Maintenance Management

APPA Institute

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Maintenance Management

AIA Continuing Education Provider

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Course Description

201 Maintenance Management APPAU201909A

Examine the contemporary issues in managing maintenance programs in higher education. Discussion will include the various methods of work identification and processing, work flow in the maintenance organization, and management controls. Performance indicators, organization and staffing, and customer relations will be related in discussions of changing management approaches. Discuss the principles, development, and values of preventive maintenance programs. Review the impact of information systems, financial planning and reporting systems, and various administrative support systems.

Faculty: Jay Klingel

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Learning Objectives

- Learn about organizational models and staffing challenges in comprehensive maintenance management programs.
- Learn about the importance of asset inventory and condition assessment of the facilities portfolio.
- Discuss current trends in work management and control; work identification, reception, authorization, assignment and reporting; discuss various CMMS systems.
- Discuss the importance of developing sound customer relations practices.
- Learn about preventive/predictive maintenance program management.
- Discuss financial management of comprehensive maintenance management programs.

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Maintenance Programs

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

Mission of the Institution

- Education
- Research
- Healthcare
- Public/community service

- 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

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

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
- A law degree

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

Basics of Maintenance Management

- Staffing and organization
- Work management/Control system
- Facility Assessment Program

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.)

Staffing the Maintenance Organization

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

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

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

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

Work Requests

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

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
- Requester's name
- Building name
- Location of work
- Nature of work

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Detailed Information

- Date and time
- Name and number
- Building name and number
- Exact location of work required
- Type of work
- Equipment number
- Source of funds
- Priority
- Responsible person
- Urgency of work
- Start/Complete/Close
- Assignment

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Work Order Systems

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

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Maintenance Categories

- 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

Scheduling

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

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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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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 kinds of data are you tracking?
- How are your metrics reports being used?
- How does your organization prioritize?
- What unit(s) have responsibility for developing and publishing metrics?

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Customer Communications

- Website
- Services Bulletins
- Newsletters
- Annual Reports
- Services Guide
- FMAB
- Customer Relations Managers
- Work Status
  - Hang tags (then)
  - Electronic notification (now)
- 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
- Satisfaction = $\frac{\text{Performance}}{\text{Expectation}}$

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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 replacement value
  - Formula
  - Actual construction value
  - Assessed value
  - Risk Management value

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Facility Assessment Program

- Facility assessments
  - Condition inspections
  - Life cycle analyses
  - Facility audits
- Maintenance backlog
- Reporting facilities 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

Budgeting in Higher Education

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

Budgeting Models

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

Budgeting Maintenance Categories

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

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Total annual maintenance operating budget

Spending Plan

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

Competing for Resources

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

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 25,000 GSF for custodial
  - Security $1.10 / GSF

Cost Accounting

- Billing system -- method of accounting for expenditures. Every resource has an associated expense: labor, materials, equipment, administrative support, etc.
- Rate setting. Basis for charging for services.
- Work order accounting -- actual charges on a specific work order.
- Budget accounting -- report of cumulative actual expenditures and encumbrances against overall annual budgets.

Preventive 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.

PM work includes:

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

PM Objectives

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

Preventive Maintenance Program

- Equipment inventory
- Job Plans
- Frequencies

Preventive Maintenance Program

- Equipment inventory
  - Construction drawings
  - Physical inventory
  - Commissioning process
  - Procedures for updating
    - Renovations
    - Maintenance replacement

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

Reliability Centered Maintenance

- An approach to maintenance that combines reactive, preventive, predictive, and proactive maintenance practices and strategies to maximize the life that a piece of equipment functions 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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Prerequisites for Success

- Strong management support
  - PM Program Manager
- Acceptance from the front line
- Include continuous training
- Implement in phases
- Once implemented, do not neglect

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Information Systems

- Hardware / software requirements
- Network operations/security
- Support staff/help desk
- Integrated maintenance management system
- Smart phone/mobile device technology
- Big data
- *Using* data

Materials Management

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

Maintenance Support Programs

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

Performance Reporting

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

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

This concludes The American Institute of Architects Continuing Education Systems Course

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