Capital Renewal and Deferred Maintenance Programs

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Introduction

Facilities management responsibilities include programs for acquiring new capital assets; programs governing operations, maintenance, and repairs; capital renewal programs; and deferred maintenance programs. Organizational structures for managing these programs vary. Larger institutions may divide the responsibilities between operations and maintenance management and facilities planning departments; at smaller institutions a facilities department may manage both responsibilities. Because the programs emerge from two concepts: accounting and plant operations: there is a built-in confusion about their meanings. The issue of deferred maintenance further complicates clear delineation of terms and operational applications to achieve the basic goal: extending the life of existing facilities or replacing them with new facilities.

This chapter discusses the overall topic of capital renewal and deferred maintenance programs within the context of integrated financial planning for capital assets.

Historical Perspective

Deferred Maintenance

Today's buildings, grounds, infrastructure, and equipment--amassed to house and support academic programs--are the legacy of the dramatic growth of new and existing campuses. More than half of the current campus facilities organizations were developed after World War II, when enrollment grew 600 percent, from 2.3 million students in 1950 to more than 14 million students by 1995. During the same period, the total number of institutions grew from 1,800 to 3,768. New institutions, primarily publicly supported two-year colleges, opened at a rate of one every two weeks from 1955 to 1974.

Facilities also expanded dramatically during this period. Of the current total of more than 4 billion gross sq. ft. of space, it is estimated that 2.5 billion was built between 1950 and 1990. Buildings were opened annually, sometimes several in the same year, and construction cranes on the skyline and mud-covered walkways were common campus experiences. Driven by financing demands for capital construction and tight delivery schedules, many of the new facilities evidence a lack of durability and adaptability for alternative uses.

The major share of construction was for new facilities, with little reinvestment allocated for existing facilities. The glamour of planning new facilities and the excitement of ribbon-cutting ceremonies overshadowed the obsolescence and decay of earlier campus buildings. "Old Main" was slowly fraying at the edges while newer facilities entered their own cycle of deterioration. Currently, many institutions not only are facing the challenge of an increasing debt burden due to an aging facilities organization, but are also planning to replace or renew their facilities using debt.

The burdensome problems of major maintenance and capital renewal/replacement have troubled higher education since the 1970s. The term deferred maintenance emerged in the early 1970s as college and university administrators began to recognize the serious nature of plant problems on their campuses. The deteriorated plant conditions produced by ignoring older facilities during higher education's post-World War II expansion were compounded by the following:

- Poor designs for institutional durability
- Cost cutting that rapidly produced space with inferior construction techniques, and innovative materials that showed early failures
- Soaring utility costs
- Inflation-reduced operations and maintenance budget reductions
- Inadequate funding for capital renewal and major maintenance
- Increased government regulations resulting in reallocation of resources and further deferral of maintenance

Shift in Focus

The early alerts to the deferred maintenance problem were heralded in news magazine stories in the late 1970s.
The graphic portrayals of scaffold-protected exterior walls, students huddled in overcoats in unheated classrooms, and laboratories with "Closed for Repair" signs introduced an awareness of the issues. Coincidentally, a national debate on the infrastructure crisis illustrated by crumbling bridges, collapsing utilities, and disasters involving loss of life reinforced higher education's problems.

The 1980s saw campuses, through a variety of initiatives by legislators, governing board members, campus presidents, business officers, and facilities directors, begin surveys of conditions. The availability of a tool for inspecting facilities conditions was jointly sponsored by APPA: The Association of Higher Education Facilities Officers and the National Association of College and University Business Officers (NACUBO) in 1982, with publication of the *Facilities Audit Workbook*. This simple format, building on work by the Tennessee Board of Higher Education and military agencies, described a process that produced comparative ratings of campus facilities conditions. The Association of Governing Boards of Colleges and Universities' (AGB) publication of *Crumbling Academe* (1984), NACUBO and APPA's *The Decaying American Campus* (1988), NACUBO's *Managing the Facilities Portfolio* (1990), and APPA's *A Foundation to Uphold* (1996) were supported by seminars and journal articles charting the way to proceed. APPA's *The Facilities Audit* (1993) provided a cost-deficiency technique to measure the extent of deferred maintenance and guidelines for capital renewal.

Results of actions varied, with some campuses responding with effective deferred maintenance reduction programs, others moving the problem onto priority agendas to seek funding, and still others struggling with overwhelming costs and stalled on directly addressing the issue. Where there were successes, they can be attributed to a determination to break the cycle of facilities deterioration. Those institutional leaders who sponsored unpopular positions of reallocating resources saw ways to develop multiple funding sources.

Perceptive facilities and financial managers, seeing that the phrase *deferred maintenance reduction* presented semantic barriers and resistance to acceptance, sought other descriptive terms. Sometimes wrought with pessimism, frustration, and cynicism by business officers and facilities managers, *deferred maintenance* was a pejorative term. It spoke of failures in management, judgment, and stewardship, as though deferred maintenance was a trait of inept management. What followed was a shift in focus to programs of comprehensive financial and facilities planning, adopting the terms *capital renewal*, *facilities equilibrium*, and *capital asset management*. They all offer opportunities for programs consistent with institutional strategic planning.

**Definitions**

**Concurrent Facilities Maintenance Programs**

An institution may be simultaneously conducting programs for major maintenance, capital renewal, and deferred maintenance reduction, along with operations and maintenance activities. The decision to create separate programs is not unusual and usually evolves from different sources of funding and/or different components of facilities management designated to supervise the programs.

Defining terms in their general usage will help in the process of selecting priorities for work and budgeting practices. Consistency in terms also assists in separating different budget components to aggregate overall needs required for comprehensive financial planning for facilities. Terms used in this chapter are defined as follows:

- **Operations**: Activities related to normal performance of the functions for which a building is used (i.e., utilities, janitorial services, waste treatment).
- **Maintenance**: Work necessary to realize the originally anticipated life of a fixed asset, including buildings, fixed equipment, and infrastructure.
- **Repairs**: Work to restore damaged or worn-out facilities to normal operating condition. Repairs are curative, whereas maintenance is preventative.
- **Replacements**: An exchange of one fixed asset for another that has the same capacity to perform the same function. In contrast to repair, replacement generally involves a complete identifiable item of reinvestment (i.e., a major building component or subsystem).
- **Alterations**: Work performed to change the interior arrangements or other physical characteristics of an existing facility or fixed equipment so that it can be used more effectively for its current designated purpose or adapted to a new use.

**Major Maintenance**

The Classification of Accounts jointly developed by APPA and NACUBO provides the following definition for *major repairs and renovations*: "expenditures for those major jobs or projects that must be accomplished but are not funded by normal maintenance resources received in the annual operating budget cycle." The distinction...
between major repairs and minor repairs should be defined by the institution. The key ingredients in this definition are the source of funds and the institutionally set cost limits for the lowest value of major maintenance and highest value for minor repairs.

Major maintenance is sometimes included as a routine part of current fund operations and maintenance. However, an institutional limit for the cost of maintenance work can shift the designation to the category of a capitalized project. Thus, an accounting decision can distinguish capital renewal from major maintenance. Rules are not fixed on the distinctions between the two categories, which can lead to confusion in allocating projects for selection of funding priorities.

**Capital Renewal and Replacement**

*Capital renewal and replacement* is defined as a systematic management process to plan and budget for known cyclic repair and replacement requirements that extend the life and retain usable condition of facilities and systems and are not normally contained in the annual operating budget. Capital renewal is a planned investment program that ensures that facilities will function at levels commensurate with the academic priorities and missions of an institution. Included are major building and infrastructure systems and components that have a maintenance cycle in excess of one year.

*Renewal and replacement* is an accounting term used to distinguish a subgroup of plant fund assets from capitalized plant additions and improvements. However, institutional accounting practices vary; decisions are sometimes made to capitalize portions of major maintenance and renewal and replacement. Replacements in the form of new construction are routinely designated as capitalized and are grouped together with renewals as capital renewal and replacement programs. As a form of capitalized construction, replacements are interchangeable with new construction, whether they are actually replacing an existing facility or are an addition to plant. Linking capital renewals with replacements is a more accurate way to describe a program for renewal of existing plant assets as distinguished from totally new additions to plant assets.

The scope, complexity, cost, and duration of a project can dictate whether major maintenance should be supervised by maintenance management or by a separate design and construction department. As an alternative to using in-house maintenance and design staff, a major maintenance project requiring plans, specifications, and competitive bidding can be designed by consultants and constructed by contractors. Capital renewal and replacement usually requires external assistance in design and construction administration to avoid dedicating facilities management staff to lengthy, time-consuming projects. Regardless of the choice made, major maintenance and capital renewal and replacement require supervision by facilities management staff to coordinate campus conditions (i.e., access during construction, interim relocations, utilities) and ensure project delivery in conformance with specifications, budgets, and schedules.

**Deferred Maintenance**

*Deferred maintenance* is defined as maintenance work that has been deferred on a planned or unplanned basis to a future budget cycle or postponed until funds are available. Roof replacements, major building component repairs, mechanical equipment, underground utilities, and roads and walkways are projects that are often deferred to the next annual funding cycle. This definition could serve just as well for major maintenance and offers a temptation to bypass the use of annual operating budgets and fund major maintenance through a deferred maintenance reduction program. The difference is that a deferred maintenance program is a comprehensive, one-time approach, often extended over several years, to control a massive backlog of maintenance work.

Deferred maintenance reduction programs result from a campus policy to group deferred major maintenance projects, and sometimes other plant needs, into a program funded separately from major maintenance or capital renewal and replacement.

Major maintenance and deferred maintenance are expenditure programs designed to accommodate the deterioration process of facilities; both programs cope with facilities renewal. As a strategy to achieve funding to eliminate problems of facilities deterioration, deferred maintenance reduction programs can be expanded to include life safety, code compliance requirements, and provisions for accessibility. In contrast, major maintenance is a planned activity of facilities renewal funded by the annual operating budget. Failure to perform needed repair, maintenance, and renewal as part of normal maintenance management creates deferred maintenance.

**Functional Improvements**

Space modifications to accommodate program needs, sometimes called *program improvements* or *alterations*, are often overlooked in budgeting for facilities needs. It is common to use maintenance funds as the only available source for improvements. Thus, an erosion in facilities maintenance results from this practice. A preferred
practice is to set up a specific budget line item for functional improvements and to attempt to coordinate major
maintenance projects into planning. For example, a revision to a suite of laboratories could include replacements
for heating, ventilation, and air conditioning (HVAC); electrical systems; and plumbing systems, creating a project
with a larger scope than the space modification project.

**Budgeting for Capital Assets**

**Magnitude of the Capital Renewal/Replacement and Deferred Maintenance Problem**

Questions repeatedly asked by federal and state agencies, legislators, governing boards, foundations, and corporate
donors are, "How large is the problem of facilities deterioration?" and "How much is needed to remedy
conditions?"

As reported by APPA in *A Foundation to Uphold*, the total accumulated deferred maintenance for all 3,768
higher education institutions in 1994 was $26 billion, with $5.7 billion defined as "urgent" needs. The 1994 data
provided by a comprehensive survey identifies deferred maintenance backlogs by Carnegie classification. Changes
in conditions after a baseline year of 1988, the publication date of *The Decaying American Campus*, vary
among institutions. For example, more than half the institutions reported increases in accumulated deferred
maintenance, approximately one-fourth saw declines, and the remainder either stayed the same or did not report
the status of condition.

Benchmarking data highlights comparisons for conditions at similar institutions. The inability to fund deferred
maintenance from current operating budgets exists for many institutions, and it is evident that external funding is
necessary to assist in remediying unsatisfactory facilities conditions.

Faculty, staff, students, and alumni will testify to the needs reported in *A Foundation to Uphold*. Prospective
students and donors also convey the message by admission applications and contributions. The importance of
facilities appearance to student recruitment is underscored by the 1987 study of the Carnegie Foundation for the
Advancement of Teaching on how students choose a college. For 62 percent of the students surveyed, "the
appearance of the buildings and grounds was the most influential factor during a campus visit.”

Federal and state legislators, campus administrators, and governing boards want more than a general estimate of
need. Hard data is demanded to justify the claims for campus capital renewal and replacement and deferred
maintenance needs. At the campus level, a response can be prepared by conducting detailed facilities audits and
condition assessments. Rigorously prepared and creatively presented, often with persistence and persuasiveness,
these surveys and assessments of conditions have proven effective in securing funding.

**Liabilities of Deferred Maintenance**

Renewal and replacement needs vary by region, building type, the extent of facilities use and abuse, and quality of
original construction and maintenance management. Levels of current operating budgets and special
appropriations for capital renewal and deferred maintenance also affect required funding levels. However,
inevitably, building systems and components deteriorate and need replacement. Plumbing wears out, roofing
breaks down and leaks, window frames warp, patched-up electrical wiring becomes dangerous, HVAC systems fail
to heat or cool, and equipment can no longer be replaced.

Underfunding of major maintenance and capital renewal and replacement inevitably results in backlogs of deferred
maintenance. Unsafe buildings and unreliable infrastructure create hazardous conditions. Failing HVAC, electrical,
and plumbing systems jeopardize the usability of spaces necessary for academic, student, and administrative
activities. Unattractive building interiors deter enrollment strategies essential to tuition-dependent institutions.
All of these factors add up to liabilities not shown on a college or university balance sheet.

Viewing campus facilities as liabilities rather than assets should change financial perspectives and encourage
strategic plans for new construction, maintenance, and repairs budgeting and surveys of existing conditions to
develop deferred maintenance reduction programs. Recognition that a significant number of a campus's facilities
are in unsatisfactory condition and are a substantial liability should spur action.

**Funding Sources**

Funds flow into facilities improvements from two funding sources, current and plant funds for preventing
deterioration and renewing or replacing facilities (Figure 1). Current funds routinely provide for major maintenance, and plant funds provide for capital improvements. Deferred maintenance is also supported by plant funds. An additional funding source, an annual renewal allowance, is budgeted from current funds.

Figure 1. Funding Sources

An important reminder is that annual funding for facilities operations and maintenance is expected to accommodate major maintenance and thereby compensate for the aging process of facilities and equipment. Separate funding for functional improvements in operating budgets is necessary to protect funding of capital renewal. Major maintenance is typically treated as a residual category after budgeting for plant administration, building and equipment maintenance, custodial services, utilities, and grounds maintenance. The residual treatment often leaving major maintenance and functional improvements unfunded has proven to be inadequate to meet plant needs and is how most campuses reached their current levels of deferred maintenance. The preferred approach is to establish an appropriate level of funding for major maintenance and capital renewal in the operating budget to prevent continued obsolescence of facilities and equipment.

Annual allocations for facilities renewal can be made either in the major maintenance component of annual budgets for operations and maintenance or as a special line item with identified specific projects. The choice is made according to the strategy most acceptable to campus budgeting practices. The important principle for policy makers to remember is that a one-time elimination of deferred maintenance priorities does not solve the problem of facilities renewal. Campus facilities continue to deteriorate and become obsolete. An annual allocation for facilities renewal is required to prevent future accumulation of deferred maintenance. An appropriate level of funding established at the beginning of a comprehensive facilities funding program may have to include catch-up costs. As needs are reduced to manageable proportions, the operating budget can accommodate priorities as they are identified. The result is a program that maintains campus facilities in good repair, functionally adequate for teaching research, campus life, and public service.

Integrating Maintenance and Repair Financial Planning

The goal of integrated financial planning is to ensure that new capital assets are acquired based on well-defined needs and are cost-effective additions to plant. This means that utilization of existing space is fully examined prior to commitments for planning and funding new construction. In addition, operations and maintenance, along with repairs, replacements, and renovating, must be fully funded to prevent accumulation of backlogs. Maintenance backlogs, when present, should be addressed through facilities audits and assessment of priorities to define funding needs. The integration of the components of facilities management responsibilities, discussed in this chapter as a model program, requires strategic planning and regular adjustments to fit changing conditions (Figure 2).
Figure 2. Integrating Financial Planning

**Budgeting vs. Financial Planning**

The overall cost of maintaining an institution's facilities organization has received varied treatment in the past. Primary attention has been devoted to budgeting techniques for operations and maintenance, with an evident lack of guidelines that can be applied to the wide-ranging conditions and needs of higher education. Some attention has been given to allocations for annual capital renewal to forecast appropriate funds to offset deterioration, similar to the concept of an annual depreciation applied in corporate balance sheet entries for declining plant value. Omitted from these approaches are concepts of financial planning for capital asset productivity of facilities organizations that integrate acquisition of new assets, operations and maintenance, capital renewal, and deferred maintenance.

Planning budget requirements for major maintenance and capital renewal and replacement derives from principles of capital asset depreciation. It is an economic fact of life that facilities have a limited productive or useful life. The life cycle concept defines the useful life of a facility as the aggregate of the durability of individual building components and systems. In common terms, a building does not wear out all at once but fails gradually, by individual systems and components. A planned program of major maintenance and capital renewal by systems and components is necessary to restore deterioration and extend a facility's life.

A common budget management pitfall is the use of major maintenance and capital renewal funding for renovations. The first category deals with deteriorated facilities conditions and protection of capital assets; the second category addresses modifications for functional inadequacies, obsolescence, and new academic or other program improvements. As final budget decisions are reached, pressure is often applied to shift major maintenance and renewal funding to meet program needs. This is an element of "budget politics" that compromises protection of plant assets.

**Major Maintenance and Capital Renewal and Replacement Strategy**

The key components of a major maintenance and capital renewal and replacement strategy are as follows:

- Planning new construction and/or acquisition of capital assets based on utilization of existing assets and evaluation of alternatives for adaptation of existing space
- Funding maintenance and repairs at adequate levels to avoid accumulation of backlogs
- Conducting facilities audits and assessments of conditions
- Prioritizing critical deferred maintenance needs
- Developing multiple funding sources for capital renewal
- Adjusting operating and capital budgeting practices to emphasize maintenance and capital renewal

A capital renewal strategy results in a plan with the following characteristics:

- A continually adjusted process
- A short-term need for deferred maintenance and long-term needs for life cycle renewal
- A coordinated facilities improvement program, funding plan, and monitoring method
A campus's awareness that deteriorating facilities conditions have reached the point of significant liability immediately opens the question: How much is needed to correct the problem?

An effective capital renewal and deferred maintenance reduction program requires reliable estimates of funding requirements and thorough planning. A successful program should estimate funding needs in the following categories:

- Long-term capital renewal needs
- Estimates of short-term programs to reduce deferred maintenance backlogs to acceptable levels

Long-term and short-term needs should be identified concurrently for an institution to achieve desired goals for capital renewal and deferred maintenance reduction programs. This approach recognizes that (1) facilities' conditions continually deteriorate over time and require ongoing investments to maintain functional and financial value and (2) historical facilities underfunding problems must be addressed through a short-term remedial program of deferred maintenance reduction.

Concerns for the condition of the nation's infrastructure resulted in a study by the Building Research Board of the National Research Council. In *Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings*, the Committee on Advanced Maintenance Concepts for Buildings examined issues of financial planning for facilities. The committee's study addressed an array of aspects of the costs of acquiring, maintaining, and replacing facilities to guide financial planning for integrating maintenance and repairs and the backlog reduction of deferred maintenance.

The Building Research Council's conclusions and recommendations are based on the finding that *underfunding of maintenance and repair is a widespread and persistent problem*. To overcome this problem, maintenance and repair budgets should be structured to explicitly identify the expenditures associated with routine maintenance and repair and activities to reduce the backlog of deferred maintenance. The council concluded that an appropriate total budget allocation for routine maintenance and capital renewal is in the range of 2 to 4 percent of the aggregate current replacement value of those facilities (excluding major infrastructure). When a backlog of deferred maintenance has been allowed to accumulate, spending must exceed this minimum level until the backlog has been eliminated.

The specific percentage for a facility depends on a wide range of factors, and the relationship between maintenance and repair requirements and current replacement value may vary widely, for any one building may be outside the proposed range (Figure 3). The 2 to 4 percent range is most valid as a budget guide for a large inventory of buildings and over periods of several years. However, even with small inventories, the 2 to 4 percent rule of thumb may be applied over a longer period, such as five to ten years. An important and often misunderstood point is that this range *does not include* "one-time" funding to reduce deferred maintenance backlogs.
In addition to the council's conclusions regarding overall routine maintenance and capital renewal annual funding, the results of empirical studies of the life cycles of individual components provide general parameters for annual capital renewal allowances, separate from maintenance. Acknowledging variances for ages and types of facilities, a recommended range for the annual capital renewal component of total is 1.5 to 3 percent of the total replacement value of plant. Some evaluations of plant conditions and needs recommend higher ranges. For example, a research-intensive institution will have a high rate of obsolescence and deterioration owing to changing technologies and usage of facilities. Institutions that have implemented a deferred maintenance reduction program will see benefits in lower capital renewal and replacement needs.

In summary, the range of 2 to 4 percent for total funding includes components of 0.5 to 2.5 percent for maintenance and repairs and 1.5 to 3 percent for capital renewal. These ranges heighten the importance of an accurate forecast for annual capital renewal allowance and accurate condition assessments to determine additional needs for deferred maintenance.

**Selecting the Appropriate Method for Estimating Capital Funding Needs**

Selecting the appropriate method for estimating an annual renewal allowance forecast of capital renewal funding needs (Figure 4) requires an understanding of an organization's fiscal planning needs and available resources for estimating.
The goal is to provide an adequate, realistic budget reserve for allocating funds for specific projects. As projects are identified, funds are allocated and expended as required. An allowance provides flexibility in determining which projects will be funded in any given year and gives facilities managers confidence that funds will be available to meet capital renewal needs.

Several methods for forecasting annual renewal allowances have been outlined by Sherman and Dergis in *A Funding Model for Building Renewal*, Harvey H. Kaiser in *Crumbling Academe*, Cushing Phillips Jr., in *Facilities Renewal: The Formula Approach*, and NACUBO's *Managing the Facilities Portfolio*. Estimating methods are characterized by the amount of detail and level of refinement needed for an annual renewal allowance for deferred maintenance project cost estimates.

Methods for estimating *annual renewal allowance* to offset facilities deterioration are based on data developed from building and infrastructure characteristics. Calculations that determine either a dollar amount for annual funding or percentages of total plant replacement value are derived from life cycles of building and infrastructure systems and components. This approach provides an overall estimate of needs and can be done with minimal field inspections of conditions. It is also cost-effective because of the reduced effort involved in gathering data and generating calculations.

The Sherman and Dergis method is a simple but effective set of calculations based on building age. Data requirements are minimal and forecasts are provided for individual buildings and total campus needs.

Another method for estimating an annual renewal forecast is based on calculations of building and infrastructure component renewal cycles. The underlying concept is that building components age at different rates and require different renewal cycles. Facilities renewal forecasts for buildings and infrastructure are developed with the following procedures:

1. **Building attributes**. For each building, the following attributes are identified:
   - Type of construction (reinforced concrete, membrane roofing, etc.)
   - Building use (library, laboratory, residence hall, etc.)
   - Gross area (e.g., 48,000 gross sq. ft.)
   - Current replacement cost

2. **Building component depreciation**. A component depreciation table is prepared for each different building type (Figure 5):
   - Percentage cost of gross building value
   - Life cycle (e.g., membrane roofing, 20 years)
   - Renewal percentage at the end of the life cycle
   - Individual component renewal profiles
3. **Present plant condition**. Each major building system (component) is assessed to account for the present condition of each building. The condition is expressed as a percentage used of the component relative to its life cycle. For example, if the HVAC system has a 20-year useful life but was completely renovated 2 years ago, its percentage used is 10 percent.

4. **Life cycle cost calculation**. The anticipated replacement year(s) for each component is calculated using values for life cycle and the percentage used. The cost of replacement is calculated by using the building replacement cost; the percentage of each component in each building; and the percentage of the component replaced. This cost is assigned to the year(s) of anticipated replacement.

The following example illustrates the calculations:

<table>
<thead>
<tr>
<th>Building System</th>
<th>Renewal Cycle (years)</th>
<th>Percentage of Total Building</th>
<th>Percentage of System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>100</td>
<td>10.52</td>
<td>5</td>
</tr>
<tr>
<td>Vertical support</td>
<td>100</td>
<td>0.00</td>
<td>5</td>
</tr>
<tr>
<td>Floor</td>
<td>75</td>
<td>0.00</td>
<td>5</td>
</tr>
<tr>
<td>Roof</td>
<td>75</td>
<td>18.39</td>
<td>10</td>
</tr>
<tr>
<td>Roofing</td>
<td>20</td>
<td>5.96</td>
<td>100</td>
</tr>
<tr>
<td>Exterior walls</td>
<td>75</td>
<td>8.03</td>
<td>65</td>
</tr>
<tr>
<td>Windows</td>
<td>30</td>
<td>2.76</td>
<td>90</td>
</tr>
<tr>
<td>Exterior doors</td>
<td>30</td>
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<tr>
<td>Partitions</td>
<td>50</td>
<td>6.97</td>
<td>95</td>
</tr>
<tr>
<td>Flooring</td>
<td>7</td>
<td>13.12</td>
<td>95</td>
</tr>
<tr>
<td>Ceiling</td>
<td>20</td>
<td>1.02</td>
<td>95</td>
</tr>
<tr>
<td>Furnishings</td>
<td>25</td>
<td>1.73</td>
<td>95</td>
</tr>
<tr>
<td>Plumbing</td>
<td>40</td>
<td>7.54</td>
<td>95</td>
</tr>
<tr>
<td>Fire protection</td>
<td>50</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>HVAC</td>
<td>20</td>
<td>13.21</td>
<td>75</td>
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<tr>
<td>Controls</td>
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<td>95</td>
</tr>
<tr>
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<td>0.84</td>
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<tr>
<td>Distribution</td>
<td>30</td>
<td>3.58</td>
<td>25</td>
</tr>
<tr>
<td>Lighting</td>
<td>30</td>
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<tr>
<td>Emergency</td>
<td>30</td>
<td>1.85</td>
<td>80</td>
</tr>
</tbody>
</table>

Given that, in 1994, the roof was 50 percent through its lifetime of 20 years, its first replacement will occur in 10 years (2004), and subsequent replacements will occur in 20-year intervals after that (2024, 2044). The replacement cost is 95 percent of the value of the roof, which in turn is 4.3 percent of the replacement cost of the building ($3,540,000). Therefore, the replacement cost is:

\[
95\% \times 4.3\% \times 3,540,000 = 144,609
\]

The cost of $144,609 is assigned to years 2004, 2024, and 2044 for roof replacement on Sample Hall.

After the calculations for each component in each building are completed, the costs assigned to each year are added together into the total renewal cost for that year. The total renewal cost can be calculated for one building, a group of buildings, or the entire campus and can be charted into a renewal expense curve. Annual costs can be monitored to manage special conditions, emergencies, or the need to reallocate a pool of annual funds as required.
Facilities Audits

Routine questions asked of the facilities manager are:

- What are the conditions of our facilities?
- Do we face a significant deferred maintenance problem?
- How much will be needed to correct the problem?
- How do we plan a capital renewal program?

The facilities audit identifies the existing physical condition and functional performance of buildings and infrastructure, as well as maintenance deficiencies. From the information gathered during an audit, capital renewal and replacement requirements can be estimated for prioritizing and phasing projects. The facilities audit provides a basis for decision-making on routine maintenance, capital renewal/deferred maintenance, functional improvements, replacements, and disposal of an institution's facilities.

Setting Priorities

Capital renewal and replacement and deferred maintenance programs require clear guidelines and procedures for setting priorities among potential projects. The desire to balance competition for scarce resources can be satisfied by the funding source's determination of categories of projects and selection criteria.

Priorities by Categories of Work

Setting priorities requires consistent treatment of deficiencies and functional improvement funding requests. Typically, categorizing involves data collection, estimating project requests, and then summarizing project requests for a five- or six-year budgeting cycle. Selection of priorities is based on a systematic categorization established by an institution or governing board.

Suggested groupings in broad descriptive categories for selecting priorities are as follows:

- **Liability proposals**: special matters requiring early attention to remove jeopardy through life safety, property damage, regulatory, or court-ordered actions
- **Program and operational purposes**: actions necessary to support an organization's mission and meet operational requirements
- **Economy and efficiency measures**: projects that also support program and operational objectives but deserve special attention because they will result in immediate or eventual cost savings

A suggested outline for ranking priorities by point values is shown in Figure 6. Three priority levels for a five-year program are described that can be interpreted from the component rating forms. Categories and subcategories can change annually. Careful judgment is necessary in choosing the priorities to fit with strategic planning and other policy considerations. Selection guidelines and project categories should be re-examined annually to ensure compatibility with institutional goals.
Separate Priority Lists

The setting of priorities and selection criteria for capital renewal should be reviewed annually, or on a schedule compatible with submission of capital requests. A triage process to assign projects to the most appropriate funding source can discover opportunities that were overlooked in the past. For example, an initial inspection of project requests should segregate potential funding sources, including operating budgets, quasi-endowment funds, reserves, and grants. In reviewing all projects, opportunities should be analyzed to "package" several projects for economies of scale. For example, roofing repairs and replacements for several buildings are commonly grouped together into a single project to allow for lower unit pricing. Similar operations, such as erecting scaffolding or suspending use of portions of buildings, also lend themselves to cost efficiencies and minimize building use inconveniences.

Intangible Factors

Other factors do not readily lend themselves to categories but should be considered when making funding decisions. Faculty and staff morale make a positive contribution to overall productivity and can be influenced by sufficient space and properly functioning, well-furnished and well-equipped, attractive, and well-maintained facilities. Faculty and staff recruitment and retention are similarly affected by the physical appearance of facilities and the architectural qualities of buildings and site aesthetics.

Historic preservation is an important aspect of a campus's traditions and image. Facilities that are in marginal condition and being considered for replacement may be more valuable, because of their historical importance or as a focal point for a community, if they are retained and improved. Organizing these categories and intangible factors into a specific set of selection guidelines enables decisions based on technical evaluations and an institution's requirements.
Management Philosophy

Two concepts influencing final priority decisions are need and risk. For example, are projects for improving quality of the environment selected before life safety or operating economy projects?

In the final analysis, selection of priorities by management is based on the relative weight given to the protection of plant assets, possible fiscal instability caused by postponing deferred maintenance or energy conservation measures, the visual image of the institution, and the risk of erosion of function and quality of environment. Although these matters may seem relatively intangible, they can be as debilitating as the more obvious physical consequences of deferring high-priority building and site repairs.

Selection of priorities for major maintenance and capital renewal and replacement includes temptations similar to those that occur in the development of annual operating budgets. The annual operating budget, which is established in a political environment of satisfying short-term needs that conflict with institutional goals, becomes a compromise between alternatives. Overcoming this traditional approach to distribution of resources requires clear policy guidelines in selecting priority projects and a strong partnership between the facilities manager and senior administration. The following principles should guide the priority selection process:

- Major maintenance and repairs in the annual operating budget should be reserved only for projects offsetting facilities deterioration and extending the life of plant assets.
- New construction or major renovations for program improvements should be funded separately from major maintenance and repairs.
- Deferred maintenance or renovations should be funded as special appropriations on a project-by-project basis.

Capital Budget Review Process

The vicissitudes of the budget process can be minimized by a capital budget review committee that includes the campus chief executive officer, chief academic and business officers, and facilities administrator. Monitoring of progress on major maintenance and capital renewal is done by the committee on a frequent basis, preferably quarterly. This permits a routine opportunity for introducing emergencies and new priorities and enhances management of institutional cash flow. Reports provided by the facilities administrator summarize the status of authorized and funded projects and list proposed projects for the following budget. An additional report summarizing anticipated projects for a "rolling" five-year period assists in overall campus long-range budgeting.

An annual meeting of the committee provides the formal approval for projects to be incorporated into the budget cycle for the following year. Use of this process integrates major maintenance, capital renewal/replacement, and capital improvements. Deferred maintenance reduction programs, where established, are included in the review committee's responsibilities of overall institutional fiscal management.

The process of selecting projects for funding is supported by priority guidelines. A preliminary evaluation is made, classifying projects by funding source. Self-amortizing projects are evaluated on their own merits. Next, capital construction is defined and set aside from the priority selection process under criteria different from major maintenance and program improvements. Capital projects for new construction of major additions are usually self-defined by program scope, complexity, and costs. Distinguishing between maintenance and capitalized construction eases the task of prioritizing major maintenance and program improvements to be funded from annual operating budgets. Classification of a project as capital construction is usually guided by minimum cost ranges (e.g., $50,000 to $500,000) and should be based on an institution's budgeting practices of funding facilities improvements.

Invariably, the funding needs of major maintenance and program improvements exceed available budgets. Special allocations for unfunded projects from operating budgets can be aided by following the guidelines for priority selection. The process of selecting project priorities consists of systematic categorization to arrive at funding decisions. Occasionally, first priorities for available funds are bypassed, and lower priorities are advanced when improvement projects are selected before repair and renovation projects. For these reasons, it is essential that an institution use the facilities audit as the basis for developing facilities improvement policy to meet the funding needs for observed conditions.

Capital Renewal Planning
Capital Renewal Planning Process

Capital renewal planning is a continuous process, beginning with a preliminary plan covering several years and evolving into a final plan adjusted on an annual basis. A preliminary plan for capital renewal defines overall goals for short-term needs for deferred maintenance and long-term needs for life cycle renewal of facilities components. Such a plan for guiding the shifting in the level of facilities condition from marginal to desirable will be influenced by institutional mission and strategic plan. These factors have become increasingly important as declining resources have affected restructuring, resulting in downsizing, shifts in emphasis from research to undergraduate teaching, and demands to improve the quality of campus residential life. Thus, a resource allocation model for capital renewal is an integral part of an overall strategic plan.

The process of developing a preliminary plan includes the following:

- Project prioritization
- Determination of the rate of annual capital reinvestment
- Determination of the duration of a deferred maintenance reduction program

A final capital renewal plan matches the rate of capital reinvestment over a period of time with the desired duration of a deferred maintenance reduction program. The result is a coordinated approach for capital renewal and maintenance that is designed to protect capital assets, is based on a funding plan, and includes monitoring of the program.

Estimating Short-Term and Long-Term Renewal Needs

Short-term and long-term needs must be addressed concurrently if an institution is to begin the capital renewal process within a reasonable period of time. Deferred maintenance, which typically results from insufficient operating budgets for maintenance, is the focus of a short-term renewal program. However, unless long-term needs for adequate maintenance and renewal are also addressed, backlogs of maintenance work will continue to accrue. Historical facilities underfunding must be addressed through a short-term program of deferred maintenance reduction, and a facilities renewal component must simultaneously be added to the operating budget to offset ongoing facilities deterioration.

Short-term renewal needs are estimated by a facilities assessment program that forms the basis of a deferred maintenance reduction plan. The facilities audit is the first step in estimating needs, followed by a tabulation and prioritization of deficiencies. The final steps are to determine available funding for deferred maintenance, compile a preliminary plan, and document individual projects.

Long-term facilities renewal needs are developed using the techniques for facilities renewal forecasting described earlier.

Facilities Condition Index

A method for measuring the relative condition of a single facility or group of facilities is useful in setting annual funding targets and the duration of deferred maintenance reduction. The facilities condition index (FCI) serves this purpose. The FCI is the ratio of the cost of remedying facilities deficiencies to the current replacement value.

\[
\text{Facilities Condition Index (FCI)} = \frac{\text{Deficiencies}}{\text{Current Replacement Value}}
\]

The following definitions are used in calculating an FCI:

- **Deficiencies**: The total dollar amount of existing major maintenance repairs and replacements, identified by a comprehensive facilities audit of buildings, grounds, fixed equipment, and infrastructure. The amount does not include projected maintenance and replacements or other types of work, such as program improvements or new construction. Those items should be treated as separate capital needs.
- **Current replacement value**: The estimated cost of constructing a new facility containing an equal amount of space that is designed and equipped for the same use as the original building, meets the current commonly accepted standards of construction, and also complies with environmental and regulatory requirements.

The FCI provides a readily available and valid indication of the relative condition of a single facility or group of facilities. It also enables the comparison of conditions with other facilities or groups of facilities. The higher the FCI, the worse the conditions. For example, after conducting an inspection of buildings and infrastructure, a campus with 3.5 million gross sq. ft. finds it has $60 million in deferred maintenance costs. Thus, using an example current replacement value of $100 per square foot ($350,000,000), the FCI is 0.171, an indication of poor conditions. Similar calculations for individual buildings can provide comparisons of relative conditions.
Suggested ratings for comparative purposes based on results of comprehensive facilities audits at a number of higher education institutions are assigned FCI ranges as follows:

<table>
<thead>
<tr>
<th>FCI Range</th>
<th>Condition Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 0.05</td>
<td>Good</td>
</tr>
<tr>
<td>Between 0.05 and 0.10</td>
<td>Fair</td>
</tr>
<tr>
<td>Over 0.10</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Costs for correcting facilities deficiencies obtained from an audit and a calculation of the current replacement value allows modeling of the variables for annual and total funding needs and the rate of backlog reduction. For example, if only 1 percent of the current replacement value is available, the change in the FCI can be calculated, or a determination to achieve an FCI of 5 percent in 10 years can produce a calculation of annual capital renewal needs.

A rule of thumb for the annual reinvestment rate is 1.5 to 3.0 percent of current replacement value. However, experience is showing a preference for the upper end of the range (2.0 to 3.0 percent) to prevent further accumulation of a deferred maintenance backlog. As noted earlier, this is separate from funding required to eliminate immediate critical needs of deferred maintenance. A capital renewal plan must include funding for two factors: deferred maintenance backlog reduction and component renewal. This concept is fundamental to capital renewal funding planning. Adequate analysis of various funding options for facilities conditions is done with backlog and funding projection models.

**Backlog and Funding Project Models**

Short-term capital renewal plans ideally reduce deferred maintenance backlogs to acceptable levels. Targets established by the FCI offer choices in determining backlog and funding levels.

How much to spend on capital renewal is guided by the results of an audit and the total cost of prioritized projects. Resource allocation questions are:

1. What are the effects of different amounts of annual expenditures for capital reinvestment on total backlog reduction?
2. What is a desirable rate of annual expenditures for reducing marginal facilities conditions?

Restated, this could be posed as, How will \( x \) dollars be spent for some number of years to reduce the backlog of deficiencies at the end of the period? Or, how much must be spent over a certain number of years to reach a desired level of conditions for all campus facilities?

Factors to be considered in developing backlog and funding models are as follows:

- **The rate of inflation**. A deficiency will cost more to repair next year than it will cost this year because of increases in labor and material rates.
- **The rate of overall plant deterioration**. Facilities are in a constant state of deterioration. While the identified deficiencies are being corrected, other deficiencies are being created.
- **The rate of backlog deterioration**. A component with an existing deficiency will usually deteriorate at a somewhat faster rate than a component that is in good condition.
- **The rate of plant growth**. As the gross square footage of the institution increases, so does the potential for maintenance and repair deficiencies.

To apply the backlog and funding projection models, the following terms are used:

- **Current replacement value** \( (V) \): The cost of replacing all assets. The initial value \( (V_o) \) can be determined as of a given date and then projected for future years, based on inflation and facility growth.
- **Projected plant growth rate** \( (G) \): The planned percentage increase or decrease in gross square feet per year from new construction, acquisition, or disposal. The plant growth rate is expressed as a percentage of current replacement value per year. It can be assumed to be constant or it can vary from year to year.
- **Maintenance and repair backlog** \( (B) \): The deferred maintenance backlogs as of a given point in time. The initial level of the repair and maintenance backlogs \( (B_o) \) is the cost, as of a given date, to eliminate all facilities deficiencies identified as deferred maintenance in the facilities audit. The calculation of future maintenance and repair backlogs takes into account the time elapsed, the rates of plant and backlog deterioration, and annual funding levels. The FCI can provide guidance in establishing backlog targets.
• **Assumed annual funding levels (F)** : Projected to determine the level of maintenance and repair backlog at the end of a certain number of years. The funding will be applied to all maintenance and repair.

• **Projected annual inflation rate (I)** : Expressed as a percentage per year. It can be assumed constant or it can vary from year to year.

• **Estimated annual rates of backlog deterioration (D)** : Expressed as a percentage per year. The rates can be assumed to be constant or vary from year to year. A component with an existing deficiency will usually deteriorate at an annual rate that is somewhat greater than that for a component that is in good condition. On this basis, values for average annual rates of backlog deterioration range from approximately 2 to 10 percent.

• **Estimated annual rates of overall plant deterioration (P)** : Includes all maintenance and repair as described earlier, except the reduction of backlog. The items primarily include minor maintenance and repair, equipment maintenance, component renewal, and other maintenance and repair. The rate of overall plant deterioration is expressed as a percentage of current replacement value per year. It can be assumed to be constant, or it can vary from year to year.

Both the backlog projection and the funding projection models demonstrate the impact of various funding levels on overall facilities condition levels. These models can be powerful management support tools. When used properly with facilities data, the models can assist decision makers in managing capital renewal.

**Backlog Projection Model**

The backlog projection model projects the level of deferred maintenance backlog that will be obtained when assuming a certain funding level. It helps answer the question, If annual funding for maintenance and repair is provided at a given level for \( n \) years, what will the backlog level be at the end of the period? To apply the model, the current replacement value and backlog level must be determined; the annual rates of inflation, backlog deterioration, plant deterioration, and plant growth must be assumed; and the theoretical annual funding level must be applied.

The formula to project backlog is as follows:

\[
B_n = (B_{n-1} \times (1 + I_n + D_n) + (V_n \times (P_n)) - F_n,
\]

where:

- \( B_n \) = Backlog at end of year
- \( V_n \) = Current replacement value at end of year \( n \)
- \( V_n = (V_{n-1} \times (1 + I_n + G_n)) \)
- \( I_n \) = Inflation rate in year \( n \)
- \( D_n \) = Backlog deterioration rate in year \( n \)
- \( P_n \) = Plant deterioration rate in year \( n \)
- \( G_n \) = Average plant growth rate in year \( n \)
- \( F_n \) = Planned funding in year \( n \)

A backlog reduction projection model is illustrated in Figure 7. This illustration assumes a backlog of $20 million and a current replacement value of $400 million. The chart shows the relationship between various levels of annual repair and maintenance funding and the resulting levels of backlog at the end of a five-year period. A reinvestment rate in this example of less than 2.5 percent of initial replacement value causes overall facilities conditions to deteriorate from the current 5.0 percent FCI.
The funding projection model projects the level of annual maintenance and repair funding required to produce a certain backlog level. It helps answer the question, What annual funding levels will be required to meet a given backlog target in \( t \) years? To use the model, the current replacement value and current backlog level must be determined; the annual rates of inflation backlog deterioration, plant deterioration, and plant growth must be assumed; and the target backlog must be applied.

The formula to project funding is as follows:

\[
Fn = (Bn - 1) \left(1 + In + Dn\right) + (Vn)(Pn) - Bn
\]

where:

- \( Fn \) = Projected annual funding
- \( Bn \) = Backlog at end of year \( n \)
- \( Vn \) = Current replacement value at end of year \( n \)
- \( Vn = (Vn - 1) \left(1 + In + Gn\right) \)
- \( In \) = Inflation rate in year \( n \)
- \( Dn \) = Backlog deterioration rate in year \( n \)
- \( Pn \) = Plant deterioration rate in year \( n \)
- \( Gn \) = Average plant growth rate in year \( n \)

A funding backlog projection model is illustrated in Figure 8. The relationship is shown between different levels of target backlogs at the end of five years and the average annual funding required over the five-year period to achieve different target levels. Calculations are performed for different target backlogs using the FCI as a measure.
Protecting Capital Assets

Funding Capital Renewal

Seeking funds for capital renewal on the scale required to reduce deferred maintenance backlogs is a challenging venture for higher education. For some colleges and universities, the traditional method of funding capital improvements from the traditional sources of gifts and grants is inadequate for the tasks faced by those universities. Successful examples show that multiple funding sources are necessary, providing a stream of funding that meets capital and component renewal project priorities. The spreading out of projects allows pooling of multiple sources to meet annual needs. This principle enables funding planning that can incorporate some of the following experiences of public systems and independent institutions.

Bond Issues

Borrowing for capital projects is a routine practice for public systems of higher education and is used occasionally by independent institutions. The urgent need for capital renewal has made acceptable the issuing of general obligation bonds, revenue bonds, or other options for new construction to use for reinvesting in existing facilities. The Commonwealth of Virginia and the states of Georgia, California, Mississippi, and others have initiated this practice. Vanderbilt University borrowed $150 million to finance renovation and deferred maintenance projects.

Operating Budgets

Some institutions have begun supplementing annual operating budgets with additional funds for capital renewal. Even in difficult financial times, states and independent institutions have both begun to reallocate financial priorities by establishing an amount in the operating budget specifically for deferred maintenance.

The College of Wooster initiated a funding model in 1977 using a "capital charge" budgeting concept to develop a reliable source of capital renewal funding for five-year planning cycles. An amount was incorporated annually into the operating budget and defined as a charge to create a reserve for funding capital renewal and debt reduction. An unrestricted gift was allocated to a reserve fund to initiate the concept. Each year's charge to the annual operating budget includes an average of projects budgeted in the current year and estimates of projects to be done in each of
The Commonwealth of Virginia developed a maintenance reserve appropriation in 1982, distributing funds to public institutions using a formula developed by Douglas R. Sherman and William A. Dergis (A Funding Model for Building Renewal, 1981). Each institution is required to prepare a maintenance reserve plan describing projects. Funding is provided as a supplement to the operating budget for maintenance, following an assumption that approximately 50 percent of the formula amount is already contained in the operating budget.

**Depreciation Accounting**

Changes to depreciation accounting guidelines for higher education offer a potential solution to provide a constant funding source for capital renewal. Although not sufficient to fund substantial backlogs of deferred maintenance, maintenance depreciation entries in the balance sheet can provide a substantial source for renewal funding. The challenge is to create depreciation reserves from current revenues equal to the declining value of capital assets. Some institutions that were able to use "off balance sheet" funding for capital renewal are currently creating depreciation maintenance reserve funds from revenues and including them in operating budgets.

The model created by Boston College in 1976 combined the annual operating budget and a separate capital budget for renewal funding. Boston College was able to rely on unexpended depreciation reserves for capital budgeting. Depreciation accounting and funding the depreciation charge through the operating budget was an innovative technique. Based on the concept that current users should pay for renewal and replacement, an equitable charge was included in the annual operating budget to develop a consistent source for funding facilities renewal. The retirement of long-term debt and a reduction in acquiring debt for new projects will improve the allocation of available funds for future renewal.

**Quasi-Endowment Funds Conversion**

Institutions with quasi-endowment funds or "funds functioning as endowment" have sacrificed interest earnings by designating the funds for use in capital renewal. This is a controversial action requiring approval of a governing board, but is a valid stopgap when current revenues are unavailable and the institution wishes to avoid incurring additional debt. Rensselaer Polytechnic Institute plans to partially fund $142 million in deferred maintenance by conversion of unrestricted quasi-endowment funds.

**Plant Fund Reserves**

Building up plant fund reserves by transferring income surplus offers a source for capital renewal funding. This decision is made in assigning priorities in the institutional budget-making process. Although not a guaranteed stream of funding, prudent financial management can create reserves allocated to fund deferred maintenance projects. Reserves can be drawn from a pool of funds as projects are defined and expenses incurred. Syracuse University used plant fund reserves to supplement maintenance operating budgets for funding more than $150 million in capital renewal and replacement over a 15-year period, beginning in 1973.

**Fund Raising**

Obtaining gifts for capital renewal represents a greater challenge than funding new construction. New or expanding programs and replacement of existing facilities have a greater appeal to donors than requests to fund deferred maintenance. However, as decaying campus facilities have become a high priority, attention has shifted from new projects to renovation of existing facilities as a target for designated gifts.

Strategies have varied from individual campaigns for specific facilities to an overall fund-raising effort with unrestricted gifts channeled to capital renewal. These approaches afford alternatives for development programs and donor choices. Some campuses have prepared lists of capital renewal projects to be included in major fund-raising programs. Changes in policies of foundations have seen the new priorities as valid reasons to award grants in support of renovation projects. By pooling challenge grants with gifts and other institutional resources, campuses can achieve a goal for a designated project not easily reached with a single gift.

**Energy Conservation**

Deferred maintenance projects for mechanical and electrical systems, utilities infrastructure, or central energy plants can be treated as unique capital renewal projects for energy conservation. Facilities audits have shown that 40 to 50 percent of deferred maintenance exists in these categories. The rationale that energy conservation will
result from these projects is based on cost-benefit analyses identifying payback periods. Thus an investment in energy conservation can be considered self-financing.

Vanderbilt University finances energy conservation by a utility depreciation reserve created by a 14 percent "tax" added to the university’s electric bills. The reserve has been supplemented by energy conservation grants. Syracuse University has obtained more than $6 million in energy conservation grants, some at 100 percent of project costs and others as matching grants. Sources include federal and state programs and programs offered by the local public utility to stimulate demand-side energy reductions. Incentives offered by private companies to participate in energy savings are an alternative method of funding a component of deferred maintenance.

Managing Capital Renewal and Deferred Maintenance Reduction Programs

Managing the long-range integrity of facilities in support of an institution’s mission is a broader challenge than routinely responding to repair emergencies or requests for modifying offices or laboratories. Management of a capital renewal and deferred maintenance reduction program starts with clear understanding of the following:

- **View a facility as a collection of components and systems**. The deterioration of a component can cause breakdowns in other parts of a system. Evaluation of a repeated maintenance problem should consider the system nature of facilities. Facilities deterioration can be offset by maintenance management staff pooling knowledge of unsatisfactory conditions that are developing into major problems.

- **Keep track of facilities conditions**. An annual audit of physical conditions to note current problems and priorities should be a basic practice of facilities management. Familiarity with conditions enables the facilities manager to become aware of the most pressing needs. Lack of knowledge of conditions prevents anticipating major problems and avoiding budget surprises for overall campus fiscal management.

- **Maintain a five-year major maintenance and capital renewal program**. A five-year capital budget plan provides a level of confidence for senior administrators in the facilities management staff by regularly reviewing overall campus capital requirements. A level of capital requirements is established in long-range budget base planning, offering flexibility for emergencies or special situations that cannot be anticipated. Finally, the facilities manager has an operational framework for maintenance management to direct staff, materials, and contractors to appropriate priorities.

- **Know the differences between maintenance, repairs, and major maintenance**. The categories may sound so routine that the important differences are not distinguished. A simple check on the practices of work management and control is the proportion of staff devoted to routine building and preventive maintenance and the proportion devoted to major maintenance. Although many facilities managers take justifiable pride in their staff’s construction accomplishments, they are mistaken if they look at their labor pool primarily as a construction team. Unless the facility is located in an area where competition from contractors is unavailable, the wrong emphasis is being placed on work management if the majority of staff labor hours are allocated to major maintenance.

- **Manage maintenance as opposed to maintaining management**. Any size institution needs a work control center to assign tasks, control material purchases, and be a responsive service organization. Similarly, annual capital budget planning is part of a five-year capital budget plan that integrates all funding streams with work priorities. Failure to bring these basic management programs into routine operations is a sign of complacent management and of an organization prepared to complain about inadequate funds and a lack of appreciation for staff that is dedicated, loyal, and hard working.

- **View facilities management as a support service**. A central purpose of an academic enterprise is to maintain the quality of its academic programs. Maintaining the quality of campus life for all members of the campus community is a close second. In terms of allocation of resources, facilities come in at least third. Something else, hopefully, may qualify as last. Disappointment in the occasional short shrift in funding can be overcome by accomplishment in providing efficient service. Prompt responses to requests, explanations for delays and postponements, and attention to meeting the service needs of the specific requirements of a college or university are traits of the service organization.

Understanding these principles can create a fresh approach to practices and procedures. The facilities manager should take good stock of the condition of plant, including buildings, grounds, utilities, and equipment. Walk through the buildings, keeping in mind the operations and maintenance budget. Be candid in the self-evaluation of the maintenance management’s effectiveness. Also, have a feel for the previous annual funding for major maintenance and the tempo of plant additions. (A quiet period or increase in activity? A shift from new construction to renovations?) Set aside frustrations from "inadequate" budgets and be self-critical of work control, staff performance, and the presentations of requests for increased base budgets and special capital appropriations.
As the facilities administrator walks the grounds and through buildings from basement to roof, note should be taken of deferred maintenance, especially for life safety problems and a building’s exterior envelope—roofing, flashings, mortar, or other sealants and places where deterioration permits moisture penetration. Check the operating records for failures of mechanical systems and complaints about heating and cooling. Finally, observe environmental safety conditions such as exits, toxic waste storage, sprinkler systems, and smoke detectors. Observe for any obstacles to disabled individuals.

This is an informal checklist to set the facilities manager onto the task of preparing a strategy for a major maintenance and capital renewal program. Formal aspects of the program begin with senior plant administrators evaluating the overall facilities management program for the institution. Later, tasks are defined for the administrator of the small campus to personally take on with available assistants or, at a larger campus, to delegate to staff.

A Plan of Action

To summarize, an action plan for comprehensive management of capital renewal and deferred maintenance reduction programs includes the following:

- Build a constituency of campus support
- Develop a work plan
- Inventory conditions
- Select priorities
- Determine funding requirements
- Seek funding sources
- Create public awareness of facilities conditions and funding needs

Continue the cycle until results are produced. The actions are necessary to prevent further plant deterioration and protect capital assets.

The Management Renewal Challenge

The facilities officer should not be discouraged at the initial response to the magnitude of costs reported in a comprehensive audit for capital renewal/deferred maintenance reduction and the gap between current and required funding to maintain renewed facilities. Resource reallocation and supplementary funding will probably be required for renewal and replacement of facilities with a high proportion of deficiencies. Capital renewal is a long-term process, and programs should be designed with this in mind. The audit process is a key component of a capital renewal program that should be updated annually, reporting progress towards goals, identifying new priorities, and adjusting to programmatic changes affecting renewal and replacement.

A useful approach to consider is the revitalization of facilities staff to inspire confidence for funding deferred maintenance. Feelings of pessimism, frustration, and cynicism among the facilities staff at Santa Clara University stimulated a program of facilities management renewal to cope with lack of support for deferred maintenance funding. The concept centered on renewal of the management team, changing attitudes to gain credibility for funding deferred maintenance. Santa Clara’s facilities management adopted a vision for their capital renewal program that included the following:

- Communicating, with credibility, the scope of the renewal and deferred maintenance needs and costs
- Proposing a strategy for achieving facilities equilibrium in a reasonable time frame
- Engaging in the budget decision process to ensure understanding of and advocacy for renewal projects
- Achieving measurable results, small and large, short-term and long-term

Facilities management team renewal can strengthen support for funding facilities renewal by increasing management’s credibility through improved attitudes, actions, and accomplishments. The attitudes, visions, and strategies of Santa Clara University’s management team are applicable for facilities managers throughout higher education.

Notes


