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MAINTENANCE PROGRAMS

- Asset inventory and assessment
- Organization and staffing
- Work Management
- Customer communications
- Computerization
 - CMMS / CAFM / IWMS
- Preventive/predictive maintenance
- Financial management

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Mission of the Institution

- Education
- Research
- Health care
- Public/Community service



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Provide the optimum physical environment to support the mission

- Classrooms and Research Labs
- Grounds, Transportation Systems
- Housing, Offices
- Infrastructure

Promote effective use of resources through leadership, policies, decision making

- Financial / Budgets
- Personnel / Staff
- Equipment / Fleet / Contracts
- Physical Plant

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Facilities Management

Mission statement

Creating and caring for the physical environment in which those who seek enlightenment, knowledge, health and productive lives can flourish.

Vision

Excellence, innovation, and leadership in our support of the education, research, health care and public service mission of the University.

Core values

Collaboration: Striving to work together and with others to accomplish the purpose and vision of the University by sharing knowledge, learning and building consensus

Respect: Sharing a common respect for ourselves, each other and our University community

Integrity: Striving for honesty and equity in all our endeavors

Excellence: Striving to be second to none in all that we do


Pride: Taking pride in the beauty of our grounds, the grandeur of our buildings and the quality of our work

Community: Making the University and our community a better place to study, work, heal and live

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Maintenance

Work required to preserve or restore buildings, systems, and equipment to their original condition or to such condition that they can be effectively used for their intended purpose.



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Maintenance Management

A systematic approach to the maintenance and upkeep of facilities, grounds and infrastructure, in support of the institutional mission, applying such management principles as organization, planning, measurement, and control.

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Chief Facilities Officer qualifications

- Fully knowledgeable of all building systems
- Advanced degree in architecture/engineering
- Expert in procurement/negotiating procedures
- Demonstrated skills in leadership and managing organizations
- Degrees in public relations and computer science
- Certified Public Accountant
- Demonstrated ability to raise funds
- An astute politician
- and a law degree

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Objectives of Maintenance Management

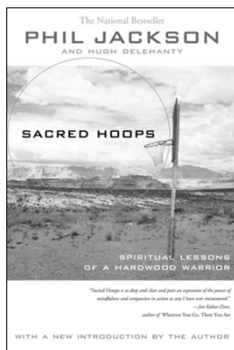
- Increase plant utilization
- Increase cost effectiveness
- Develop effective, efficient, reliable organization
- Emphasize service oriented management principles
- Enhance appearance of the institution
- Improve communications

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What is the role of the facilities manager in supporting the goals of the organization and the mission of the institution?



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Basics of Maintenance Management

- Staffing and Organization
- Work Management/Control System
- Facility Assessment Program
- Commitment to Preventive Maintenance

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**Types of
Maintenance Organizations**

- **Centralized or shop**
 - Central location, trades segregation
- **Decentralized or zone**
 - Geographic responsibility
 - Responsibility by customer group
- **Functional or operational**
 - Organized by major activity (PM, minor work, etc.)

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**Staffing the
Maintenance Organization**

- Size of workforce
- Staffing administrative functions
- Supervisor/mechanic ratio
- Flexibility/adaptability
- Org charts

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Staffing Philosophies

- Every campus unique in size, layout, economic environment
- Space use or classification
- Expectations of maintenance service levels
- Extent of outsourcing
- Fund dependent
- Guides useful in shaping organization
 - Custodial/Grounds/Maintenance Staffing Guidelines

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**Work Management/
Work Control**

- Work order system- to identify and categorize work
- Work authorization- to cite availability of resources
- Work control- to plan, measure success, and report on work

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**Work Order System:
Basis for identification of requests for services**

- Describes the work
- Alerts the responsible unit of requirements
- Defines a time requirement
- Authorizes expenditures
- Provides basis for tracking performance

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Work Requests

- Telephone calls
- Internet / www.servicerequest@
- Social Media
- Email
- Verbal requests
- Inspection results
- Preprinted forms
- FAX
- Letters

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Work Requests

- Building users / Facility coordinators
- Facilities Management employees
- Security
- Students
- Central monitoring system
- Campus events scheduler
- Auxiliaries
- General Public

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Work Order Information

- Date
- Requestor's name
- Building name
- Location of work
- Nature of work

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Work Order Information

- Interchangeable terms?
 - CMMS - Computerized Maintenance Management System
 - CAFM – Computer-aided Facility Management
 - IWMS – Integrated Work Management System
- Next Evolution?
 - BIM – Building Information Modeling

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Categories of Maintenance

- Planned maintenance
 - Preventive/predictive
 - Corrective
- Unplanned maintenance
 - Emergency
 - Reactive
- Major/capital maintenance
- Support services or minor work

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Work Authorization

- Type of work
- Estimated cost
- Availability of funds
- Availability of work force
- Impact if not accomplished
- Priority

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Work Authorization

- How is responsibility for authorization of work established and communicated?
- What is the appropriate level of review and approval for different work categories?

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Work Assignment

- How are the responsibilities and procedures for assigning work established and communicated?
- Who assigns?
 - Work Control
 - Operations
 - Scheduler
 - Director
- Who performs?
 - Shops - if so, which one
 - Service contract

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Planning

Decision making--deciding on the best strategies for effective use of available resources to meet the goals of the organization.

- Long range planning
- Short range planning
- Individual job planning

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Long Range Maintenance Planning

- Painting Program
- Roof Program
- Systems Audits
- Capital Renewal
- Roads and Walks
- Staffing and Training
- Shop Equipment / Vehicles

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Short Range Maintenance Planning

- Workload--current and anticipated
- Resources
 - Labor hours
 - Contractors
 - Materials
 - Equipment
- Performance standards

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Individual Job Planning

- Materials and equipment
- Labor / timeframe
- Contractual support
- Current backlog of work
- Method of accomplishment
- Proposed schedule
- Sequence of activities
- Estimate costs

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Estimating Maintenance Projects

- Standards--EPS, Means
- Experience
- Use of professional estimator
- Historical cost of similar work
- Contracts
 - Unit rates
 - DOC

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Types of Contracts

- Time and materials
- Fixed price
- Guaranteed maximum price (GMP)
- Unit rate

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Weekly scheduling

Based on:

- Workload
- Available labor hours
- Available materials
- Rate of success in current week's schedule
- Priorities

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Scheduling

- Levels workload
- Provides basis for evaluating actual vs. planned
- Satisfies organizational priorities
- Builds effective communication tool
- Establishes commitment / customer service

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Tracking Work

- Weekly schedule compliance
- Backlog of work
- Exception reporting on performance standards
 - PM
 - Service work
 - Minor work
- Major project tracking
- Work Order Dashboard

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Metrics

- What kind of data are you tracking?
- How are your metrics reports being used?
- How has your organization prioritized different types of metrics?
- What units have responsibility for developing and publishing metrics?

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Customer Communications

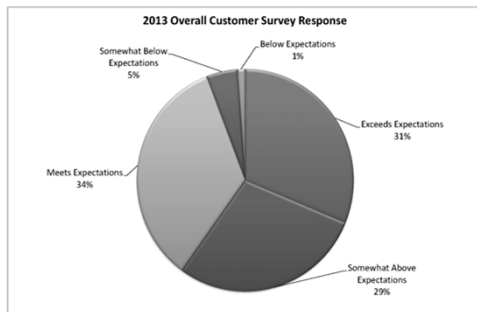
- Website
- Services bulletins
- Newsletters
- Annual reports
- Services guide
- Facilities coordinators
- FMAB
- Customer relations managers
- Work status
 - Hang tags
 - Electronic notification
- Customer surveys

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Customer Communications

- Customer surveys
 - Individual projects or services performed
 - Types of services
 - Periodic evaluation of overall performance

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Customer Communications

- Advise status of work request
- Facilities coordinator concept

$$\text{Satisfaction} = \frac{\text{Performance}}{\text{Expectation}}$$

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Work Management/ Work Control

- **Work order system** - to identify and categorize work
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Maintenance Management Basics

- Facility assessment program
- Financial systems
- Preventive/Predictive maintenance program

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Facility Assessment Program

- **Develop and maintain inventory of facilities**
 - GSF, NA, type of space
 - Age
 - Classification
 - Room inventory
 - Value

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Facility Assessment Program

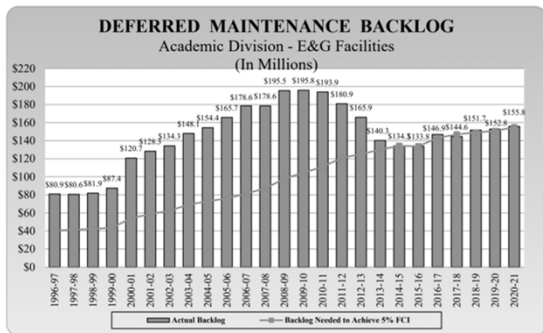
- Determine current replacement value (CRV)
 - Formula
 - Actual construction value
 - Assessment of value
 - Risk Management values?

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Facility Assessment Program

- Facility assessments
 - Life cycle analyses
 - Condition inspections
 - Facility audits
- Maintenance backlog
- Annual report on conditions
 - Listing of facilities with assessment data
 - Facility condition index (FCI)
 - Future funding trends

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Financial Systems

- **Budgeting**
 - Maintenance categories
 - Expenditure plans
- **Accounting**
 - Billing systems
 - Budget performance

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Budgeting in Higher Education

- Zero based budgeting
- Incremental budgeting
- Formula based budgeting
 - \$/GSF
 - Reinvestment Rate

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Budgeting Models

- Centralized
 - Central Allocation for E&G
 - Auxiliary enterprises
- Decentralized
 - Responsibility Centered Budgeting
 - o Impact on FM and other central service providers

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Budgeting Maintenance Categories

- Service work
- Preventive maintenance
- Grounds
- Painting
- Major repairs
- Custodial
- Utilities

_____ Total annual operating budget

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Spending Plan

- Monthly, quarterly budgets by categories
- Based on number of working days/month, or
- Based on historical spending patterns
- React to variances

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Competing for Resources

- Marketing Facilities Management
- Understanding the competition
- Speaking the language of business officers
- Justifying budget increases
 - New facilities funding model

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Competing for Resources

- Justifying budget increases
- New facilities funding model

Maintenance	2.0% of construction cost
Custodial	\$1.95 / GSF
Utilities	\$5.00 - \$8.75 - \$12.50 / GSF
Grounds	Estimate
FTEs	1 per \$120,000 of maintenance 1 per 35,000 GSF for custodial

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Cost Accounting

- Billing system -- method of accounting for expenditures. Every resource has an associated expense: labor, materials, equipment, administrative support, etc.
 - Rate setting – direct/indirect.
- Work order accounting -- actual charges on a specific work order.
 - Front line accounts for all hours.
- Budget accounting -- report of cumulative actual expenditures and encumbrances against overall annual budgets.

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Preventative Maintenance

- A planned and controlled program of continuous inspections and corrective actions taken to ensure peak efficiency and minimize deterioration.
- A procedure of inspecting, testing, and reconditioning a system at regular intervals according to specific instructions, intended to prevent failures in service or to retard deterioration.

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PM Work includes:

- Inspection
- Cleaning
- Adjustment
- Lubrication
- Replacing parts
- Analysis and testing
- Minor repairs

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PM Objectives

- Reduce frequency of unscheduled breakdowns and downtime of critical equipment
- Extend service life of equipment
- Reduce energy consumption
- Enhance safety
- Improve overall appearance of facilities
- Reduce overall maintenance costs

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Preventive Maintenance Program

- Equipment inventory
 - Construction drawings
 - Physical inventory
 - Commissioning process
 - Procedures for updating

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Preventive Maintenance Program

- Job Plans
 - O&M manual
 - Standardized instructions
 - Maintenance staff input
 - Emphasize preventive activities
 - Separate job plans

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Preventive Maintenance Program

- Frequencies
 - Impact of downtime
 - Equipment type -- static or dynamic
 - Operating hours
 - Environmental factors -- heat, dust, etc.
 - Age
 - Cost factors
 - Safety / code factors
 - O&M manual or industry standards

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Predictive Maintenance

Corrective action based upon condition analysis of equipment

- Periodic or continuous monitoring
- Trend analysis
- Optimum scheduling of repairs

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Condition Assessment

- Oil analysis
- Thermography
- Vibration analysis
- Acoustic testing
- Ultrasonic testing
- Water treatment analysis
- Infra-red photography
- Fault detection & diagnosis

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Reliability Centered Maintenance

An approach to maintenance that combines reactive, preventive, predictive, and proactive maintenance practices and strategies to maximize the life that systems and components function in the required manner.

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PM Performance Indicators

- Review performance reports
 - Percentage of PM work orders completed
 - Estimated vs. actual hours
- Building system reliability
- PM vs. major maintenance and repair
- Cost reports

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Information Systems

- Hardware / software requirements
- Network operations / security
- Meaningful reporting – data mining
- Dashboards - metrics
- Integrated with institution's enterprise system
- Smart phone / mobile device technology
- Big data
- FM or central IT support?

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Materials Management

- Procurement
- Inventory / "just in time" deliveries
- Warehousing / "Storefronts"
- Materials distribution
- Service contracting

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Maintenance Support Programs

- Risk management
- Environmental health and safety
- Service contracts
- Emergency preparedness / operations
- Fleet management
- Safety and security
- Central monitoring and control / BAS

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Performance Reporting

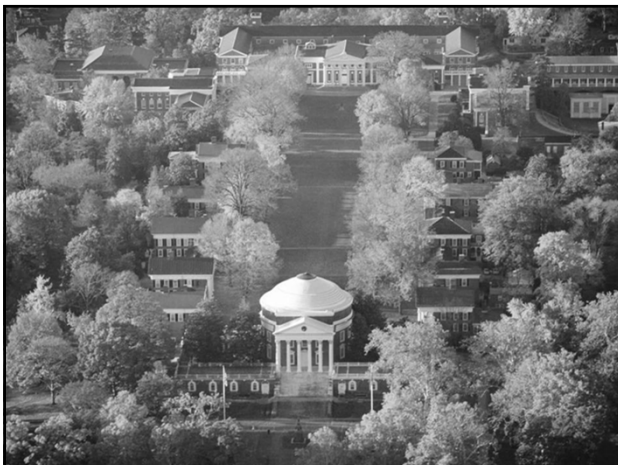
- Published performance indicators -- APPA, NACUBO, other benchmarking reports
- Internal standards
 - Performance standards
 - Variance analysis / cost and schedule
 - Labor productivity reports
 - o Backlog
 - o Overtime
 - o Absenteeism

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Maintenance Management

- Informed and Satisfied Customers
- Improved level of maintenance
- Improved productivity
- Efficient staffing
- Protection of capital investment
- Intangibles
 - Aesthetics
 - Safety and security
 - Comfort and convenience

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