of different maintenance functions. Either of these models may work well with medium and large maintenance organizations; however, the “trade-centered” approach seems to work best for smaller districts or community colleges that are not too far dispersed. The occupations typically found in educational facilities maintenance departments include, but are not limited to, the following categories:

Systems/Equipment-related Occupations

- Mechanical engineers and technicians: heating, ventilation, air conditioning, refrigeration
- Air-conditioning technicians
- Electrician and technicians: electrical service, electronics, security/alarm systems
- Plumbers: general plumbing, utility systems plumbing
- Boiler technicians

Building-related Occupations

- Electricians
- Carpenters: general building envelope (interiors)
- Masons: concrete finishing, block and brick laying
- Roofers: roofing repair and installations
- Glazers: glass/window repairs and installations
- Painters: general painting
- Welders: general welding
- Locksmiths: key coordination, lockset repairs, security
- Furniture/Cabinetmakers: classroom and administrative furniture maintenance and cabinetry
- Sheet metal machinist
- Allied trades: kitchen equipment, boilermen

Transportation/Vehicular-related Occupations

- Automotive/Small engine mechanics: general-use vehicle maintenance, bus maintenance, grounds equipment maintenance
- Diesel mechanics

Specialized Equipment Occupations

- Heavy/light equipment operators
- Welders
- Kitchen equipment repair persons
- Irrigation technicians

Specialized Technical Trades

- Audio visual technicians
- Computer/office equipment/data systems technicians
- Inspectors
- Construction administrators

Support Occupations

- Clerical
- Accountants/payroll clerks
- Work/production control clerks
- Planners
- Estimators
- Human resource officers
- Purchasing clerks
- Warehouse/inventory control coordinators
- Dispatchers
- General maintenance technician

The number of personnel in each occupational group is ultimately dependent on service requirements and workload at individual educational facilities. As maintenance departments in school districts and community colleges take on additional responsibilities, administrators may find the need to add trades and craftspeople with expertise in other fields to meet the growing demands of the facility.

A trend that is gaining in popularity among maintenance supervisors and administrators is the use of “multi-skilled” tradespeople. In many instances where experienced labor is in short supply, and where it is cost effective and practical, administrators are staffing certain positions with personnel who are skilled in several different trades. Maintenance staff being used in this manner should be proficient or certified in at least one of the areas where they perform regular tasks. Some situations may require that the district or community college provide the necessary “cross-training” for employees to be able to function in a dual capacity manner. Although this approach is proving to be beneficial in certain instances, administrators should have a clear understanding of how “multi-skilled” staff members fit within the overall maintenance organization and their relationship with other trades workers. While “multi-skilled” tradespeople provide a greater degree of flexibility in delivering a variety of maintenance services, administrators should not consider the elimination of needed staff positions when a single employee performs different trades-related functions.

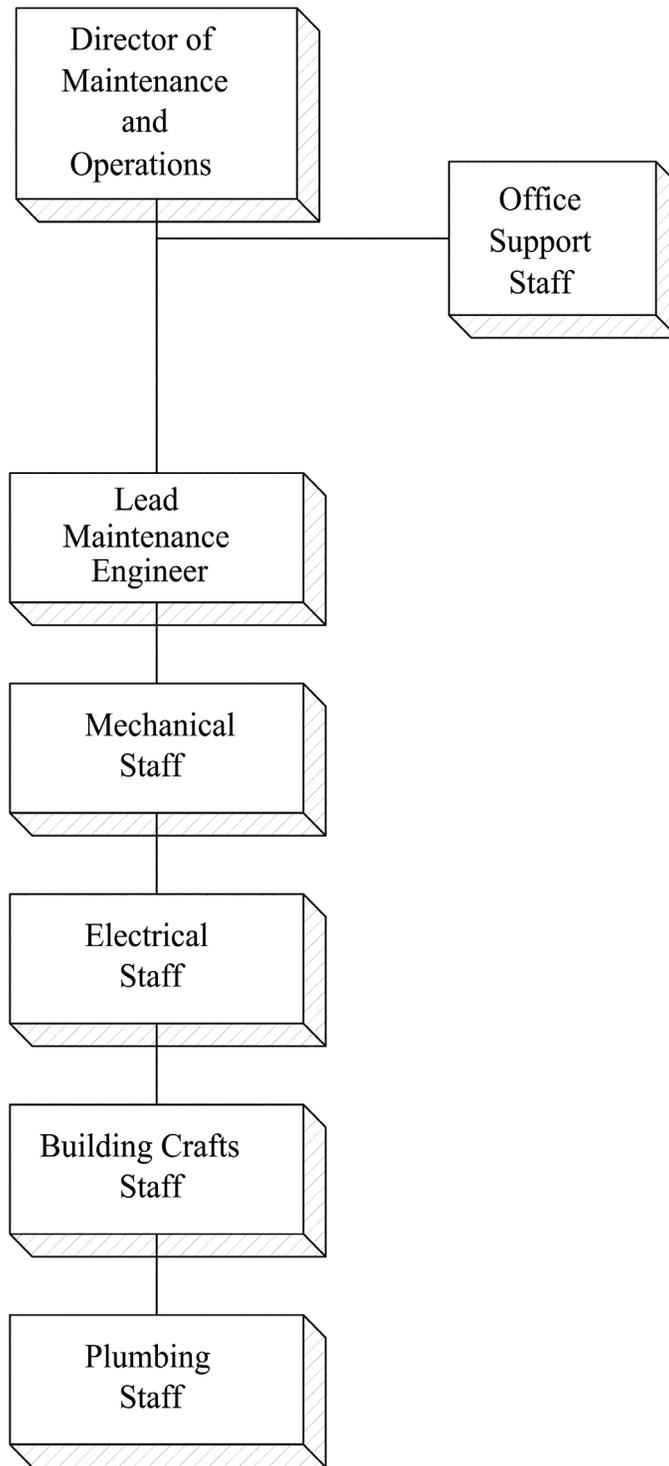


Figure 6.2: Organizational Chart for a Maintenance Department at a Small School District.

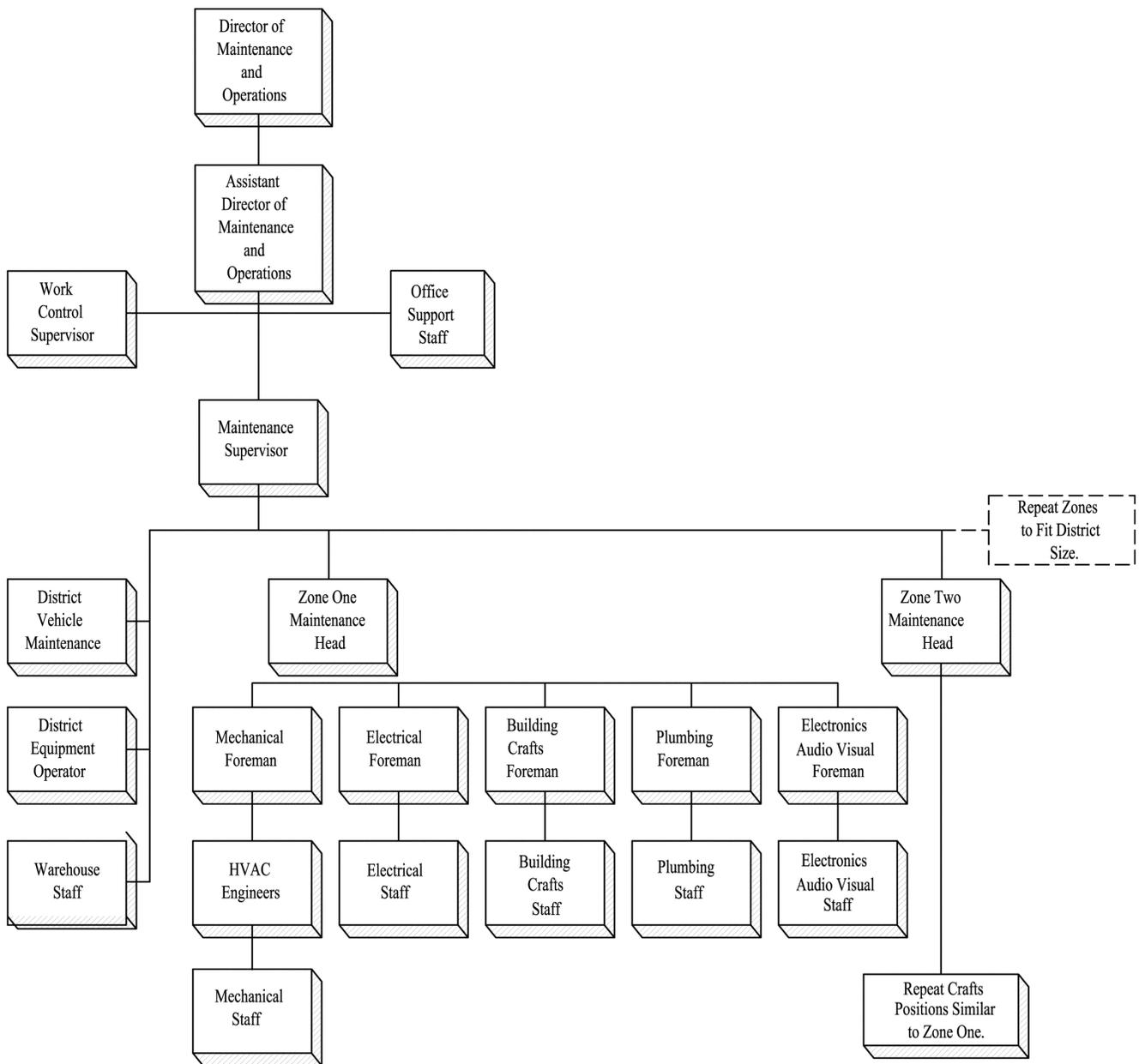


Figure 6.3: Organizational Chart for a Maintenance Department at a Large School District.

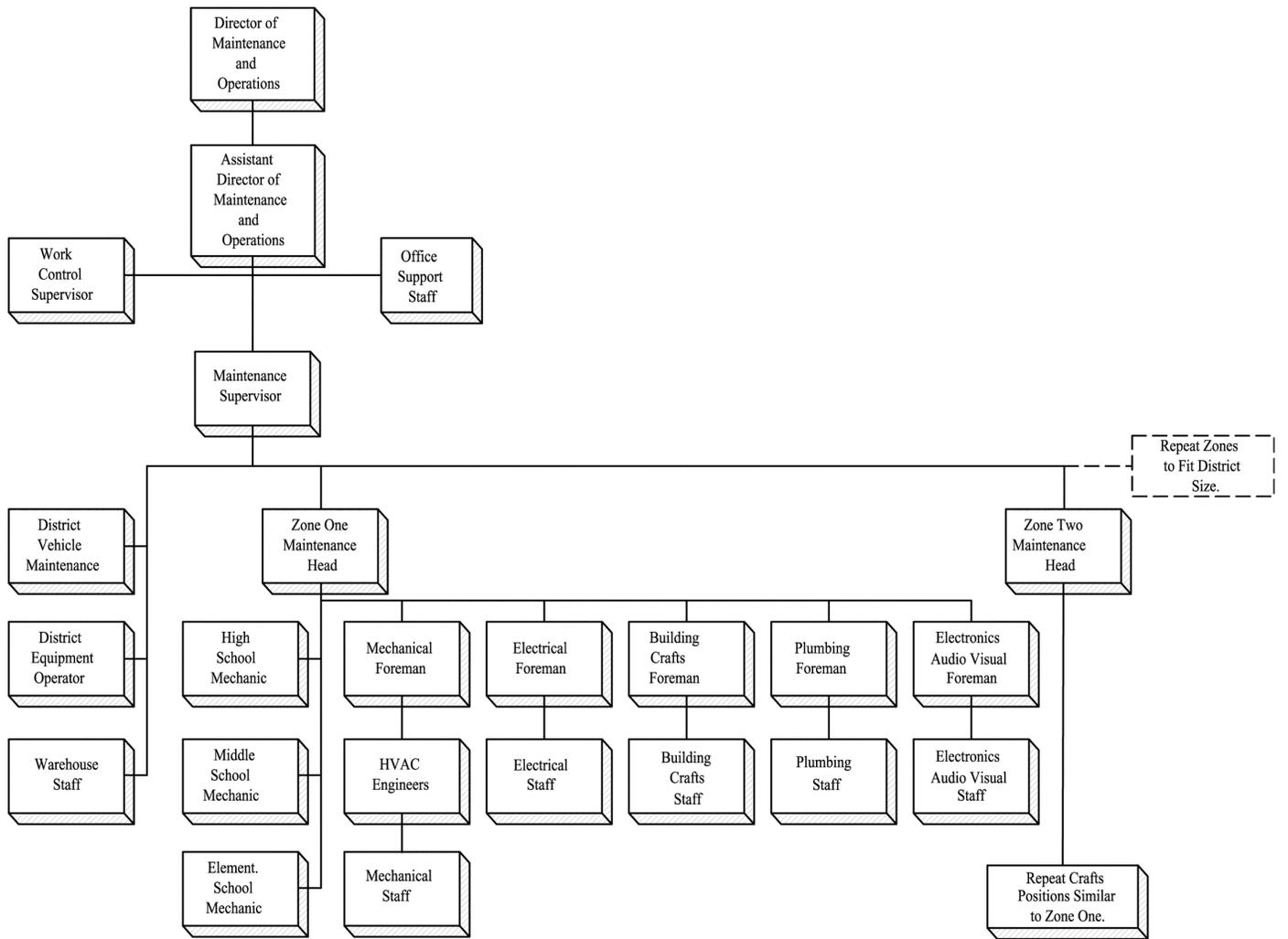
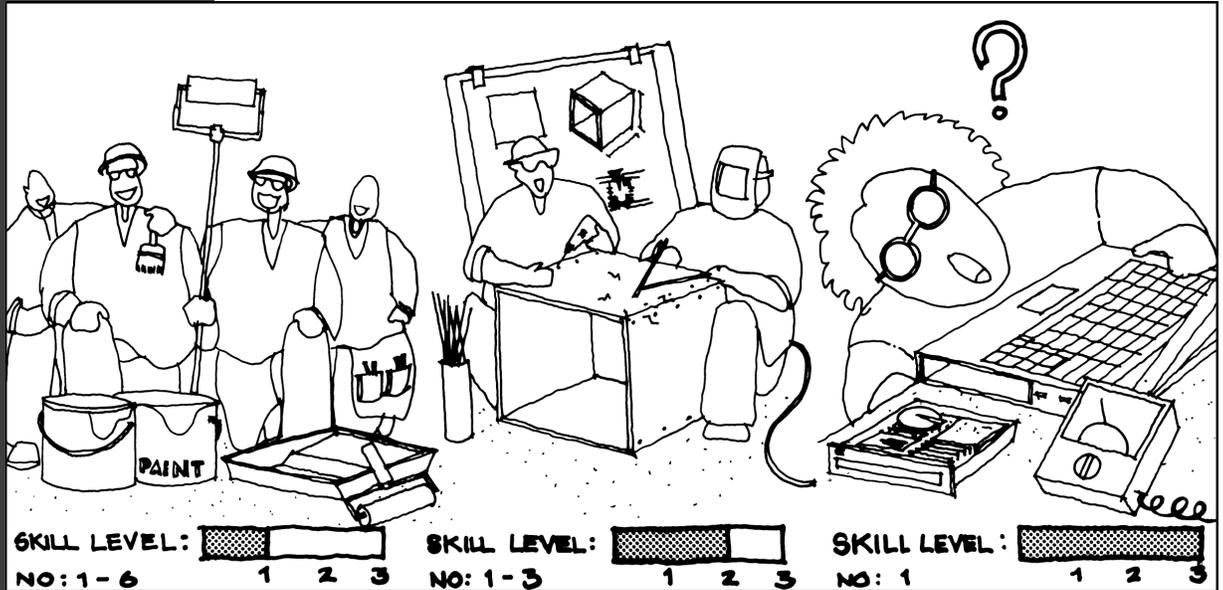


Figure 6.4: Organizational Chart for a Maintenance Department With Zones.

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Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Staffing Formulas For Maintenance Tasks



Although there is little agreement on an ideal approach for determining maintenance staffing levels at educational facilities, there are a number of valid approaches in current use. In determining the number of trades-related workers, technical, and support staff needed to maintain a facility, maintenance administrators and supervisors should identify or create a staffing approach that incorporates the following objectives:

- The staffing approach should be well-suited to the specific needs of the facility and the maintenance department’s primary mission.
- The staffing approach should provide a credible basis or justification for existing staff positions, as well as the need for new lines.
- The staffing approach should be both practical and flexible, and directly tied to the overall organizational structure of the department.
- The staffing approach should be comprehensive and identify all critical line positions such as skilled tradespeople, budget officers, estimators, and office support staff.

The Florida School and Community College Staffing Formula

A suggested approach for determining maintenance staffing levels that is simplified enough to use as a primary staffing level determinant or as a reference for other approaches is the facility based square footage method. Essentially, this approach applies a ratio of staff positions to the gross or overall floor area to be maintained. This approach takes into account the various trades or maintenance divisions involved in servicing an entire school district or community college. The following formula was developed using this approach and is applicable to maintenance departments at educational facilities throughout the state.

Maintenance Staffing Formula	
Total facility square footage (as listed on FISH report)	
Divided by	
45,000 square feet	
Equals	
1 FTE building maintenance–related staff position	
Plus	
1 FTE support positions for each 6.8* building	
maintenance–related staff positions	
Equals	
Total FTE for maintenance department.	
(*based on sampling of school districts and community colleges)	

Figure 6.5: Maintenance Staffing Formula.

Example:

Community college with 1,500,000 square feet of building space, on four separate campuses.

	1,500,000				
÷	<u>45,000</u>				
Total building maintenance-related staff					33.3 positions
	33.3 building maintenance-related positions				
÷	<u>6.8 support staff ratio</u>				
Total number of support staff positions					4.9 positions
Total number of maintenance department employees					38.2 positions

The use of 45,000 square feet as a constant in this formula is based on a reasonable amount of square footage within a facility that can be serviced by a “trades-related” employee during an average workday. The support staff ratio of 6.8 is based on an average number of building maintenance-related staff positions that generate the need for 1 support position. The actual number of trades-related and support staff positions should be adjusted to reflect situations unique to a particular maintenance organization within a school district or community college.

Buildings and Systems Replacement Costs Staffing Formula

This approach to maintenance staffing is frequently used in private industry and is also well-suited for educational facilities. It bases “trades-related” or direct staffing on a percentage of today’s replacement costs of buildings, systems, and equipment.

<p>Replacement costs of systems and equipment in current dollars (a) Multiplied by .11 Plus Replacement costs of buildings in current dollars (b) Multiplied by .023 Multiplied by .6 Divided by average annual cost per maintenance-related worker in current dollars (y) Equals Total number of primary building maintenance-related positions required by facility (N)</p>
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Figure 6.6: Buildings and Systems Replacement Costs Staffing Formula.

$$\frac{((a) \times .11) + ((b) \times .023) \times .6}{(y)} = (N)$$

Explanation of formula constants:

.11 : This is 11 percent of the total replacement costs for systems and equipment. This is an average between 7 and 15 percent that is considered an appropriate range for the educational facility industry. A more accurate percentage may be needed to reflect local conditions.

.023 : This is 2.3 percent of the total replacement costs for buildings. This is an average between 1 and 3 percent that is considered an appropriate range for the educational facility industry. A more accurate percentage may be needed to reflect local conditions.

.6 : This is 60 percent of the total maintenance cost. This is a high-end average between 30 and 60 percent which may represent the labor portion of the maintenance department's budget. A more accurate percentage may be needed to reflect local conditions.

Additional Calculations:

These calculations can be used for planning and budgeting purposes. They can also be used to determine when to add new staff or keep existing positions unfilled. Some basic indicators are as follows:

$N + .2N$ = Total number of building maintenance-related positions required for primary and secondary positions. This number includes an allowance for unskilled laborer positions ($.2N = 20$ percent. A more accurate percentage may be needed to reflect local conditions).

If $N + .2N$ is greater than 10 percent of the current staffing level, administrators can assume that the department may be overstaffed. The department's resources may be diminished as a result of excess employees' lost time.

If $N + .2N$ is less than 10 percent of the current staffing level, administrators can assume that the department may be understaffed. This may be characterized by a recurring backlog of work/service orders and place certain systems and equipment in a "breakdown maintenance" status.

(Source: Facility Managers Operations and Maintenance Handbook, McGraw-Hill, 1999).

6.6

Maintenance and Operations Administrative Guidelines for School Districts and Community Colleges

Measuring Worker Productivity

CUSTOMER SATISFACTION SURVEY			
DESCRIPTIONS	FACILITY	CUSTOMER	COST EFFECTIVENESS
MAINTENANCE:	3	4	5
OPERATIONS:	4	4	5
GROUNDS:	4	4	5
OTH	5	4	5

Administrators are often faced with the challenge of determining how productive staff members are in performing certain maintenance tasks as a way to gauge worker productivity. While there are several methods in current use, including assessing workload backlogs and general familiarity with assigned duties, administrators should rely on more accurate methods for measuring worker productivity. In some instances labor standards that have been developed by other entities such as R.S. Means or the General Services Administration (GSA) may serve as guides for benchmarking and comparisons. However, oftentimes these standards do not accurately reflect local circumstances. Maintenance workers often perform additional duties that may not be considered in national or regional standards.

Engineered Performance Standards (EPS)

A widely accepted method for measuring productivity used in private industry facilities management for over 25 years is the development of engineered performance standards (EPS). Rather than rely on standards used by others, this approach seeks to develop

them locally. In addition to determining productivity standards, the engineered performance standards approach can also help control and cut costs. There are also other reasons why this approach may prove beneficial to maintenance administrators and supervisors:

- Improved work order scheduling
- Better planning for scheduling repetitive tasks
- A sound basis for evaluating employee performance
- Improved budgeting
- Enhanced morale among staff
- Improved customer service

Engineered performance standards are based on a keen understanding of standard work tasks and the overall scope of work. While every work situation presents its own set of unique conditions, this process can be adjusted to account for these variable circumstances as well. Engineered performance standards can be derived in a number of ways. They can be developed through direct observation of various work tasks, through an examination of historical data, or from informed or skilled estimates. In some instances, locally derived standards may be averaged with standards published for the facilities industry. These methods can be used individually or in a combined manner to arrive at labor standards that are appropriate to local conditions. Additional resources that may help in developing labor standards include information from equipment manufacturers, skilled tradespeople in the private sector, outsourcing contractors, consultants, and administrators at other facilities.

Although the engineered work performance method offers several benefits, administrators should assess actual work quality using a different set of standards and criteria. Work quality standards should be used in conjunction with labor standards to arrive at a clearer understanding of productivity and effectiveness.