APPA Institute: O&M Track

Operations & Maintenance Management
Rollie Zumbrunn, Director of Operations
University of Virginia Facilities Management
rz9t@virginia.edu

1

Introduction

- APPA Institute: Intent and Format
  - O&M, Planning Design & Construction, Energy & Utilities, General Administration tracks
- O&M track: Maintenance, Custodial, Grounds, Special Topics
- My Background

2

Critical Resources

- APPA's Operational Guidelines for Educational Facilities – Maintenance
- National Research Council's The Fourth Dimension in Buildings: Strategies for Minimizing Obsolescence
- APPA's Body of Knowledge articles

3

Maintenance Core Outline

- Why do we invest in maintenance?
- What is it (types, activities) and who is responsible?
- How much of it should we do?
- How do we budget for it and fund?
- How do we manage it?
- Who should execute it, and how should they be organized?
- What are tools to check our work?
- What does success look like and how do we get there?
- What special topics and support systems are relevant?

4

What is the mission of Operations & Maintenance?

- <u>Within the framework of the institution's mission and character</u>, what are the goals of the facilities management organization?
- FM should seek to provide an optimum physical environment to support institutional missions.
  - Education, Research, Healthcare, Public Service? Entertainment, other?
  - Classrooms, offices, laboratories, infrastructure, housing, performing venues, computing, clinical, vivaria, dining, museums, landscape, historic preservation, etc.
- And promote effective use of resources through leadership, expertise, policies, and decision-making.
  - Life safety, continuity of operations, life cycle costing, alignment of needs and resources, change management, continual improvement.

5

6

Chief Facilities Officer Roles and Competencies

- 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

7

What is Maintenance?

- Definition: 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, ensuring ongoing operation of the campus. Asset stewardship.
- Activities include basic services like inspections, servicing, and repairs intended to keep assets in safe operational condition in support of programming.
- Reliablity-Centered Maintenance: optimize physical plant availability and quality
- Types of maintenance
- Examples of services
- Trades required
- Needs that are not maintenance – and why Operations must support them.

8

System Obsolescence & Risk Management

Physical Plant as an Institutional resource – where the product is made
- Maximize availability and utilization, preserve financial and productive value
- Delay obsolescence due to:
  - Functional factors
  - Economic factors
  - Technological factors
  - Social, legal, political, and cultural factors
- Failures can be incredibly costly
- Facility Condition Index (FCI) as a measure of obsolescence and risk
  - (Deferred Maintenance backlog + Capital Renewal needs) / Current Replacement Value

9

Extension of System Life via Maintenance
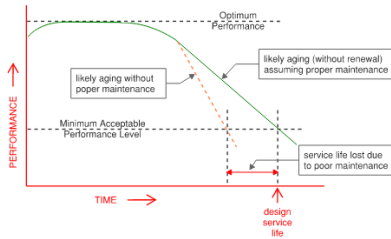
10

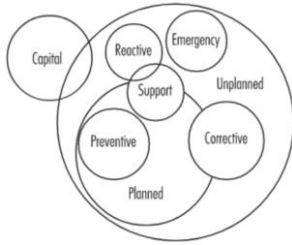## Expectations for Facilities are Constantly Increasing
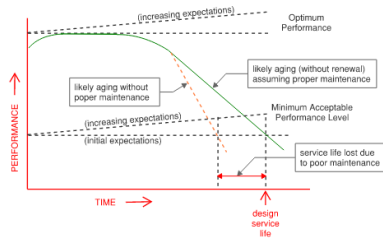
11

Risk Evaluation to Align Resources and Expectations

12

Overlaps and Interrelationships in Types of Maintenance

- Planned and Unplanned
- Reactive and Proactive
- Not Maintenance:
  - Support Services
  - Capital Plant Renewal

13

Limited Resources and the tension between Stewardship and Customer Service

14

Levels of Maintenance and Benchmarking

- Level 1: Showpiece Facility
- Level 2: Comprehensive Stewardship
- Level 3: Managed Care
- Level 4: Reactive Management
- Level 5: Crisis Response

15

16

Levels of Maintenance and Benchmarking

- Needs vary across campus…
- Resource Allocation and Conditions should vary too
  - High profile buildings vs low priority spaces
  - Critical systems: life support; research; healthcare, event venues
  - Seasonality: coordinate maintenance activities with showpiece times, weather impacts, etc
  - Funding: campus "owners" have different ability to pay
  - "Run to failure" strategies ahead of replacement

17

Maintenance Activities as a Proportion of Total Resources by Stewardship Level
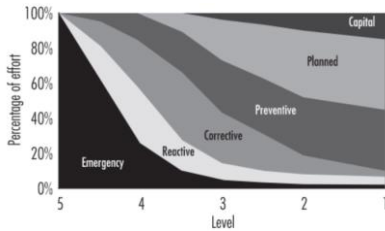
18

Relative Change to FCI over Time Depending on Maintenance Level
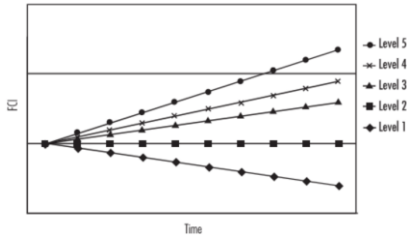
19

Intensity Factors and Resource Calculation

- Space type
- Campus size
- Campus age and condition
- Building system complexity
- Institutional mission

Figure 3.2		Figure 3.1	
Space Type	Area (gsf)	Staffing Factor	Baseline Staffing
classroom	64,350	15	0.97
laboratory	26,650	27	0.72
office	234,000	24	5.62
residence halls	825,000	18	14.85
campus total:	1,150,000	Total:	22.15

20

Preventative Maintenance

- Asset-based (system component)
- Planned, cyclical work to check asset condition and function, provide routine service, replace consumable materials, perform minor repairs
- Standard work with formalized job plan tailored to specific asset
- Predictive maintenance subtype

21

Maintenance Funding

- Institutional organization
  - Consolidated facilities department or decentralized staffing
    - "Auxiliaries" as financially responsible independent operating units
    - Responsibility Centered Budgeting
  - Operating unit level differentiation and prioritization
  - Cost recovery vs central funding
  - Major events, emergency management, etc
- Life Cycle Costing (LCC) concept
- Budgeting methods

22

Integrated Planning Processes

- Strategic use of resources to meet the goals of the organization
- Medium and long-range forecasting
  - Maintenance needs vary throughout the life of a system
  - Major repairs often need to be coordinated well in advance to minimize impact and procurement times
  - Resource leveling greatly increases efficiency, particularly for in-house teams
- Programmatic approach
  - Painting, roofs, condition assessments, equipment and vehicles, staffing and training, roads and walkways
- Coordination with Capital Renewal Program

23

Budgeting and Billing Methods

- Incremental budgeting based on historical costs
- Formula based budgeting
  - $/GSF
  - Reinvestment Rate: maintenance as a proportion of CRV
- Zero-based budgeting
- "Time & Materials" billing
- Fixed price quotes
- Guaranteed maximum prices
- Unit rates (Job Order Contracting)

24

Maintenance Budget Categories

• Stewardship (preventative maintenance)
• Service work
• Major repairs
• Exteriors and grounds
• Aesthetics and painting

25

Maintenance Management

• The <u>measurement</u> of aspects of maintenance in order to provide the <u>feedback</u> necessary to <u>adjust the overall maintenance plan</u>.
• A systematic approach to the upkeep of facilities, grounds, and infrastructure, in support of the institutional mission, applying such management principles as <u>organization</u>, <u>planning</u>, <u>measurement</u>, and <u>control</u>.
• Objectives: increase plant utilization, reliability, and cost effectiveness; emphasize service-oriented management principles; enhance condition of the institution; improve communication and decision-making.

26

Maintenance Management Elements

• Work order system – to identify and categorize work
• Work <u>authorization</u> – to determine availability of resources
    • When is estimating necessary and when not?
• Work <u>control</u> – to plan work, measure success, and document history

• Where do work orders come from?
• Who decides if, when, and how the work should proceed?
• How can historical information be used to guide decision-making?

27

Management tools: CMMS

- Computerized Maintenance Management System
- Work requests
  - Key data elements: requestor, type of work, priority, description
  - Location, system
  - Assignment
  - Costing and billing (labor, materials, equipment, contractors)
- Planning and scheduling
- Communication and feedback
- Work order analysis and trending

28

Who does the Work?

- In House teams vs Contractor support
- Zone Maintenance vs Central Shops
  - Zones: multi-trade teams responsible for general maintenance needs across a specific area of the institution, generally determined geographically. Can increase efficiency, knowledge and ownership of systems, and relationship with building occupants.
  - Central Shops: centralized trade teams generally responsible for entire campus. Can increase expertise, project capacity, consistency, documentation
- Blended Approach: Zone personnel as "property owners" who rely on specialized central shops, project teams, program managers, and contractors to execute work beyond their capabilities.

29

Trade Needs

- Institution-dependent: type and resources
- General trades: service response, event staff, carpentry, paint?
- MEP: HVAC, electrical, plumbing
- Specialty trades: fire alarm, automation services, roofing, locksmith, masonry, elevators
- Program support: fleet, roof, paving
- Context matters:
  - Do you need to be self-sufficient?
  - Are you big enough to maintain consistent work?

30

Labor Rate Calculation

- Billable "wrench time" vs "non-productive" time
- Fully loaded cost recovery shop rates
  - Total compensation: salaries, leave, benefits
  - "Other than personnel" costs
  - Supervision and quality control
  - Overhead
- Rate viability and organizational credibility
  - Some rates may be uncompetitive
  - Some customer requests may be hard to bill
  - But there may still be benefit to providing subsidized services

31

Proving Performance

- Quality control at the shop level
  - Supervision
  - Contract administration
- Metrics and Key Performance Indicators (KPIs)
- 3rd Party Inspection Teams
- Long run assessments
  - Peer benchmarking
  - Facility Condition Assessments
  - System life cycle analyses
- Occupant feedback

32

Metrics and Key Performance Indicators

- Pearson's Law: "When performance is measured, performance increases. When performance is measured and reported back, the rate of improvement accelerates."
- What matters?
- Gaming the system vs material improvements
- Examples:
  - Monthly completion rates, particularly for code-required PM work
  - Response times, particularly for critical requests
  - Reactive vs Proactive ratio
  - Building operational data: utility consumption, system uptime
  - Occupant feedback: work orders, complaints
  - Sensitive work types: pest control, mold, indoor air quality

33

Visualizations & Dashboards

34

Facility Assessment Program

- A continuous systematic approach to identifying, assessing, prioritizing, the specific maintenance, repair, renewal, and replacement requirements for all facility assets to provide valid documentation, reporting mechanisms, and budgetary information in a detailed database of facility issues.

- In house blended inspection team or Consultant Service
- Cyclical assessments to maintain consistency and track changes
- Informed by facility managers, work order data, customers, asset info

35

Customer Feedback and Surveys

- CMMS as communication tool
- Customer service representatives and Building Coordinators
- Routine meetings to build relationships, share information, align processes, minimize impact, and optimize value
- Engaging building occupants to decrease maintenance expenditures
- Online survey data

- Who are we working for? "Customer" engagement and support.

36

QR Code for O&M Maintenance Management I

37

APPA Institute: O&M Wrap Up

Operations & Maintenance Management
Rollie Zumbrunn, Director of Operations
University of Virginia Facilities Management
rz9t@virginia.edu

38

Organizational Culture & Resources

- Support from institutional leaders and management
  - Resources, Trust, Knowledge, Buy-In
- Agency and Ownership vs Stewardship?
- Reactivity and Firefighting – plans get burned down
- Change Management and Continuous Improvement
  - "That's how it's always been" is not an explanation
- Command & Control Hierarchy vs Distributed Leadership

39

Competing for Resources

- Opportunity Costs: maintenance is not the purpose of the institution!
- Marketing Facilities Management: managing "up and across"
  - LEAN Manufacturing: value is defined by the customer
  - So we need to educate our stakeholders to ensure funding, prioritization
- Budget increase proposals
  - New initiatives and regulatory requirements come with costs
  - New programs can entail intensive support needss
  - New buildings often appear "cheap" in short run
  - Business cases for new services

40

Customer Engagement and Focus

- Predictable processes and services
- Excellent service value and cost control
- Services and programs tailored to their needs
- Strong collaboration and partnership
- Excellent communication
- Expertise and resources
- Responsiveness and resiliency

41

Marketing Facilities Management

42

Related Topics and Support Systems

- Organizational Values and Initiatives
  - Safety, Sustainability, Training & Development
  - Facilities Design Guidelines at <u>Institutional</u> Level
- Compliance
  - Joint Commission, Research bodies, Security needs
  - Fire Marshal and Building Official – processes
- Emergency Management
- Support Teams
  - IT, Logistics, EHS, Risk Management, Central Monitoring, Fleet
- FM Partners

43

<u>Institutional</u> Facility Design Guidelines
How our buildings are designed and constructed matters!

- Explicitly Enforce Organizational Values
- Life Cycle Costing
  - First cost matters but cannot be the only factor
- Sustainability & Energy Consumption
- Safety & Maintainability
  - Are aesthetics prioritized over serviceability?
- Efficiency of service
  - Are assets on rooftop or easily accessible?
  - Are materials and parts readily obtainable?
- Are systems standardized throughout the institution?

44

Organizational Values: Safety

- Foundational competency above all else
- Risky work is irresponsible – but also expensive
- Elimination before mitigation
- Basic work processes
  - Job Hazard Assessments for non-routine work
  - High Hazard requirements
    - Lock Out Tag Out, Confined Space permits, Hot Work permits, Elevated Work
  - Programmatic processes and documentation
    - Lead, Asbestos

45

Organizational Value: Sustainability

- A Fundamental Component of Stewardship
- Material disposal
  - Refrigerants, batteries, oils, lightbulbs
- Resource conservation
  - Institutional goals for energy, waste, and emissions
  - Utility consumption as funding mechanism

46

Compliance Requirements

- Increasing requirements for documentation of maintenance
- Regulated activities, materials, and environments
  - Healthcare, pharmacy
  - Building Automation trend data
  - Access control systems
- Research and program requirements
  - Laboratories, vivaria, museums, performing arts
- Documentation can often be managed and organized in CMMS to increase accountability and reporting

47

Emergency Management & Risk Management

- Facilities Management increasingly expected to engage with institutional leaders to assess and mitigate risks
- FM assets, personnel, and systems critical for response
- Weather event planning and response

- All of our work can be thought of in terms of risk management!

48

Operational Partners

- Custodial teams as "first line of maintenance"
  - Eyes in the building
  - Potential resource for some work to increase efficiency
  - Customer feedback mechanism
  - Coordination of work
- Landscape
- Systems Control and Work Management
- Fleet
- Document Management and Mapping Services
- Project teams
- Occupant Groups and Leadership

49

FM Support Teams

- Information Technology
- Logistics
- Space Management
- Document Management
- Finance
- Human Resources
- Building Official
- Energy Engineers
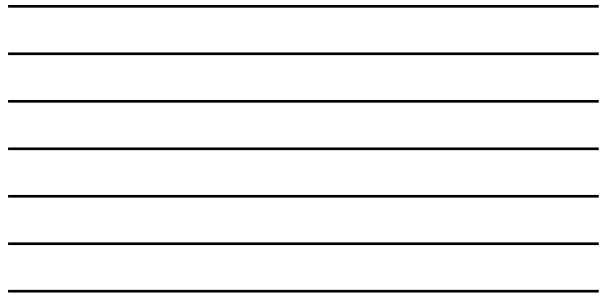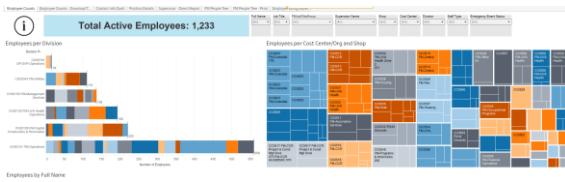
50

Operational Data – Quantification & Analysis

51

Operational Data – Quantification & Analysis

52

Operational Data – Quantification & Analysis

53

Operational Data – Quantification & Analysis

54

Additional Resources

- Operational Guidelines for Educational Facilities – Maintenance (APPA)
- The Facilities Audit: A Process for Improving Facilities Conditions, by Harvey H. Kaiser (APPA)
- Benchmarking & Organizational Change, by Mohammad H Qayoumi (APPA)
- APPA Thought Leaders Series: Transforming Facilities to Achieve Student Success
- The Fourth Dimension in Building: Strategies for Minimizing Obsolescence (NRC Building Research Board)
- Component Renewal Expected Life Guidelines (APPA)

- Other examples and tools (UVA materials available on request):
    - UVA Facility Design Guidelines
    - Asset templates and job plans for standardized work
    - Metrics and Dashboards
    - Emergency Management risk calculation tool

55

QR Code for O&M Core Wrap Up

56