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# State Building Maintenance

Report #98-04

February 1998

A P r o g r a m E v a l u a t i o n R e p o r t

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Office of the Legislative Auditor  
State of Minnesota

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STATE OF MINNESOTA  
**OFFICE OF THE LEGISLATIVE AUDITOR**  
JAMES R. NOBLES, LEGISLATIVE AUDITOR

February 16, 1998

Members  
Legislative Audit Commission

The state of Minnesota is responsible for more than 4,800 buildings worth about \$7 billion. Concerned about how well the state is protecting these public assets, the Legislative Audit Commission directed us to evaluate state building maintenance policies and practices.

We found that most state buildings are generally in good condition, but there is a large backlog of deferred maintenance that needs to be addressed. Managers of state facilities acknowledge that they should be doing more preventive maintenance so that problems are resolved before they become more serious and expensive. Also, there is evidence that state spending for building maintenance has been less than applicable national standards.

We recommend strengthening preventive maintenance programs to ensure that important building components are adequately maintained before they deteriorate. We also discuss options for providing adequate funding for building maintenance, including adopting a funding formula within agencies' operating budgets.

We received the full cooperation of the University of Minnesota, the Minnesota State Colleges and Universities, and state agencies, particularly the departments of administration and finance. This report was researched and written by Dan Jacobson, Jan Sandberg, and Tina Tsuei who jointly managed the project.

Sincerely,

A handwritten signature in cursive script that reads "James Nobles".

James Nobles  
Legislative Auditor

A handwritten signature in cursive script that reads "Roger Brooks".

Roger Brooks  
Deputy Legislative Auditor

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# MINNESOTA OFFICE OF THE LEGISLATIVE AUDITOR

# State Building Maintenance

## SUMMARY

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**P**reservation of buildings owned by the State of Minnesota has become a topic of increasing concern within both the legislative and executive branches of government. Over the years, the state has made a significant investment in structures of many kinds: office complexes, college classroom facilities, storage sheds, monumental buildings, correctional facilities, and many other types of buildings. Altogether, state agencies, the University of Minnesota, and Minnesota State Colleges and Universities (MnSCU) are responsible for over 4,800 buildings with about 73 million square feet and a replacement value that exceeds \$7 billion. Policy makers are concerned about whether this investment is adequately protected and whether the state's buildings are adequately maintained.

In 1994, the Department of Administration estimated that the state had a deferred maintenance backlog of roughly \$1.5 billion. This represents a significant amount of deferred maintenance and raises important questions about the adequacy of state building maintenance and the suitability of the state's maintenance policies and procedures.

The evaluation addressed the following questions:

- **What is the condition of the state's buildings?**
- **Does the state have a deferred maintenance backlog? If so, how large is it?**
- **Does the state protect its building investments with adequate maintenance practices, including preventive maintenance?**

To answer these questions, we examined the Department of Administration's Facility Audit Survey data on the condition of state buildings, reviewed deferred maintenance projects identified by state agencies and higher education institutions, toured various buildings, interviewed facility management personnel, and reviewed the literature on building maintenance. We also surveyed physical plant directors and facilities managers about their maintenance practices.

Legislators were also interested in knowing whether state policies and practices add to the cost or time to construct new state buildings. Although we did not examine this issue in depth due to resource constraints, we did survey private consultant designers and construction contractors and employees from state agencies and higher education institutions to determine their perspective on this issue.

## BUILDING CONDITION

Under the Department of Administration's Facility Audit Survey, state departments, colleges, and universities evaluated each of their buildings in terms of 98 building elements within 6 broad building components: building exteriors, roofs, mechanical systems, electrical systems, interiors, and sites. Most buildings were rated in 1994 or 1995. The survey asked maintenance staff to rate the physical condition and performance of each element as good, fair, or poor. In addition, the survey asked about building suitability, which differs from physical condition in that it considers whether the element meets the needs of the building's occupants. For example, a ventilation system that is in good working order but does not have adequate capacity to meet modern ventilation standards may be rated in good physical condition but poor for suitability.

Our analysis of the Facility Audit Survey data indicates that:

- **State agencies and higher education institutions rated most of their building components in good physical condition, although ratings for building suitability were generally lower.**

The percentage of buildings receiving "good" physical condition ratings ranged from 78 percent for electrical systems to 65 percent for roofs. The percentage with "poor" ratings ranged from 2 percent for electrical systems to 10 percent for roofs. State agencies and higher education campuses rated 42 percent of their buildings as "good" for all five primary building components although one building in five had at least one building component rated as "poor."<sup>1</sup>

Suitability ratings were generally lower than physical condition ratings. For example, while state entities rated mechanical systems in "poor" physical condition for only 5 percent of buildings, they were more likely to rate suitability as "poor" for each of the major mechanical systems: cooling systems (22 percent), ventilation systems (21 percent), heating systems (14 percent), and plumbing systems (10 percent).

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**One-fifth of state buildings had at least one major component rated as "poor."**

## DEFERRED MAINTENANCE ESTIMATES

In 1994, the Department of Administration asserted that the state had a large "capital iceberg" of deferred maintenance of unknown size.<sup>2</sup> Its rough estimate of \$1.5 billion was obtained by (1) using studies from other states to estimate that the deferred maintenance for state agencies and state colleges and universities was about \$10 per square foot, or \$600 million, and (2) using the University of Minnesota's own estimate that its deferred maintenance was about \$923 million. The University's estimate was based on a theoretical model that considered the life expectancy, age, and replacement cost of major building components. To

<sup>1</sup> This analysis excluded the site component because site ratings were missing for many buildings.

<sup>2</sup> In this report, we use the term deferred maintenance in the same way that the Department of Administration uses the term "capital iceberg," that is, maintenance, repair, replacement, and renewal projects that are due but have not been completed.

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**State agencies, colleges, and universities used a variety of approaches to estimate deferred maintenance.**

provide more concrete evidence of deferred maintenance, many state entities have identified specific building deficiencies and estimated the cost to correct them.

It is important to recognize that state departments, colleges, and universities used a variety of approaches to estimate their deferred maintenance. The principal difference involves the degree to which agencies included building improvements designed to bring building components up to modern standards. Some agencies defined deferred maintenance narrowly by including only physical defects that occurred because of physical deterioration. In contrast, the University of Minnesota took a broad view by also including the cost of upgrading buildings to meet modern standards, including modern heating, ventilation, and air conditioning standards, energy standards, fire and life safety standards, and accessibility standards. For example, the University included the cost of adding modern central air conditioning systems to buildings which lacked air conditioning or had only window air conditioners or small rooftop systems.

- **Overall, we confirmed that there is a substantial amount of deferred maintenance attributable to physical deterioration of state buildings, though there is considerable uncertainty over the exact amount.**

Statewide, the amount of deferred maintenance is not known with precision for several reasons. First, because definitions of deferred maintenance varied greatly among state entities, we could not simply add the estimates together. Instead, we had to make assumptions for some state entities to make estimates reasonably comparable. In addition, state agencies and higher education campuses vary in how thoroughly they have inspected their buildings and how they estimated the cost to correct the deficiencies.

Together, state agencies and MnSCU have identified roughly \$230 million in deferred maintenance, most of which is attributable to physical deterioration. While the University of Minnesota's deferred maintenance estimate is much higher (\$923 million), most of it involves the cost of upgrading buildings to meet modern standards rather than correcting physical deterioration. For example, comprehensive assessments of ten buildings scheduled to be renovated under the University's six-year capital plan indicate that 41 percent of the estimated cost is attributable to upgrading heating, ventilation, and air conditioning to modern standards and 30 percent is for correcting fire, life safety, asbestos, and accessibility deficiencies.

The fact that the University of Minnesota's buildings have the same average age as state agency buildings suggests that they may have roughly the same amount of physical deterioration as state agencies (on a square-footage basis). Allowing for a possibly large amount of unidentified deferred maintenance,

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**Some state buildings have a substantial amount of physical deterioration.**

- **We estimate that the statewide level of deferred maintenance attributable to physical deterioration is between \$300 million and \$600 million.**

State agencies identified about \$140 million in deferred maintenance projects, most of which involve physical deterioration. For example, the Department of Corrections reported about \$46 million in deferred maintenance, the largest

amount of any state agency. About half of this amount is to replace or repair deteriorating windows and walls, particularly at Stillwater State Prison. For example, part of the catwalk on Stillwater's security wall has collapsed and other sections are not safe.

Other examples of physical deterioration are the veterans homes in Hastings and Minneapolis, both of which have extensive deterioration in their basic infrastructure, including tunnels and the steam and water distribution systems. An engineering analysis of the tunnels of the Minneapolis Veterans Home concluded that these deficiencies need to be addressed as soon as possible or risk major system failure and resident evacuation.

Based on the broader view of deferred maintenance, the best available evidence comes from comprehensive building assessments conducted by architectural and engineering consultants for 20 University of Minnesota buildings. Results from these assessments are generally consistent with the University's estimate that it would cost about \$923 million to upgrade all state-supported University buildings to modern standards.

Applying the same method to state agencies and MnSCU would certainly increase the deferred maintenance estimates, but it is difficult to estimate how much. For example, the cost of meeting modern standards is probably less for MnSCU because it has newer facilities and most of MnSCU's buildings already have modern heating, ventilation, and air conditioning systems in place. However, even if we assume that the cost of meeting modern standards for state agencies and MnSCU is only half as much as the University (on a square-footage basis), the statewide amount of deferred maintenance under the broad definition would be roughly \$2 billion.

## MAINTENANCE PRACTICES

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**Preventive maintenance is important to avoid premature breakdowns.**

The large amount of deferred maintenance for state facilities raises questions about the maintenance practices used by state agencies, colleges, and universities. We focused on the state's preventive maintenance practices. Preventive maintenance is widely recognized as being important to prevent premature breakdowns and to ensure that building systems operate efficiently.<sup>3</sup> Preventive maintenance activities include regular inspections of mechanical systems, electrical systems, roofs, and building exteriors so that problems can be corrected before they cause a more serious problem such as a mechanical breakdown, a major roof leak, or structural damage.

Our survey of physical plant directors at state agency sites and college campuses revealed that:

- **Almost all physical plant directors said that they should be doing more preventive maintenance than they currently perform.**

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<sup>3</sup> Preventive maintenance includes planned actions taken to keep building components functioning as they were designed to perform. It occurs before a building component fails. In contrast, corrective maintenance occurs after a component fails.



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**Preventive maintenance practices vary widely among state entities.**

In fact, 96 percent of survey respondents said they should be doing more, including over 40 percent who said they should be doing much more. Physical plant directors cited a variety of preventive maintenance tasks that they do not do enough of, including painting, checking electrical connections, wires, and motors, cleaning and monitoring mechanical equipment, and checking plumbing for leaks.

Key components of an effective preventive maintenance program include development of a formal program with written schedules, regular adherence to the schedules, and documentation of work actually performed.<sup>4</sup> Our survey indicates that preventive maintenance programs at state facilities vary widely. Some have neither written nor unwritten schedules for any building component, while others have computerized programs that (1) contain customized schedules for each building component and each piece of equipment, (2) generate daily work orders for each maintenance employee, and (3) record all preventive and corrective work performed.

Overall, 73 percent of state agencies, colleges, and universities (weighted by square footage) said they had written preventive maintenance schedules for mechanical systems and 65 percent said they had written schedules for electrical systems. Only one-fourth to one-third of state entities said they had written schedules for roofs, building exteriors, and interiors. While an additional 12 to 22 percent had unwritten schedules for these components, about half had no schedule for roofs, exteriors, and interiors.

Schedules for mechanical systems are particularly important because heating, ventilation, and air conditioning systems are complex and require frequent checks and adjustments. But schedules for other components are also important. For example, regular roof inspections are important so that minor problems can be corrected before they shorten the life of the roof.

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**Problem areas include lack of schedules and documentation.**

Most state entities that have schedules said that they follow them most of the time. The percentage of respondents with written schedules who said they regularly or frequently follow them ranged from 93 percent for mechanical systems to 71 percent for interiors.

While most state agencies and higher education institutions said that they document most of their preventive maintenance work, a substantial number do not regularly document their work. The percentage who do not regularly document preventive maintenance work ranged from 30 percent for mechanical systems to 46 percent for interiors.

Nearly all respondents reported inspecting belts, changing ventilation filters, and lubricating bearings at intervals that met minimum standards. However, performance of preventive maintenance for roofs and steam systems was mixed. For example, 27 percent of respondents said that they did not regularly inspect

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<sup>4</sup> David G. Cotts and Michael Lee, *The Facility Management Handbook* (New York: American Management Association, 1992), 203, 214-215.

their roofs, and only 8 percent met our consultants' recommended standard that roofs should be inspected by a qualified roof inspector at least twice a year.<sup>5</sup> Moreover, most facilities with steam systems did not meet the standard that steam traps should be checked at least twice a year.

One way to manage the maintenance scheduling process is through the use of computerized maintenance programs. These software programs can generate prescheduled work orders and track completed preventive and corrective maintenance work. As of 1997, about 40 percent of state agencies, 34 percent of state colleges and universities, and the University of Minnesota's Twin Cities campus used computerized maintenance systems. We found:

- **Computerized maintenance systems are highly rated by those that use them, though there are start-up and ongoing costs.**

Almost all users rated computerized systems "very useful" or "moderately useful." In addition, agencies that used computerized maintenance systems were more likely than non-users to say that they increased the amount of preventive maintenance they performed compared with five years ago. Also, users of computerized programs were more likely to say that it is easier to complete corrective maintenance tasks now than five years ago and less likely to report large maintenance backlogs.

While these systems help state entities organize and schedule work, they are expensive to set up and require on-going clerical support to record and track work orders.

In summary, preventive maintenance practices vary greatly among state agencies, colleges, and universities. We think that it is important that maintenance practices, particularly preventive maintenance, be improved. Many physical plant directors recognize that they need to strengthen their preventive maintenance practices, but said they do not have enough resources (staff and dollars) to establish an effective preventive maintenance program. We think that even if funding is inadequate, agencies should do a better job of preventive maintenance. In fact, some preventive maintenance practices pay for themselves very quickly. For example, one area that many agencies neglect is preventive maintenance of steam traps. Steam traps are designed to increase the efficiency of steam heating systems by letting condensate return to the boiler while trapping steam where it can most efficiently provide heat. Failing to repair or replace faulty steam traps generally will not be noticed by building occupants, but may reduce the efficiency of the heating system. The chief engineer at St. Peter Regional Treatment Center estimated that replacing a typical steam trap that was leaking steam would annually save three times the replacement cost of the steam trap.

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**Many state entities need to strengthen their preventive maintenance programs.**

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<sup>5</sup> We contracted with Cain Ouse Associates Inc. and Pope Associates Inc. to provide us with a device on engineering and architectural issues, and assistance in constructing several questionnaires.

## POLICY CONSIDERATIONS

It is difficult to measure how much of the current backlog of deferred maintenance is due to poor or inefficient maintenance practices and how much to inadequate spending. Based on our survey of maintenance practices and our site visits, we think that inadequate maintenance practices are part of the deferred maintenance problem.

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### **Maintenance programs could benefit from increased support by the Department of Administration and MnSCU.**

We think that maintenance programs could benefit from greater oversight by central agencies and the Legislature. The state has a long term interest in preserving its building assets and should ensure that proper maintenance practices are used. The Department of Administration and MnSCU could provide additional technical assistance to state agencies, colleges, and universities and report back in future years on the status of maintenance practices. The Department of Administration has worked with several state agencies and community colleges to improve their maintenance practices. For example, it organized the Statewide Facilities Management Group, which includes facility management professionals from state agencies and MnSCU. Its objectives include developing facility management information systems, establishing common benchmarks and best practices, and sharing facility management information. We think that these are important objectives for the Department of Administration and other state entities to support. In addition, MnSCU could help set up a similar group for its colleges and universities.

We do not think that it would be wise for the Legislature to mandate specific preventive maintenance programs because the types of buildings and their requirements vary so much from facility to facility and specific practices and schedules are matters of professional judgment. Nor do we recommend creating additional bureaucracy to oversee state agencies and higher education institutions. But more legislative oversight hearings focused on maintenance practices would be appropriate and could prompt more executive branch action.

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### **More legislative oversight could also help.**

The Department of Administration could also, when appropriate, help state agencies set up computerized systems, building on the experience of existing users. MnSCU could perform a similar service for state colleges and universities. The Legislature may wish to help fund the start-up costs of these computerized systems, with the understanding that the ongoing operational costs would be the entities' responsibility. Costs for these systems vary. The Department of Human Services spent about \$5,500 per site several years ago for software for each regional treatment center; additional start-up costs included clerical staff time to input detailed specifications for preventive maintenance programs and additional computers. Ongoing support for the system requires clerical staff support, an annual license fee (\$550 to \$840 per site), and occasional computer upgrades.

We did not examine the efficiency of maintenance operations across the state, but we found that comparative information on maintenance staffing and spending is not readily available either in Minnesota or other states. Such information could provide useful benchmarks that might raise issues of efficiency (if staffing or spending is unusually high) or adequacy (if staffing or spending is unusually low).

The size and prevalence of deferred maintenance among Minnesota's state agencies and higher education institutions suggest that maintenance spending levels may also be a reason that Minnesota has a large amount of deferred maintenance. We found that:

- **State entities in Minnesota generally spent less on maintenance and repair than the middle of the range recommended by the Building Research Board of the National Research Council.**

These national standards are the judgments of a committee established by the Building Research Board, including public sector facility managers, professors of architecture, and engineers from the private sector, but are not based on systematic studies. As a result, these standards should be viewed as general benchmarks. In addition, maintenance operating spending levels by our sample of six state colleges and universities, the Department of Natural Resources, and the Department of Administration were below that of private sector office buildings. While these comparisons suggest that Minnesota's maintenance spending is low, they are not definitive.

In any case, recent executive and legislative initiatives have increased maintenance funding. Recently, the state has placed greater emphasis on asset preservation in the capital budget process by increasing funding of the Capital Asset Preservation and Replacement Account (CAPRA) and for Higher Education Asset Preservation and Renewal (HEAPR). Under CAPRA, the Department of Administration allocates funds for specific projects based on need. This helps ensure that funds are used on maintenance projects that have been externally reviewed. One concern with using this approach indefinitely is that it rewards agencies that let their buildings deteriorate by neglecting proper maintenance.

Overall, it makes sense to address the existing deferred maintenance problem with the capital budget process because of the magnitude of the problem. The capital budget process allows the Legislature to set priorities among large deferred maintenance projects and delegate decisions for smaller projects to the Department of Administration (under CAPRA) and MnSCU and the University of Minnesota (under HEAPR).

As a long term goal, however, we agree with the Capital Budget Reform Steering Committee's 1992 recommendation that capital financing should be reserved for "new construction, substantial adaptive remodeling, expansion, or improvements that are long term and not predictable or recurring."<sup>6</sup> The operating budget is the appropriate place to fund routine and preventive maintenance and recurring repair and replacement projects such as roof and boiler replacements and masonry repair. These projects occur too frequently to be effectively managed by the Legislature and can be accomplished more efficiently if conducted as part of a well planned maintenance program.

The 1997 Legislature increased maintenance operating funding for several state agencies and MnSCU. The advantage of this approach is that it allows agencies to plan their maintenance program and use the funds for preventive maintenance

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**The operating budget should fund routine maintenance and recurring repair and replacement projects.**

<sup>6</sup> Capital Budget Reform Steering Committee, *Capital Budget Reform* (St. Paul, January 1992), 16.

instead of waiting for building components to fail. A potential disadvantage is that agencies are currently not required to spend a fixed amount of their appropriation on maintenance.

To help ensure that state entities spend as much on maintenance as intended by the Legislature, the Legislature could mandate that a certain level of funding be set aside for maintenance. The arguments in favor of spending set-asides are that (1) they would ensure that maintenance spending is addressed on a continuous basis, rather than waiting until problems mount, (2) there is no natural constituency for building maintenance as there is for state programs, and (3) the state is ultimately responsible for maintaining buildings and may have to make up for past maintenance omissions. An argument against spending set-asides is that state entities are in the best position to decide how to allocate funds between maintenance and programs.

Alternatively, the Legislature could require state entities simply to report their maintenance spending levels. This would be less intrusive than set-asides, though it would require active legislative oversight to be effective. A reasonable approach might be to require maintenance spending reports and follow up with set-asides if entities do not devote sufficient resources to maintenance.

To improve how maintenance funds are allocated to state entities, the Legislature may want to adopt a formula for funding building maintenance within the operating budget. A funding formula should reflect the variation in maintenance requirements among buildings due to factors such as square footage (or replacement cost), type of buildings, intensity of use, age of buildings, and whether the buildings have been renovated. The Legislature could direct the Department of Finance, in consultation with the Department of Administration, the University of Minnesota, and MnSCU, to recommend a specific formula for consideration during the 1999 legislative session.

The Facility Audit Survey was designed to help legislators broadly assess the condition of the state's buildings and to help set priorities for asset preservation funding. However, as it is currently structured and maintained, the survey is inadequate for this purpose. Interviews we conducted and results from our own building maintenance survey show that different agencies use different approaches to rate their buildings. Other than written instructions, the Department of Administration does not provide agency personnel with any formal training to ensure that ratings will be consistent across agencies. Also, it does not check the ratings to ensure the consistency of the data. The Department of Administration recognizes that the current system does not ensure consistent ratings but cites resource constraints as the reason it cannot check the ratings made by state agencies and higher education institutions.

In addition, the system is incomplete, containing ratings for only about 75 percent of the state's total square footage.<sup>7</sup> The database contains very limited information about the age of building components and the estimated cost of needed building repairs. The Facility Audit data are also several years old. Given

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**The Legislature may want to adopt a formula to fund maintenance within the operating budget.**

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<sup>7</sup> As of September 1997, the database was missing about half of the academic buildings (weighted by square footage) of the Minnesota State College and University system and about 80 percent of the buildings maintained by the Veterans Homes Board.

these problems, the Legislature cannot rely on the ratings alone to measure funding requirements of state agencies.

The Facility Audit Survey is a very detailed system, requiring staff to rate each of 98 elements in every building as poor, fair, or good. We think that keeping the level of detail found in the Facility Audit Survey is not necessary for policy purposes. It is more important to ensure that the data are reliable, current, and complete. In any case, we think that the Legislature should consider how it wants to use building condition data before deciding what type of data system should be maintained. Specifically,

- **If the Legislature intends to use building condition data to make funding decisions, we recommend that the Department of Administration should develop a less detailed but more uniform system for assessing the condition of the state's buildings.**

## BUILDING CONSTRUCTION

State agencies, Minnesota state colleges and universities, and the University of Minnesota spend millions of state bonding dollars each year constructing new buildings. Legislators have expressed concerns about the cost and time required to construct state buildings, how state building costs compare to private sector costs, and what factors, if any, inflate state building costs.

We asked private consultant designers and construction contractors to compare the cost of constructing state buildings with that of similar private buildings. Over two-thirds reported that the costs for state buildings were higher. Contractors said that the number of meetings and reports, time to make decisions, and use of targeted vendors were factors that made the cost of state buildings “much higher” than comparable private buildings. State employees and private contractors also rated state decision-making delays and targeted vendor participation and selection as factors that might cause project budgets and timelines to increase from original projections.

State employees and private contractors identified predesign, prequalification of contractors and architects, and use of qualified project managers as factors that might help hold down project costs.<sup>8</sup> Respondents volunteered both positive and negative comments about agencies and processes. The most positive comments identified use of a predesign phase to define the purpose, scope, cost, and schedule of the project. About 10 percent of all respondents volunteered comments critical of MnSCU's administrative procedures.

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<sup>8</sup> Predesign is a separate stage that specifies the purpose, scope, cost, and schedule of the complete project before the authorization of funds for construction. Prequalification of contractors is the advance determination that contractors and architects have the ability, including experience and other resources, to bid on a specific project. A qualified project manager is an independent manager or firm hired to guide a large project from development through completion.

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# Introduction

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**T**he State of Minnesota owns about 4,800 buildings, totaling more than 73 million gross square feet and an estimated replacement value of over \$7 billion. The state's inventory encompasses a wide range of building types, including office complexes, correctional facilities, regional treatment centers, historic sites, highway rest stops, armories, truck loading stations, and classroom facilities, research laboratories, and administrative buildings on college and university campuses. These buildings are under the custodial control of a number of state agencies, including the departments of Administration, Corrections, Human Services, Military Affairs, Natural Resources, and Transportation, as well as the University of Minnesota and the Minnesota State Colleges and Universities (MnSCU) system.

National research has identified systematic neglect in the maintenance of public facilities at all levels of government.<sup>1</sup> In Minnesota, preservation of the state's substantial investment in buildings has become a topic of increasing concern within both the legislative and executive branches of government.

In recent years, the Legislature has appropriated funds to designated accounts for capital asset preservation to help reduce the \$1.5 billion backlog in deferred maintenance identified by the Department of Administration. Organization operating budgets include accounts for routine maintenance and repair work, and capital bond proceeds are used to fund major renewal projects approved by the Legislature.

Legislators wanted to know whether state agencies and institutions of higher education are adequately caring for the state's buildings. In this report we focus on the cost of maintaining the state's buildings and evaluate the maintenance practices used to preserve the state's investments in those buildings. The report addresses the following questions:

- **What is the condition of the state's buildings? Does the state have a deferred maintenance backlog? If so, how large is it?**
- **How much does the state spend on maintenance and repairs? How does this spending compare with national standards?**

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<sup>1</sup> Building Research Board, National Research Council, *Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings* (Washington D.C.: National Academy Press, 1990), ix.

- **Does the state protect its building investments with adequate preventive maintenance?**

To assess the state's deferred maintenance problem, we examined deferred maintenance projects identified by state agencies and higher education institutions, reviewed building assessments by architectural and engineering consultants, visited building sites, interviewed facility management personnel, and examined the Facility Audit Survey data gathered by the Department of Administration on the condition of state buildings.

We asked state agencies, the University of Minnesota, and MnSCU to provide us with operating expenditure data for building maintenance and combined this information with data on capital appropriations for maintenance projects. We also compared maintenance expenditures for state agencies and higher education institutions with national standards for maintenance spending and with spending on private sector office buildings.

We reviewed the national literature on maintenance practices and standards and contracted with Cain Ouse Associates Inc. and Pope Associates Inc. for engineering and architectural advice. Since building management responsibility is decentralized within the state, we collected information about the maintenance practices of state agencies and public higher education institutions by surveying physical plant directors and facilities managers and conducting follow-up interviews.

Legislators were also interested in knowing whether state policies or practices add to the cost or time to construct new buildings. Due to time constraints, we were unable to examine this issue in detail. This report does, however, identify some factors which may add to building construction time or costs and presents the results of a survey we conducted of state entity staff and private consultant designers and construction contractors. We asked survey respondents to rate how various factors that could add to the cost or time to construct new buildings affected projects managed by their agencies.

Chapter 1 of this report focuses on the condition of state buildings and our analysis of spending data. Chapter 2 focuses on deferred maintenance issues. Chapter 3 presents information about how the various state entities maintain their buildings, including the use of schedules and basic maintenance practices. Chapter 4 includes a summary and our recommendations. Chapter 5 includes a review of the results of our survey of factors that affect the cost of public buildings.



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# Background

## CHAPTER 1

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**P**reservation of buildings owned by the State of Minnesota has become a topic of increasing concern within both the legislative and executive branches of government. Over the years, the state has made a significant investment in structures of many kinds: office buildings, classrooms, equipment sheds, monumental buildings, and many other types of buildings. Policy makers are concerned about whether this investment is adequately protected and whether the state's buildings are adequately maintained.

State agencies and higher education institutions are generally responsible for maintaining and repairing the buildings they control. Maintenance expenditures for routine upkeep and repair activities include staff salaries and the cost of materials, and generally come from agency operating funds. Some funding, especially for costly or unexpected projects, comes from capital appropriations. We wanted to identify the funding sources available to state agencies, the University of Minnesota, and Minnesota State Colleges and Universities (MnSCU), and to determine how adequately maintenance is currently funded. In this chapter, we address the following questions:

- **What buildings does the state own?**
- **What is the condition of state buildings?**
- **How much does the state spend on maintenance and repairs? How does this spending compare with national standards?**

To address these questions, we examined the building ratings in the Department of Administration's Facility Audit Survey. We reviewed Minnesota laws and identified capital projects for the last 18 years. We asked state agencies, the University of Minnesota, and MnSCU to provide us with operating expenditure data for building maintenance. We combined available information with data on capital appropriations for maintenance projects. We then compared maintenance expenditures for state agencies and higher education institutions with national standards for maintenance spending and with spending on private sector office buildings.

Overall, we found that most state buildings are in reasonably good physical condition, but agencies consider some of these physically sound buildings

unsuitable for current uses because they have inadequate heating, ventilation, or air conditioning.

In fiscal year 1997, state agencies, colleges, and universities generally spent less on maintenance and repair than the middle of the range recommended by the Building Research Board of the National Research Council. In addition, building maintenance operating expenditures for the Department of Natural Resources, the Department of Administration, and state colleges and universities were lower than average spending for private office buildings.

Trends in capital spending indicate that the state's investment in existing buildings was considerably lower during the 1980s and early 1990s than the past four years, when the Legislature placed greater emphasis on asset preservation. This suggests that the state's maintenance spending has been below national standards for an extended time.

This chapter begins by examining how many buildings are owned or leased by the state. Next we analyze the building ratings developed by the Department of Administration's Facility Audit Survey and examine maintenance spending by various state entities.

## THE STATE'S INVENTORY OF BUILDINGS

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**The state owns about 4,800 buildings incorporating more than 73 million square feet.**

The State of Minnesota owns about 4,800 buildings, totaling more than 73 million gross square feet.<sup>1</sup> The state's inventory of buildings encompasses a wide range of building types. Buildings owned by the state range from small, simple structures such as the salt sheds used by the Department of Transportation, to large, complex research laboratories at the University of Minnesota. Other types of state buildings include office complexes, historic sites, highway rest stops, armories, visitor centers at state parks, truck loading stations, classroom buildings, residential facilities, such as the regional treatment centers operated by the Department of Human Services, and the nine adult and juvenile correctional institutions.

At least 16 state departments and other entities have custodial control of state buildings, meaning that they shoulder responsibility for managing and maintaining state-owned facilities. Minnesota's two higher education systems, the University of Minnesota and the Minnesota State Colleges and Universities (MnSCU) system, account for more than 48 million square feet, or about two-thirds of the state's total square footage. Table 1.1 shows the distribution of the state's square footage by agency. The state finances the entire cost or a

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<sup>1</sup> The exact number of buildings and amount of square footage owned by the state is difficult to pinpoint for several reasons. First, there is no complete statewide list of buildings owned by the state government, although the Department of Administration is trying to establish such an inventory. Second, there is no precise definition of "building," so counts may vary from one state agency to another. For example, one agency might consider an addition to a building as a separate structure while another might count it as one unit. Similarly, the Department of Natural Resources might count its storage sheds as buildings, but the Department of Transportation might not. Third, the state's holdings are constantly changing as new buildings are constructed or purchased and old ones are demolished or sold.

**Table 1.1: Building Square Footage, 1997**

State Agencies and Higher Education Institutions	Gross Square Footage (000s)
University of Minnesota	25,964
MnSCU	22,378
Department of Human Services	4,659
Department of Corrections	4,845
Department of Transportation	4,392
Department of Administration	2,960
Department of Natural Resources	2,717
Department of Military Affairs	2,010
Veterans Homes Board	855
State Fair	827
MN Zoological Garden	480
Residential Academies	456
Historical Society	330
Department of Economic Security	199
Iron Range Resources and Rehabilitation Board	169
Center for Arts Education	136
<b>Total</b>	<b>73,377</b>

SOURCE: Department of Administration, state agencies, and institutions of higher education.

**The state leases  
an additional  
3.5 million  
square feet.**

significant share of maintaining most of these buildings. The state does not finance the maintenance of college dormitories, student unions, and miscellaneous other buildings supported by user fees. The University of Minnesota and MnSCU have about 12 million square feet of buildings that are not supported by the state. Thus, the state supports the maintenance of buildings with a total of nearly 62 million square feet. Our report focuses on the maintenance of state supported buildings.

Besides the space it owns and occupies, the State of Minnesota also leases an additional 3.5 million square feet, primarily for office space or warehouse storage uses. As of November 1997, the Real Estate Management Division of the Department of Administration was overseeing a total of 629 commercial leases with annual rent exceeding \$48 million. Nearly 70 percent of the leased space is concentrated in the City of St. Paul, which accounts for about 2.4 million square feet.

The 1987 Legislature directed the Department of Administration to complete a study comparing the costs of leasing office space in privately-owned facilities with the cost of constructing new office buildings to house state agencies. The department issued its report in two phases. The March 1988 report outlined factors beyond direct costs that the state should consider in deciding whether to lease or purchase office space. Those considerations include: <sup>2</sup>

<sup>2</sup> Department of Administration, Management Analysis Division, *Report to the Legislature on Policies and Costs of Leasing Space Versus Constructing New Buildings to House State Agencies* (St. Paul, March 1988), iii.

- projections of conditions in the lease market,
- agencies' needs and location requirements,
- the availability of capital financing,
- the availability of suitable land or building for purchase, and
- the impact on the economy.

The report recommended that the state evaluate each decision on a case-by-case basis, weighing the particular alternatives for each proposal.

In the second phase of the report, issued in December 1988, the Department of Administration analyzed nine alternative ways for the state to provide office space. The study showed that leasing office space in older, privately-owned buildings was the least expensive way for the state to acquire the use of office space. But when the analysis incorporated the quality of office space as a factor, then it showed that building, owning, and operating a new office building to be the favored alternative. The report stated, "In a direct comparison of building or leasing identical office space, the build alternative promises long-term cost savings of approximately 35 percent."<sup>3</sup>

To realize these long-term cost savings, the Department of Administration has set a goal to locate up to 70 percent of the state's office space in state-owned buildings and 30 percent in leased facilities by the year 2013. When the department established this objective in 1996, the state's office space was split roughly equally between state-owned and privately-owned facilities.

## CONDITION OF BUILDINGS

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**The Facility Audit Survey contains information on the condition and suitability of the state's buildings.**

In his proposed capital budget for 1986-87, Governor Rudy Perpich recommended that funds be appropriated to the Department of Administration for a study "to determine the current status of state facilities and establish procedures to maintain this inventory on a current basis in the future."<sup>4</sup> The proposal explained: "There is a lack of centralized information regarding the condition of the state's physical plant assets. While institutional managers implicitly know the status of the facilities under their stewardship, there exists no systematic procedure to record or report that information to higher levels, particularly at a statewide level. Without such information it is difficult or impossible to assure that appropriate maintenance standards are achieved or maintained."<sup>5</sup>

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<sup>3</sup> Department of Administration, Management Analysis Division, *State Office Space: Options and Costs* (St. Paul, December 30, 1988), 1-2.

<sup>4</sup> Governor Rudy Perpich, State of Minnesota Proposed 1986-87 Capital Budget (St. Paul, March 1985), 16.

<sup>5</sup> *Ibid.*, 16.

In 1990, the Legislature directed the Commissioner of Administration to create and maintain an inventory of all major state buildings and office space owned or leased by the state, including a classification system on the condition and suitability of each major building.”<sup>6</sup> The 1996 Legislature directed the Commissioner of Administration to “identify the condition and suitability of all major state buildings and office space” in order to help the Legislature make asset preservation funding decisions. The report was to “identify the useful life, the current condition, the estimated cost of currently needed repairs, and the suitability for the current state purposes of all major state-owned buildings and office space owned or leased by the state.”<sup>7</sup>

The Department of Administration developed the Facility Audit Survey to collect detailed, comprehensive information about the condition of buildings owned by the State of Minnesota. The department directs agencies to have the facility audit performed by a person who has “a strong working knowledge of the building (i.e. facility manager, plant engineer, or maintenance person).” Staff are to rate each building element’s physical condition and performance as “poor” (repair needed immediately), “fair” (repair needed in 0-6 years), or “good” (repair not needed until beyond 6 years). Each building is divided into six main components: building exterior, roof, mechanical systems, electrical systems, site, and interiors. Each component is then divided into more specific elements; there are a total of 98 elements for each building. In addition, staff are to rate the suitability, or overall functionality of the building, and provide descriptive data about the building and its components. Finally, the Facility Audit Survey asks agencies to submit project cost estimates and descriptions for any element that is rated as poor.

While the data have several limitations, it is useful to examine the building ratings to obtain agency perspectives on the condition of their buildings.<sup>8</sup> We analyzed building ratings in the Facility Audit Survey database as of September 1997. Overall, we found:

- **State agencies and higher education campuses rated most of their building components in good physical condition, although ratings for building suitability were lower.**

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**Forty-two percent of state buildings are rated in overall good physical condition.**

State agencies and higher education campuses rated 42 percent of their buildings as good for all five primary building components (building exteriors, roofs, mechanical systems, electrical systems, and interiors). Eighteen percent of buildings had at least one of the five building components rated as poor.<sup>9</sup>

As Table 1.2 shows, the statewide percentage of buildings (weighted by square footage) rated poor ranged from 10 percent for roofs to 2 percent for electrical systems. Poor ratings were given to 7 percent of building interiors, followed by mechanical systems (5 percent), and building exteriors (3 percent). The

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<sup>6</sup> *Minn. Stat.* §16B.31, subd. 6.

<sup>7</sup> *Minn. Laws* (1996), ch. 463, sec. 13, subd. 2.

<sup>8</sup> We had several concerns with the Facility Audit Survey, including the consistency, completeness, and recency of the ratings, that are discussed in Chapter 4.

<sup>9</sup> This analysis excluded the site component because site ratings were missing for many buildings.

**Table 1.2: Facility Audit Survey Ratings of Building Components**

<u>Building Component Ratings</u>	<u>Poor</u>	<u>Fair</u>	<u>Good</u>
<u>Physical condition</u>			
Electrical systems	2%	19%	79%
Building exteriors	3	21	75
Mechanical systems	5	26	69
Interiors	7	28	65
Roofs	10	26	64
<u>Suitability</u>			
Electrical systems	9	23	68
Plumbing systems	10	26	64
Heating systems	14	26	60
Ventilation systems	21	34	44
Cooling systems	22	29	50

NOTE: Ninety-seven percent of buildings were rated between 1993 and 1995.

SOURCE: Program Evaluation Division analysis of Facility Audit Survey data.

percentage rated good ranged from 65 percent for roofs to 78 percent for electrical systems.

Agencies also rated the suitability of buildings for a variety of elements, including mechanical systems, electrical systems, attractiveness, and overall design concept. Suitability differs from physical condition ratings in that it considers whether the element meets the needs of the program or occupants. For example, a ventilation system that is in good working order, but does not have adequate capacity to meet modern ventilation standards may be rated in good physical condition but poor for suitability.

Suitability ratings were generally lower than physical condition ratings.

Theoretically, a system rated in poor physical condition would also have a low suitability rating. In addition, systems in good physical condition could be rated as fair or poor in terms of their suitability, usually because they did not meet modern standards. For example, while agencies rated mechanical systems in poor physical condition for only 5 percent of buildings, they were more likely to rate suitability as poor for major mechanical systems: cooling systems (22 percent), ventilation systems (21 percent), heating systems (14 percent), and plumbing systems (10 percent).

Ratings for specific building elements varied more than the ratings for the broad building components. The percentage of buildings with poor ratings ranged from less than 1 percent for footings to 20 percent for windows. Building elements with above-average ratings included electrical transformers, switchgear, columns and beams, and foundation walls. In addition to windows, building elements with below average ratings included fire alarm actuators, signage for compliance with the Americans with Disabilities Act (ADA) and fire codes, exterior joints, carpeting, and electrical panelboards and breakers.

**Suitability ratings were generally lower than physical condition ratings.**

Table 1.3 compares average building ratings among different age categories. Older buildings had lower physical condition ratings than newer buildings for the five building components.

**Table 1.3: Average Facility Audit Rating by Age of Building**

<u>Building Age</u>	<u>Average Condition Rating (0=Poor; 50=Fair;100=Good)</u>
0 - 10 years	95
11 - 20 years	85
21 - 30 years	86
31 - 40 years	81
41 - 50 years	80
51 - 70 years	74
71 - 90 years	77
Over 90 years	66

NOTE: Ninety-seven percent of buildings were rated between 1993 and 1995.

SOURCE: Program Evaluation Division analysis of Facility Audit Survey data.

**Building age is an important factor in building condition ratings.**

On a scale of 0 to 100 (based on 0 for poor, 50 for fair, and 100 for good), the average rating for the broad building components ranged from 95 for buildings less than 10 years old to 66 for buildings built over 90 years ago. Building elements whose ratings declined with age by more than average amounts include windows, doors, and hardware. For example, windows were rated good for 94 percent of buildings less than 10 years old, compared with 28 percent of buildings more than 40 years old.

We also compared ratings among different agencies and examined whether differences in building age helps explain any differences. Table 1.4 shows that:

- **Average building condition ratings varied greatly among state agencies, colleges, and universities, ranging from 97 for the Iron Range Resources and Rehabilitation Board (IRRRB) to 48 for the Minnesota State Academies for the Deaf and Blind.**

The University of Minnesota and MnSCU rated their buildings higher than most state agencies. Overall, the University ranked third highest behind IRRRB and the Historical Society. MnSCU ranked fourth. These rankings may be affected by the fact that agencies used different procedures to rate their buildings.

- **Differences in building age help explain some of the differences in building condition ratings, although there are some anomalies.**

The average age of the residential academies' buildings (59 years compared with the average of 35 years) helps explain their low building ratings. Also, the relative newness of buildings owned by IRRRB (average age of 13 years) and Minnesota Department of Transportation (MnDOT) (22 years) helps explain these

**Table 1.4: Facility Audit Ratings**

Agencies and Higher Education Institutions	Average Rating (0=Poor; 50=Fair; 100=Good)	Average Building Age <sup>a</sup> (in Years)	Square Footage of Rated Buildings
Iron Range Resources and Rehabilitation Board	97	13	185,347
Historical Society	91	80	296,944
University of Minnesota	89	38	25,121,085
MnSCU	86	24	8,957,201
Department of Transportation	85	22	1,794,826
Department of Military Affairs	84	28	3,700,336
Department of Economic Security	83	22	182,600
Department of Corrections	79	53	4,139,868
Department of Human Services	73	55	5,670,823
Department of Administration	70	37	3,219,873
Center for Arts Education	69	25	135,987
Department of Natural Resources	62	37	2,589,444
Minnesota Zoological Garden	57	17	448,966
Residential Academies	48	59	436,313

NOTE: Ninety-seven percent of buildings were rated between 1993 and 1995.

<sup>a</sup>Average building age refers to age when buildings were rated.

SOURCE: Program Evaluation Division analysis of Facility Audit Survey data.

**Average  
building  
condition  
ratings varied  
greatly among  
state agencies.**

agencies' high building ratings. Another factor may be that MnDOT has its own funding source for building maintenance, the trunk highway fund.

There were two significant anomalies in the Facility Audit data. First, the Historical Society's buildings were 80 years old, on average, the oldest of any state agency, but they received the second highest ratings. Second, the Zoo gave its buildings relatively low marks even though its buildings are much newer than average (17 years). We asked a similar question in our building maintenance survey and the ratings for these two agencies were more in line with building age. The Historical Society had the third lowest ratings, and the Zoo had above average ratings.

## MAINTENANCE SPENDING

Maintenance funding comes from both operating and capital budgets. Operating funds most often account for routine, low-cost maintenance activities. Capital budget accounts are most often tapped for renovations, large repair or replacement projects, and unanticipated emergency repairs.

## Operating Fund Sources

Maintenance operating funds typically include routine maintenance accounts and repair and replacement accounts. Routine maintenance accounts include staff salaries and other expenses involved in the routine building upkeep. In most cases this type of account does not include repair or replacement activities, but does



include cleaning and maintaining equipment. Repair and replacement accounts cover expenditures for small repair or replacement projects, such as caulking , minor roof repairs, and replacing broken parts.

## Capital Fund Sources

Capital projects are generally defined as improvements to fixed assets that will last for a long period of time and that require a substantial outlay of money. Examples include new facility construction, remodeling of existing facilities, and substantial repair or abatement projects, such as roof replacements or asbestos removal. Projects are funded from a variety of sources, including general obligation bonds (as authorized by the Minnesota Constitution), the general fund, user financing, federal funds, and the trunk highway fund. General obligation bonds currently constitute the largest source of funding for capital projects.

Since 1979, the capital budget has included a wide variety of capital improvement projects, including highways, bridges, wastewater treatment plants, and buildings. The proposed 1985 capital budget was the first to include multi-year recommendations to encourage longer range capital planning. Currently, *Minn. Stat.* §16A.11 directs the Governor to submit a capital budget in each even-numbered year.<sup>10</sup> State entities and local units of government present their capital requests to the Governor, who proposes a formal “bonding bill.” The Department of Finance works with those requesting funds and coordinates the capital budget process. The Legislature may add projects to, or delete projects from, the bill while it is being presented and debated. After passage, the Governor may veto individual projects.<sup>11</sup> Legislators may propose capital projects independently of the bill in any year.

### Constraints on Funding Capital Projects

Although Minnesota statutes do not specify any general debt management guidelines, the executive and legislative branches have agreed to several debt constraints in order to preserve the state’s fiscal health and protect its ability to borrow money at low cost. There are four debt management guidelines:

1. The appropriation for general fund debt service is limited to 3 percent of general fund non-dedicated revenue per biennium.
2. The ratio of total general obligation long-term debt is limited to 2.5 percent of total personal income in the state.
3. The ratio of total revenue and general obligation debt of state agencies, state public corporations, and the University of Minnesota is limited to 3.5 percent of total personal income in the state.

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**General obligation bonds are the largest source of capital project funding.**

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**Minnesota’s debt management guidelines are voluntary.**

<sup>10</sup> Prior to 1990, capital appropriations were determined by the Legislature in the odd-numbered years.

<sup>11</sup> In 1996 the Governor vetoed just over \$40 million in projects for state agencies and local units of government.

4. The ratio of total general obligation debt, moral obligation debt, state bond guarantees, equipment capital leases, and real estate leases is limited to 5 percent of total personal income in the state.

Requests for funding for capital projects have routinely exceeded the constraints outlined in the debt management guidelines, forcing the Legislature and the Governor to choose which requests to fund. For example, for the 1996 bill, total requests for capital projects exceeded \$1.1 billion, the Legislature appropriated \$652 million, and the Governor approved about \$617 million.

### Recent Legislative Initiatives

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**Recent legislative and executive initiatives have placed greater emphasis on asset preservation.**

Recently, legislative and executive initiatives have placed greater emphasis on asset preservation in the capital budget process. First, in 1990 the Legislature created a separate Capital Asset Preservation and Replacement Account (CAPRA) within the state bond proceeds fund. CAPRA was designed to provide a source of funds for preservation and replacement of portions of capital assets owned by the state, excluding institutions of higher education. The Department of Administration's Division of State Building Construction reviews physical plant project requests.<sup>12</sup> Agencies apply to Administration for CAPRA funding, and Administration prioritizes the requests. Based on the requests received, Administration submits a request for CAPRA funding in each capital budget and distributes funds to agencies based on the total CAPRA appropriation passed by the Legislature. State agencies with asset preservation proposals that exceed the maximum limit for CAPRA funding submit specific requests for inclusion in the agencies' capital budgets.

Second, the Legislature directed the Department of Administration to examine the capital budget process, including how asset preservation should be funded. The report, released in January 1992, discussed the importance of preserving the state's capital assets and the need for "an orderly funding strategy for asset preservation." The report recommended that (1) capital financing be reserved for "new construction, substantial adaptive remodeling, expansion, or improvements that are long term and not predictable or recurring," and (2) operating budgets be the source of funds for routine maintenance and upkeep of a facility.<sup>13</sup>

Third, the 1994 Legislature created a separate funding stream, Higher Education Asset Preservation and Renewal (HEAPR), for capital projects intended to preserve and replace facilities on higher education campuses. The law recognized that "post-secondary governing boards operate campus physical plants that in

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<sup>12</sup> Categories of projects described in statute as most appropriate for CAPRA financing include: (1) unanticipated emergencies, (2) projects to remove life safety hazards, (3) elimination or containment of hazard substances, and (4) moderate cost replacement and repair of roofs, windows, and other elements needed to preserve the exterior and interior of buildings. The statute also outlines criteria for Administration to use in allocating CAPRA funds, namely the urgency of the project in ensuring the safety of a building, the potential for avoiding future costs, and the absolute cost of the project. The Department of Administration's guidelines suggest that CAPRA funds be requested only for projects exceeding \$25,000 but less than \$350,000.

<sup>13</sup> Capital Budget Reform Steering Committee, *Capital Budget Reform* (St. Paul, January 1992), 16.

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**Requests  
for asset  
preservation  
funds exceed  
available  
dollars.**

number, size, and programmatic use differ significantly from the physical plants operated by state departments and agencies.”<sup>14</sup> The statute lists the types of capital projects that can receive funding from the HEAPR program. Projects are similar to those appropriate for CAPRA funding, including code compliance projects, hazardous material abatement, access improvement, building or infrastructure repairs, or “renewal to support the programmatic mission of the campus.”<sup>15</sup> MnSCU and the University of Minnesota submit HEAPR requests based on projects proposed by local campuses.

CAPRA appropriations have increased from \$2.5 million in 1990 to \$12 million in 1996, but requests continue to exceed the available dollars. In 1996, agency requests totaled over \$40 million, leaving nearly \$30 million unfunded. Demand for HEAPR dollars has also increased although funding has declined from \$39.8 million in 1994 to \$28 million in 1996.

In addition to HEAPR and CAPRA, the 1996 Legislature approved an additional \$5 million in asset preservation funding for six state agencies.<sup>16</sup> The 1997 Legislature provided an additional \$4.5 million to the Department of Administration for asset preservation of the capitol complex (\$2.25 million for fiscal year 1998 and another \$2.25 million for fiscal year 1999).

For fiscal years 1998 and 1999 the Legislature appropriated additional operating funds for several state agencies and institutions of higher education. Just over \$8 million was designated for the Departments of Administration, Corrections, Military Affairs, and Natural Resources, the Minnesota Historical Society, and the Minnesota Zoo, and \$4 million was designated for MnSCU. While these appropriations were intended to be used for asset preservation, they were not required to be used for this purpose.

## Spending Trends in Minnesota

We examined trends in maintenance spending because the condition of state buildings is the cumulative result of maintenance spending and practices over time. While we looked at trends in both operating and capital spending, we focused on trends in capital spending. It is particularly important to examine trends in capital expenses because capital spending tends to vary greatly from year to year. Also, the historical data on capital spending are much better than data for operating expenditures.

### Operating Spending

We were unable to obtain historical data on maintenance operating expenditures for most state government entities. Data from the University of Minnesota suggest that total operating expenditures for routine maintenance and renewal and replacement for the last four years have increased only slightly. Repair and

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<sup>14</sup> *Minn. Stat.* §135A.046, subd. 1.

<sup>15</sup> *Minn. Stat.* §135A.046, subd. 2.

<sup>16</sup> Grants between \$500,000 and \$1.75 million were given to the Veterans Homes Board, residential academies, and the Departments of Military Affairs, Natural Resources, Human Services, and Corrections.

betterments allocations by the Department of Human Services to residential treatment centers increased slightly over the past ten years. In contrast, allocations for repair and replacement for MnSCU peaked in fiscal year 1989, and have generally declined during the 1990s.

Responses to our survey of maintenance personnel also indicate that maintenance operating spending for state agencies and the University of Minnesota has remained stable or increased somewhat during the last five years, as shown in Table 1.5. But two-thirds of Minnesota State Colleges and Universities reported that their maintenance operating budget has declined during the past five years, including 27 percent who said it was much smaller now.

**Table 1.5: Changes in Maintenance Staff and Maintenance Budgets**

	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
<u>“Compared with five years ago, how has the number of your maintenance staff changed?”</u>				
“Many more”	<1%	3%	0%	1%
“Somewhat more”	8	5	82	28
“About the same”	33	9	5	16
“Somewhat fewer”	45	47	13	37
“Many fewer”	14	36	0	18
Number of respondents	52	45	4	101
Square footage maintained by respondents, in millions	22.0	21.1	17.1	60.2
<u>“Compared with five years ago, how has your maintenance budget changed (excluding the Capital Asset Preservation program, the Higher Education Asset Preservation program, and special appropriations)?”</u>				
“Much larger”	5%	0%	0%	2%
“Somewhat larger”	32	6	87	38
“About the same”	30	22	3	20
“Somewhat smaller”	25	40	11	26
“Much smaller”	5	27	0	11
“Don’t know”	3	5	0	3
Number of respondents	56	45	4	105
Square footage maintained by respondents, in millions	24.1	20.7	17.1	61.9

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. Numbers for any state organization may not sum to 100 percent due to rounding.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

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**Capital spending for building repair and maintenance has increased over the past decade.**

### Capital Spending

To analyze allocations for capital projects we reviewed session laws, categorized capital projects into eight general types, and combined the types into three broad categories: investment in existing state buildings, new state construction, and a category that combined bond expenses, costs not related to buildings, and local projects. We looked at authorizations in two-year periods because the Legislature uses a two-year cycle for most of the capital requests. In 1988, the Legislature shifted from considering capital requests in the odd-numbered year to the even-numbered year. This change resulted in a one-year capital budget in 1989. The allocations in 1997 dollars are shown in Table 1.6.

In 1997 dollars, the state's capital investment in existing state buildings reached a peak of \$193.6 million during 1994-95, twice as much as the average of the two-year periods between 1979 and 1993. Investment in existing buildings declined to \$127.3 million in 1996-97, but this was still 32 percent higher than the average for 1979 through 1993.

Capital investment in existing buildings during 1996-97 included \$42.3 million for repair and maintenance, \$58.0 million for building renovation, and \$27.6 million for code compliance. Capital spending for building repair and maintenance reached its highest level in 1994-95, and remained at nearly that level in 1996-97. While spending on building renovations and code compliance tend to fluctuate greatly from year to year, they have been generally higher than average during the past four years, particularly in 1994-95.

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**Table 1.6: Capital Bonding Bill Authorizations, 1979-97 Sessions**

	<u>79-80</u>	<u>81-82</u>	<u>83-84</u>	<u>85-86</u>	<u>87-88</u>	<u>89</u>	<u>90-91</u>	<u>92-93</u>	<u>94-95</u>	<u>96-97</u>
<u>Investment in existing state buildings</u>										
Repair and maintenance	\$ 6.8	\$ 12.9	\$ 29.0	\$ 11.7	\$ 29.6	\$ 16.2	\$ 30.8	\$ 33.9	\$ 42.9	\$ 42.3
Renovation <sup>a</sup>	18.3	35.4	115.9	30.7	82.6	27.8	43.4	57.0	108.9	58.0
Code compliance	<u>0.1</u>	<u>17.9</u>	<u>21.1</u>	<u>7.6</u>	<u>23.0</u>	<u>45.4</u>	<u>8.1</u>	<u>17.2</u>	<u>41.8</u>	<u>27.0</u>
Subtotal	25.2	66.2	166.1	50.0	135.2	89.4	82.3	108.1	193.6	127.3
New state building construction	\$111.5	\$101.2	\$156.9	\$133.3	\$251.6	\$36.4	\$228.6	\$125.9	\$267.0	\$327.1
<u>Other</u>										
DNR projects not involving buildings	\$ 1.5	\$ 4.2	\$26.9	\$ 10.4	\$ 27.7	\$ 7.6	\$ 18.0	\$ 13.4	\$ 41.5	\$ 34.3
MnDOT projects not involving buildings	0.0	143.9	22.4	2.8	11.8	9.6	13.1	25.3	48.2	28.0
Grants for local government projects	32.1	8.1	28.7	61.4	163.9	37.1	116.2	98.3	174.3	154.8
Other, including bond expenses and site projects	<u>1.2</u>	<u>1.3</u>	<u>37.9</u>	<u>13.6</u>	<u>43.4</u>	<u>9.4</u>	<u>12.9</u>	<u>12.6</u>	<u>5.9</u>	<u>55.8</u>
Subtotal	34.9	157.7	115.9	88.2	246.8	63.7	160.3	149.7	269.9	272.9
Total	\$171.6	\$325.1	\$438.9	\$271.4	\$633.6	\$189.5	\$471.1	\$383.7	\$730.4	\$727.3

<sup>a</sup>Includes energy conservation projects.

NOTE: Allocations in millions of 1997 dollars.

SOURCE: *Minn. Laws*, 1979-97.

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We looked at how capital dollars were allocated to MnSCU, the University of Minnesota, and state agencies. As shown in Table 1.7, during the past 19 years, the state invested an average of \$26.7 million per year in existing state agency buildings, \$15.4 million in MnSCU's buildings, and \$12.9 million in the University of Minnesota's buildings. For all three government entities, existing buildings received substantially more dollars than the historical average in 1994-95. But in 1996-97, only the University of Minnesota received substantially more than its 19-year average for existing buildings. State agencies received slightly more than their average in 1996-97; MnSCU received slightly less.

## National Standards

To assess the adequacy of maintenance spending by state agencies and higher education institutions, we compared their maintenance spending with national standards and with spending on private sector office buildings.

### Standards Based on Replacement Value

**Table 1.7: Capital Bonding Bill Authorizations for MnSCU, the University of Minnesota, and State Agencies, 1979-97 Sessions**

	<u>79-80</u>	<u>81-82</u>	<u>83-84</u>	<u>85-86</u>	<u>87-88</u>	<u>89</u>	<u>90-91</u>	<u>92-93</u>	<u>94-95</u>	<u>96-97</u>
<u>MnSCU</u>										
Investment in existing state buildings										
Repair and maintenance	\$ 3.7	\$ 3.6	\$ 9.5	\$ 2.7	\$ 17.4	\$ 6.6	\$ 21.8	\$ 13.9	\$ 17.5	\$ 17.1
Code compliance	0.0	0.7	6.0	2.9	8.9	12.7	1.5	10.3	14.2	10.8
Renovation <sup>a</sup>	1.8	1.3	20.8	11.2	26.9	13.7	0.5	10.7	23.2	0.2
Subtotal	5.5	5.6	36.4	16.7	53.2	32.9	23.8	34.9	54.9	28.1
New State Building Construction	<u>9.2</u>	<u>21.7</u>	<u>44.0</u>	<u>20.2</u>	<u>101.7</u>	<u>21.5</u>	<u>113.4</u>	<u>13.2</u>	<u>95.4</u>	<u>66.1</u>
MnSCU Subtotal	14.6	27.3	80.3	36.9	154.9	54.4	137.3	48.1	150.3	94.1
<u>University of Minnesota</u>										
Investment in existing state buildings										
Repair and maintenance	\$ 0.0	\$ 0.9	\$ 1.2	\$ 0.0	\$ 5.9	\$ 0.0	\$ 2.1	\$ 10.5	\$ 2.2	\$ 5.7
Code compliance	0.0	1.5	2.2	1.6	2.5	3.7	1.8	2.2	13.9	6.3
Renovation <sup>a</sup>	10.3	8.5	53.1	10.9	32.7	2.7	6.1	0.0	23.5	32.5
Subtotal	10.3	11.0	56.5	12.6	41.1	6.4	9.9	12.8	39.6	44.5
New state building construction	<u>82.6</u>	<u>55.0</u>	<u>53.4</u>	<u>85.0</u>	<u>15.0</u>	<u>7.8</u>	<u>73.8</u>	<u>60.3</u>	<u>33.9</u>	<u>56.3</u>
U of M subtotal	93.0	65.9	109.9	97.5	56.1	14.2	83.7	73.0	73.5	100.8
<u>State Agencies</u>										
Investment in existing state buildings										
Repair and maintenance	\$ 3.1	\$ 8.4	\$ 18.3	\$ 9.0	\$ 6.4	\$ 9.7	\$ 6.9	\$ 9.4	\$ 23.1	\$ 19.5
Code compliance	0.1	15.7	12.9	3.0	11.6	29.1	4.8	4.7	13.7	9.9
Renovation <sup>a</sup>	6.2	25.6	42.0	8.6	23.0	11.4	36.9	46.3	62.2	25.3
Subtotal	9.4	49.7	73.2	20.7	41.0	50.2	48.5	60.4	99.0	54.8
New state building construction	<u>19.7</u>	<u>24.5</u>	<u>59.5</u>	<u>28.1</u>	<u>134.8</u>	<u>7.0</u>	<u>41.4</u>	<u>52.4</u>	<u>137.6</u>	<u>204.7</u>
State agencies subtotal	29.1	74.2	132.7	48.8	175.8	57.2	89.9	112.9	236.7	259.5
Total	\$136.7	\$167.4	\$323.0	\$183.2	\$386.8	\$125.8	\$310.9	\$234.0	\$460.5	\$454.4

NOTE: Allocations in millions of 1997 dollars.

<sup>a</sup>Includes energy conservation projects.

SOURCE: *Minn. Laws, 1979-97.*

The Building Research Board of the National Research Council recommended that in an average year public agencies should spend between 2 and 4 percent of

their buildings' replacement value on building maintenance, including routine maintenance, repairs, and replacement. For state and local governments across the nation, this is equivalent to about \$2.40 to \$4.80 per square foot in fiscal year 1997 dollars.<sup>17</sup> These national standards are the judgments of a committee established by the Building Research Board, including public sector facility managers, professors of architecture, and engineers from the private sector, but are not based on systematic studies. As a result, these standards should be viewed as general benchmarks.

The range in recommended spending levels reflects the variation in maintenance requirements among different government entities due to factors such as building age, the intensity of use, type and complexity of buildings, the distances between buildings, and climate.

To assess the reasonableness of these standards, we analyzed the average annual cost required to replace building components at scheduled intervals based on their average life expectancies. Mankato State University analyzed its maintenance funding requirements based on the Department of Administration's estimated life expectancies for different building components, as shown in Figure 1.1.<sup>18</sup> For example, since roofs have an expected life of 20 years, the average annual cost of replacing roofs every 20 years would be 5 percent of the replacement cost of the roof.

We applied this method to Mankato State University's buildings and found that the average annual cost required to replace all of the building components at the end of their expected life is about 3.9 percent of the total replacement cost. Even though this estimate does not include the cost of preventive maintenance activities, it is close to the top of the range recommended by the Building Research Board. Our consultants thought that several building components would usually last longer than the time estimated by the Department of Administration and that it is often more economical to repair a component rather than completely replacing it.

In fact, a life cycle cost analysis by Ohio State University used somewhat longer life expectancies than the Department of Administration and estimated the portion of each building component that would need to be replaced.<sup>19</sup> It estimated that the average annual cost would be 2.16 percent of the replacement cost for classroom and office buildings and 3.76 percent for hi-tech laboratory buildings. For the entire campus, it estimated that the average annual investment required would be about 2.6 percent of the replacement cost. In summary, life cycle cost analyses

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<sup>17</sup> The Building Research Board estimated that the average replacement value for buildings owned by the nation's state and local governments was \$100 per square foot in 1990. After adjusting for inflation, the value in fiscal year 1997 would be \$120 per square foot.

<sup>18</sup> Mankato State hired an architect to estimate the replacement cost attributable to each component for each of its buildings.

<sup>19</sup> Jack Probasco, "Crumbling Campuses, What are the Real Costs?", *NACUBO Business Officer* (November 1991): 36-41.

**Figure 1.1: Department of Administration's Building Component Life Expectancy Table, as Modified by Mankato State University**

	Life Expectancy (in Years)
Foundation/Structure	
Footings and foundation walls	75
Waterproofing and underdrain	50
Slab on grade	50
Columns, beams, and floor systems	75
Exterior Envelope	
Walls	50
Doors and windows	30
Roofs	20
Interior Construction	
Walls and doors	25
Wall and floor finishes	10
Ceiling finishes	20
Specialties	15
Conveyance Systems	20
Plumbing	
Hot and cold lines	30
Sanitary and interior storm drains	50
Fixtures	30
Compressed gasses	50
Heating, Ventilation, Air Conditioning	
Ventilation and air handling	30
Temperature control	30
Fire sprinkler	50
Boiler or furnace	35
Heating and cooling lines	50
Heating and cooling equipment	20
Air conditioning units and cooling towers	20
Electrical	
Power distribution system	35
Lighting	20
Communication and data	15
Fire alarm and security systems	20
Emergency generator	30

NOTE: The life expectancies in this table are based on the life expectancies used by the Department of Administration's Facility Audit Survey, with some increases in life expectancies for foundation and structural components.

SOURCE: Mankato State University, *Building Life Cycle Cost Analysis* (Mankato: February 1996).



**National maintenance spending standards do not include the costs of adapting a building to new uses.**

produced different estimates of annual funding requirements, but are within the range recommended by the Building Research Board.

We collected operating and capital expenditure data from seven state agencies, the University of Minnesota Twin Cities campus, and six state colleges and universities. We obtained operating expenditure data for fiscal year 1997.

Because capital bonding is heavily concentrated in even years, we included one half of the capital spending authorized by the 1996 and 1997 Legislatures.

While the Building Research Board's spending recommendation applies to routine building maintenance, repair, and replacement activities, it does not apply to adapting buildings to new uses, such as converting office space to a laboratory. Since building renovations often include building adaptation as well as repair and replacement, not all of renovation expenses should be considered when comparing maintenance spending with the standard. We present spending data with and without renovations because it is not possible to separate out the adaptation component without detailed analysis.

Table 1.8 shows how much selected state entities spent on maintenance per square foot in fiscal year 1997.

**Table 1.8: Building Maintenance Spending per Square Foot by Selected State Agencies, Colleges, and Universities, 1997**

State Agencies	Buildings' Square Footage	Total Maintenance Spending		Operating Expenses	Capital Authorizations	
		Excluding Renovation	Including Renovation		Maintenance and Code	Renovation
Residential Academies	372,000	3.19	3.93	1.29	1.89	0.75
Veterans Homes Board	855,000	2.96	2.96	1.81	1.16	0.00
Department of Human Services	4,659,000	2.67	2.97	2.08	0.58	0.30
Department of Corrections	4,283,000	2.52	2.69	2.10	0.42	0.18
Department of Transportation	4,411,000	2.49	N/A	N/A	N/A	N/A
Department of Administration	2,960,000	1.36	3.98	1.05	0.32	2.61
Department of Natural Resources	2,300,000	1.17	1.69	0.82	0.34	0.52
State Agency Total <sup>a</sup>	19,840,000	2.18	2.92	1.67	0.51	0.74
University of Minnesota Twin Cities Campus	14,000,000	2.40	3.56	1.97	0.43	1.16
Minnesota State Colleges and Universities <sup>b</sup>	18,280,000	1.79	1.85	1.09	0.70	0.06

NOTE: Operating expenses are for fiscal year 1997; capital authorizations are based on the average of capital authorizations made by the 1996 and 1997 Legislatures, including CAPRA, HEAPR, and Asset Preservation.

<sup>a</sup>State agency totals exclude spending by the Department of Transportation.

<sup>b</sup>Operating expenses for Minnesota State Colleges and Universities are based on data for six colleges and universities (St. Cloud State University, Moorhead State University, Riverland Community College, North Hennepin Community College, Central Lakes College, and St. Paul Technical College). Capital authorizations are for all MnSCU campuses.

SOURCE: Program Evaluation Division analysis of operating expense data submitted by state organizations, CAPRA expenses submitted by the Department of Administration, and other capital authorizations in the 1996 and 1997 bonding bills.

- **Overall, Minnesota state agencies and higher education institutions generally spent less on maintenance and repair than the middle of the range recommended by the Building Research Board of the National Research Council.**

If renovation expenditures were excluded, all seven state agencies, the University, and all six MnSCU campuses spent less than the middle of the range recommended by the Building Research Board (\$3.60 per square foot). If renovation expenditures were included, only the Department of Administration and the residential academies spent more than the middle of the range.

The Department of Administration's maintenance spending (including renovation spending) was higher than other state agencies because the 1996 bonding bill financed two large renovation projects involving the Transportation Building and the State Capitol. Large renovation projects have been common for the department during the 1980s and 1990s. The average capital appropriation for building renovations for the past 19 years was \$6.3 million per year, only slightly less than the 1996-97 appropriation (\$7.7 million per year).

Excluding renovations, the department's maintenance spending was less than the bottom of the recommended range. One reason it spends less than other state agencies is that it does not have to maintain a central heating plant or distribution system because it purchases steam from St. Paul's district heating system.

The residential academies spent more per square foot than most other agencies because they received more funds per square foot from CAPRA and asset preservation to address their deferred maintenance. As we discussed earlier, the residential academies have old buildings with a large amount of deferred maintenance.

State regional treatment centers, correctional facilities, and veterans homes spent less than the middle of the recommended range, even though they each have older than average buildings that are used 24 hours per day. Another reason that regional treatment centers and correctional facilities have greater maintenance needs is that prisoners and mental health patients tend to be hard on buildings. Also, because of security concerns at correctional facilities, maintenance and repairs require additional time and cost.

Maintenance spending by the Minnesota Department of Transportation (MnDOT) is noteworthy because it is the only large state agency that reported minimal deferred maintenance and it has its own funding source—the trunk highway fund. MnDOT's maintenance spending appears to be in line with the Building Research Board's recommendation. While MnDOT's maintenance spending is less than the middle of the recommended range, its buildings are considerably newer and simpler than average. On average, MnDOT's buildings are about 22 years of age, compared with 38 years for all state buildings. Also, slightly more than half of MnDOT's building square footage consists of storage buildings (29 percent) and truck stations (25 percent). According to MnDOT's estimates, MnDOT's storage buildings, on average, require about half as much maintenance per square foot as a typical office building. Similarly, truck stations require about 20 percent less maintenance than an office building.

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**Several state agencies with older, high-use facilities reported fairly low spending.**

The Department of Natural Resources (DNR) and all six MnSCU campuses spent less than the bottom of the range recommended by the Building Research Board (\$2.40 per square foot). While DNR and MnSCU probably require less maintenance than average, there are several reasons that their spending requirements are higher than the bottom of the recommended range.

DNR's maintenance requirements are probably below average because they have many simple buildings such as storage buildings and garages and few buildings have complex mechanical and electrical systems. Nonetheless, DNR's maintenance requirements are probably higher than the bottom of the range for several reasons. First, it has over 2,000 buildings spread out across the state, making it difficult to manage its building inventory. It also is responsible for maintaining many historic buildings, which adds to the cost of maintenance. Finally, its buildings are, on average, about 40 years of age. DNR's overall maintenance spending (\$1.69 per square foot) was well below the bottom of the recommended range. Its maintenance operating expenditures of \$.82 per square foot was the lowest of the government entities we examined.

Similarly, MnSCU's maintenance requirements are probably below average because its buildings are generally newer (28 years) than buildings maintained by the University of Minnesota (41 years) and state agencies (42 years). On the other hand, its maintenance requirements likely exceed the bottom of the range because their buildings are heavily used and most buildings are reaching the age when major building components begin to fail. MnSCU's maintenance spending in fiscal year 1997 was about \$1.85 per square foot, also well below the bottom of the recommended range.

The University of Minnesota, whose buildings are older and more complex than average, spent near the middle of the recommended range if renovations were included, and at the bottom of the range if renovations were excluded.

### Comparisons with Spending on Private Sector Office Buildings

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**Some state agencies have more maintenance requirements than most private office buildings.**

We also compared maintenance spending by the state with private sector office buildings. The Building Owners Management Association (BOMA) annually collects maintenance spending data from private office buildings. Unfortunately, BOMA's data include operating expenses only. Also, many state buildings have substantially different maintenance requirements than office buildings. Nevertheless, operating expense comparisons provide some indication of how spending on routine maintenance and repair by the state compares with the private sector.

We excluded the University of Minnesota and the Department of Transportation from our analysis because their spending data were not comparable with BOMA's data. For example, the University of Minnesota uses its operating funds to pay for some capital projects, including roof replacements, that are excluded from BOMA's data.

Some state agencies probably have more maintenance requirements than private building owners for two main reasons. First, state correctional facilities, residential treatment centers, veterans homes, and college research and classroom

buildings probably receive more wear and tear than the average private office building. Second, state buildings are, on average, nearly twice as old as private office buildings in BOMA's data (20 years).

Table 1.9 compares operating expenses for state buildings with private office buildings. Our spending data for the state are for fiscal year 1997, six months later than the reporting period for our private sector data, which was calendar year 1996. We found:

- **The Department of Administration, the Department of Natural Resources, and our sample of six state colleges and universities had lower maintenance operating expenses per square foot than private office buildings.**

The Department of Natural Resources' maintenance operating expenses were 33 percent lower than corresponding expenses of private office buildings. While DNR has many simple buildings, its buildings are older (42 years compared with 20 years) and are much more spread out than private office buildings.

Operating expenses were also lower for the six Minnesota state colleges and universities (11 percent lower) and the Department of Administration (15 percent lower). As noted earlier, one reason that buildings maintained by the Department

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**Table 1.9: Maintenance Operating Expenses of State Buildings Compared with Private Office Buildings, 1996-97**

	Operating Expenses Per Square Foot	Square Footage
<u>U.S. Private Sector, Calendar Year 1996</u>		
Age of building		
0-9 years	\$1.09	129,616,000
10-19 years	1.09	216,427,000
20-29 years	1.29	90,252,173
30 years and over	1.52	67,028,000
All buildings <sup>a</sup>	1.23	594,428,000
Corporate (owner-occupied) facilities	1.54	97,218,505
<u>State Organizations, Fiscal Year 1997</u>		
Department of Natural Resources	0.82	2,300,000
Department of Administration	1.05	2,960,000
Six state colleges and universities	1.09	4,282,000
Residential Academies	1.29	372,000
Veterans Homes Board	1.81	855,000
Department of Human Services	2.08	4,659,000
Department of Corrections	2.10	4,283,000

<sup>a</sup>The square footage for all buildings does not equal the sum of square footages for the four age categories because age was not available for all buildings.

SOURCE: 1997 BOMA Experience Exchange Report and Program Evaluation Division analysis of state agency and MnSCU data.

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of Administration had lower operating expenses was that plant management staff do not have to maintain boilers for the capitol complex buildings because they are served by St. Paul's district heating system.

Regional treatment centers, correctional facilities, and veterans homes had higher maintenance operating expenses, but this is expected because of their greater maintenance requirements.

## SUMMARY

We found that in fiscal year 1997, state agencies, colleges, and universities generally spent less on maintenance and repair than the middle of the range recommended by the Building Research Board of the National Research Council. The one agency whose spending appears to be in line with this national standard is the Minnesota Department of Transportation, which was the only large state agency to report minimal deferred maintenance. Unlike other state agencies, MnDOT has its own funding source: the trunk highway fund.

In addition, building maintenance operating expenditures for the Department of Natural Resources, the Department of Administration, and state colleges and universities were lower than spending for private office buildings. Maintenance operating expenses for regional treatment centers, correctional facilities, and veterans homes were higher than spending on private office buildings because these state facilities are much older and have more intensive use than most office buildings.

Maintenance spending trends suggest that the state's maintenance spending has been below national standards for an extended time. During the 1990s, the Legislature has placed greater emphasis on asset preservation in the capital budget through the Capital Asset Preservation and Replacement Account (CAPRA) and the Higher Education Asset Preservation and Renewal (HEAPR) program. Trends in capital spending indicate that the state's investment in existing buildings was considerably lower during the 1980s and early 1990s than the past four years. While data for operating spending are incomplete, available evidence suggests that state agencies and the University of Minnesota have generally increased their spending to a moderate extent over the past five to ten years, while most state colleges and universities have decreased operating spending.



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# Deferred Maintenance

## CHAPTER 2

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In 1994, the Department of Administration estimated that the state had a deferred maintenance backlog of roughly \$1.5 billion. This represents a significant amount of deferred maintenance and raises important questions about the adequacy of state building maintenance and the suitability of the state's maintenance policies and procedures. In this chapter, we address the following questions:

- **Does the state have a deferred maintenance backlog? If so, how large is it? What type of building deficiencies exist?**
- **What are the impacts of deferring maintenance and repairs?**

To address these questions, we obtained lists of deferred maintenance projects identified by agencies, interviewed physical plant directors and other agency officials, reviewed inspection reports and building assessments conducted by agency consultants, and conducted site visits.

Overall, we confirmed that there is a large backlog of deferred maintenance in state buildings, although there is considerable uncertainty about the exact amount. Based on a narrow definition of deferred maintenance that emphasizes physical deterioration, available evidence suggests that the amount of deferred maintenance is between \$300 and \$600 million. But using a broader definition that includes the cost of upgrading buildings to modern standards, the total could be roughly \$2 billion.

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**The state's deferred maintenance estimate of \$1.5 billion was based on estimates from other states and a theoretical model.**

## DEFERRED MAINTENANCE ESTIMATES

In 1994, the Department of Administration asserted that the state has a large "capital iceberg" of deferred maintenance of unknown size. Its rough estimate of \$1.5 billion was obtained by (1) using studies from other states to estimate that the deferred maintenance for state agencies and state colleges and universities was about \$10 per square foot, or \$600 million, and (2) using the University of Minnesota's own estimate that its deferred maintenance was about \$923 million.<sup>1</sup> The University's estimate was based on a theoretical model that considered the life expectancy, age, and replacement cost of major building components.

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<sup>1</sup> Department of Administration, *The Capital Iceberg* (St. Paul, 1994).

To provide more concrete evidence of deferred maintenance, the Department of Administration has encouraged state departments and other entities to identify building deficiencies and to determine the required corrective action. Subsequently, many state agencies and higher education institutions have identified deferred maintenance problems and estimated the cost to correct them. In the following section, we discuss various ways state governmental entities have defined deferred maintenance. We then examine deferred maintenance for state agencies, the University of Minnesota, and state colleges and universities.

## Definitions of Deferred Maintenance

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**Each agency is responsible for estimating its deferred maintenance needs.**

In this report, we use the term deferred maintenance in the same way that the Department of Administration uses the term “capital iceberg,” that is, maintenance, repair, replacement, and renewal projects that should have been performed but were not.<sup>2</sup>

While the Department of Administration has a definition of deferred maintenance, each agency is responsible for developing its own approach to identify its deferred maintenance. State agencies vary in terms of what types of building deficiencies were included and how building deficiencies were identified. In addition, whether to label a building deficiency as deferred maintenance often requires subjective judgment about the seriousness of the deficiency. As a result, comparisons among agency estimates should be made with caution.

To interpret estimates of deferred maintenance, it is useful to consider three types of building deficiencies, as illustrated in Figure 2.1. The first type includes physical defects that must be corrected to maintain the building as it was originally designed. These defects are usually caused by physical deterioration, though in some cases they may be due to faulty construction. Many building components wear out with time and must be repaired or replaced. Examples include filters, paint, window glazing, masonry, roofs, and boilers. Agencies routinely include problems with these components in their deferred maintenance estimates. However, there are no uniform standards on how much a building component has to deteriorate before it needs to be repaired or replaced.

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**Some agency definitions of deferred maintenance include building modernization.**

The second type of building deficiency is the failure to meet standards that have changed since the building was constructed. During the lifetime of many state buildings, there have been major changes in fire/life safety codes. Also, governments have established new standards for accessibility, energy conservation, and environmental health, including asbestos and indoor air quality. Heating, ventilation, and air conditioning systems have improved over time due to technological advances. Finally, electrical standards have changed in order to accommodate increased usage of computers and other electronic equipment.

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<sup>2</sup> The Department of Administration defines capital iceberg as the combination of “deferred normal maintenance” and “deferred renewal.” Deferred normal maintenance includes preventive maintenance activities and minor repairs that should have been performed but were not. Normal maintenance activities are funded by the operating budget. Examples are painting, glazing windows, repairing small roof defects, and replacing broken parts. Deferred renewal refers to renewal or replacement projects that are due but have not been executed. These are projects that have a maintenance cycle in excess of one year and are typically not funded by the annual operating budget. Examples include replacing roofs, mechanical systems, and windows.



### Figure 2.1: Types of Building Deficiencies

**Physical defects that affect functioning of buildings as originally designed:** Routinely included in deferred maintenance estimates.

Examples of corrective action:

Changing filters, painting, glazing windows, masonry repairs, replacement or major repair of roofs, boilers and other mechanical equipment.

**Failure to meet modern building standards:** May or may not be included in deferred maintenance estimates.

Examples of corrective action:

Fire and life safety codes (adding fire sprinklers, enclosing staircases)

Upgrade electrical systems to meet modern demand levels

Meeting accessibility standards under ADA

Asbestos containment

Adding ventilation systems to meet ventilation standards

Window replacement

Replacing old steam heating systems with hot water systems

Replacing window air conditioners with central air conditioning or adding new air conditioning

**Building not suitable for new program requirements:** Generally not included in deferred maintenance estimates

Examples of corrective action:

Converting office space into lab space

Remodeling space to support new programs

SOURCE: Program Evaluation Division.

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**Adapting a building to meet new program needs is generally not considered deferred maintenance.**

Most of the differences among agency definitions of deferred maintenance involve the degree to which agencies include building improvements designed to bring building components up to modern standards. Some agencies define deferred maintenance narrowly to include only fire code and life safety issues in addition to physical deterioration. Alternatively, the University of Minnesota defines deferred maintenance broadly to include the repairs and upgrades that need to be carried out to bring almost all building components to modern standards. This definition tends to make the University's estimates of deferred maintenance higher than they would otherwise be.

The third type of building deficiency involves building adaptation, that is, alterations that are required to accommodate program changes. An example of building adaptation is remodeling an office to include more laboratory space. While building adaptation can be important to an agency's mission, few, if any, agencies consider it to be deferred maintenance.

## State Agencies

We examined the deferred maintenance of eight state departments, which collectively own about 90 percent of state agency buildings. Tables 2.1 and 2.2 summarize the amount of deferred maintenance reported by these agencies.

- **Overall, state agencies identified about \$140 million in deferred maintenance projects.**

**Table 2.1: Deferred Maintenance Reported by Selected State Agencies**

<u>State Agency</u>	<u>Square Footage</u>	<u>Deferred Maintenance</u>	<u>Deferred Maintenance per Square Foot</u>
Hastings Veterans Home	244,000	\$ 7,728,000	\$32
Residential Academies	438,000	5,881,000	15
Minneapolis Veterans Home	500,000	5,627,000	11
Department of Corrections	4,376,000	45,778,000	10
Department of Natural Resources	2,300,000	\$22,000,000	\$10
Department of Military Affairs	2,050,000 <sup>a</sup>	17,357,000	8
Department of Administration	2,960,000	16,976,000 <sup>b</sup>	6
Department of Human Services	4,464,000	20,306,000	5
Department of Transportation	4,392,000	Minimal	0

<sup>a</sup>Excludes square footage for Faribault buildings because facilities will soon be transferred to the Department of Corrections.

<sup>b</sup>Excludes \$12 million in deferred maintenance for the Capitol Square Building, which the Department of Administration concluded should be demolished.

SOURCE: State agencies.

### State agency estimates of deferred maintenance are generally conservative.

We consider these estimates to be generally conservative estimates of deferred maintenance because most of these estimates are based on known deficiencies in the buildings' physical condition. They usually do not include the cost of modernizing mechanical components in good working condition. Also, some agencies have not included certain types of deficiencies. For example, neither the Department of Human Services nor the Department of Natural Resources included accessibility deficiencies. The Hastings Veterans Home did not include deferred maintenance for interiors or tuckpointing because it focused on more serious deficiencies.

Many state agencies reported significant amounts of deferred maintenance, including the departments of Corrections (\$45 million), Human Services (\$20 million), Natural Resources (\$22 million), Administration (\$17 million), and Military Affairs (\$17 million). On a per square foot basis, the state sites with the most deferred maintenance were the Hastings Veterans Home, the state prisons in

**Table 2.2: Types of Deferred Maintenance for Selected State Agencies**

	Corrections			Human Services	Administration	Veterans Homes		Residential Academies
	Total	Stillwater	St. Cloud			Hastings	Minneapolis	
Building square footage	4,376,164	1,205,844	603,926	4,464,448	2,960,000	244,461	500,000	384,313
Total deferred maintenance (in '000s)	\$45,778	\$22,130	\$13,187	\$20,306	\$16,976	\$7,728	\$5,627	\$5,881
Deferred maintenance per square foot	\$10.46	\$18.35	\$21.84	\$4.55	\$5.74	\$31.61	\$11.25	\$15.30
<b>Types of Deferred Maintenance</b>								
Building exteriors								
Windows	31.9%	51.6%	1.6%	7.9%	6.5%	1.1%	0.0%	17.2%
Walls/tuckpointing	20.6	32.9	5.0	10.7	25.6	1.5	5.2	0.0
Foundation	0.0	0.0	0.0	3.0	0.1	0.0	0.0	6.5
Mechanical								
Plumbing/piping	14.8	4.6	39.5	0.0	0.1	5.5	6.0	0.0
Ventilation/AC	3.6	0.0	3.2	2.6	10.5	18.3	0.0	6.9
Heating (boiler, piping)	1.9	0.0	5.9	5.5	0.0	14.5	9.0	0.0
Infrastructure (tunnels, piping)	0.0	0.0	0.0	27.9	0.4	31.8	72.3	0.0
Roofs	4.9	0.0	1.4	0.0	19.3	4.9	0.0	19.4
Electrical	4.8	3.6	10.1	21.5	5.4	7.2	0.0	29.8
Interiors	2.4	1.8	3.8	0.0	0.5	0.0	0.0	7.7
Asbestos	2.5	0.5	0.0	0.0	3.7	11.2	0.0	6.9
Fire/life Safety	10.7	4.6	28.6	8.9	0.0	0.0	0.0	2.0
Remodeling	0.0	0.0	0.0	0.0	14.6	0.0	0.0	0.0
Other <sup>a</sup>	<u>1.9</u>	<u>0.3</u>	<u>0.9</u>	<u>12.0</u>	<u>13.4</u>	<u>4.0</u>	<u>7.5</u>	<u>3.6</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

<sup>a</sup>Other includes general repairs, water treatment, retaining walls, removal of underground storage tanks, and demolition.

SOURCE: Program Evaluation Division analysis of state agency deferred maintenance lists.

**Many agencies reported significant amounts of physical deterioration.**

St. Cloud and Stillwater, and the residential academies, each of which maintains very old buildings.<sup>3</sup>

The Department of Corrections reported about \$46 million in deferred maintenance, the largest amount of any state agency. About half of this amount is to replace deteriorated windows and repair deteriorated walls, most of which are at Stillwater State Prison. Fifteen percent is for plumbing repairs and 11 percent is for correcting fire/life safety deficiencies.

Stillwater State Prison has extensive physical deterioration in its windows and walls. Part of the catwalk on the security wall has collapsed and other sections are not safe. The security wall and towers have many cracks that allow water intrusion, causing further deterioration of the bricks and stucco. It has old, single pane windows in very poor condition. During the winter, thick layers of frost

<sup>3</sup> We refer throughout the report to the Minnesota State Academy for the Deaf and the Minnesota State Academy for the Blind as the residential academies.

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**Specific deferred maintenance needs of state agencies vary widely.**

build-up on the windows and drip onto the floor, requiring considerable maintenance. Our consulting architect concluded that the deteriorating masonry and windows require prompt repair as a matter of asset preservation.<sup>4</sup>

For other state agencies, most of the deferred maintenance also consists of physical deterioration of basic infrastructure and buildings. Out of the \$20 million in deferred maintenance at the regional treatment centers operated by the Department of Human Services, half is for electrical, tunnel, and piping systems. Regional treatment center buildings are, on average, about 60 years of age.

The veterans homes in Hastings and Minneapolis have extensive deterioration in their basic infrastructure, including tunnels and the steam, water, and sewer distribution systems. An engineering analysis of the tunnels of the Minneapolis Veterans Home found numerous leaks in steam, condensate, and water pipes. In addition, most tunnels had leakage problems, particularly the older tunnels that are nearly 100 years old. The water leakage has corroded piping supports and caused the collapse of portions of three tunnels. An engineer for the Department of Administration concluded that these deficiencies need to be addressed as soon as possible or there will be a risk of major system failure and resident evacuation.

Similar problems exist at the Hastings Veterans Home. Due to major problems with its heating plant, it received emergency assistance from the Department of Administration's CAPRA program in 1997. The Department of Administration and the Veterans Homes Board identified deferred maintenance projects at Hastings costing \$7.7 million, most of which is for renewing the heating plant and infrastructure. The deferred renewal reported by the residential academies consists primarily of correcting deterioration in basic building components, including roofs, heating and ventilation systems, windows, and foundations.

The Department of Natural Resources, which is responsible for maintaining more than 2,000 buildings, has a variety of deferred maintenance problems. Officials from DNR, Finance, and Administration all told us that many DNR buildings are in poor condition. We also found a variety of deferred maintenance issues on our tours of Itasca and Fort Snelling State Parks. DNR maintenance staff and park officials said that Itasca's deferred maintenance includes sewer and water lines that need to be replaced at a cost of about \$760,000. A campground sanitation building was closed because of deterioration of the sewer and water infrastructure serving the building and general deterioration of the building's interior. In addition, DNR recommended replacing Nicollet Court, a two story log resort building, because it had deteriorated to the point that it was beyond repair. The building is rotting from the inside out because of inadequate ventilation.

The Department of Administration has identified \$17 million in deferred maintenance projects, including \$1 million of low priority projects. These low priority projects include several roofs that, according to plant management staff, need to be replaced, but currently do not have significant leakage problems. The \$17 million deferred maintenance estimate excludes about \$12 million in deferred maintenance at the Capitol Square Building because the department is

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<sup>4</sup> We contracted with Cain Ouse Associates Inc. and Pope Associates Inc. to provide us with advice on engineering and architectural issues and assistance in constructing several questionnaires.

recommending that Capitol Square be demolished. Even if the building were totally renovated, inadequate floor-to-floor height prevents it from meeting modern office building standards.<sup>5</sup>

## University of Minnesota

The University has requested substantial funds this year to help it renovate or replace many of its buildings. To examine its deferred maintenance, we first reviewed the University consultants' assessments of 20 buildings on the Twin Cities campus. These assessments, prepared by consulting architects and engineers at a cost of over \$500,000, are the most comprehensive information available on the physical condition of University buildings. We then reviewed campus-wide assessments of building deficiencies conducted in the following areas: fire/life safety, accessibility, roofs, windows, and exterior walls.

### Comprehensive Building Assessments

While the 20 buildings that were assessed are not representative of all of the University's buildings, they are generally representative of buildings scheduled to be renovated or replaced under the University's \$750 million six-year capital plan. This capital plan focuses on preserving the University's existing buildings rather than new construction. The centerpiece of the plan is the renovation of 11 buildings on or near the mall, costing about \$179 million. Other major renovation and replacement projects for the Twin Cities campus include (1) \$120 million to renovate approximately seven buildings in the Knoll area, the oldest section of the University, (2) \$35 million to renovate four other Twin Cities campus buildings, including one on the St. Paul campus and one on the west bank, (3) \$70 million to replace the Jackson, Owre, Millard, Lyon (JOML) complex with a new molecular and cellular biology building, and (4) \$15 million to replace the Studio Arts Building.

The 20 building assessments include all 6 buildings scheduled for demolition and replacement and 10 of the approximate 22 buildings scheduled for major renovations under the six-year capital plan. The ten assessments of buildings scheduled for renovation include seven buildings in the mall area, one on the West Bank, one on the St. Paul campus, and one building in the Knoll area. Thus, the Knoll area renovations are the only area that the assessments underrepresent. Since the Knoll buildings tend to be the oldest buildings with the most physical deterioration, the building assessments may somewhat understate the deferred maintenance of the 22 buildings scheduled for renovation.

The building assessments and our tour of several of these buildings indicate that these ten buildings have many fire and life safety code deficiencies and most have old heating, ventilation, and air conditioning systems that do not meet modern standards. They are partially air conditioned (using a combination of room air conditioners and a few small roof-top systems) and rely largely on windows for ventilation. Table 2.3 summarizes the type of deficiencies found in these

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**The University's building assessments reflect its deferred maintenance needs.**

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<sup>5</sup> Adequate floor-to-floor height is important to ensure that there is enough space above the ceiling for ductwork, communication and electrical wiring, sprinkler piping, and other requirements.

**Table 2.3: The Estimated Cost of Correcting Deficiencies in Buildings Scheduled to be Renovated or Replaced Under the University of Minnesota's Six-Year Capital Plan**

	Ten Buildings Scheduled for <u>Renovation</u>	Six Buildings Scheduled for <u>Replacement</u>
Gross square footage	934,855	434,585
Cost of correcting deficiencies (in '000s)	\$ 75,200	\$ 67,300
Cost per square foot	\$ 80	\$ 155
Fire/life safety and accessibility		
Fire/life safety	15.9%	13.8%
Asbestos	8.3	4.7
Accessibility/ADA	5.8	2.5
Building Envelope		
Windows	7.8	6.5
Exterior walls	5.7	1.2
Roofs	2.9	2.0
Mechanical systems		
A/C & ventilation	31.8	21.4
Heating systems	5.8	2.7
HVAC controls	3.3	5.7
Plumbing	2.5	3.7
Electrical systems	6.4	9.2
Interiors	3.1	0.6
Other	0.9	3.8
New construction/remodeling	<u>0.0</u>	<u>22.2</u>
Total	100.0%	100.0%

SOURCE: These estimates are based upon detailed building assessments conducted by University consultants for 10 out of 22 Twin Cities campus buildings scheduled to be renovated under the University's six-year capital plan. These ten buildings are Johnston Hall, Morrill Hall, Ford Hall, Vincent Hall, Murphy Hall, Lind Hall, Mechanical Engineering/Ackerman Hall, Pillsbury Hall, Blegan Hall, and Peters Hall. The six buildings scheduled to be demolished and replaced with new facilities are the Studio Arts Building and a five building medical science classroom and research facility, including Jackson Hall, Jackson Owre, Owre Hall, Millard Hall, and Lyon Laboratories (JOML).

buildings and the cost to correct them. Based on the building assessment estimates, renewing the physical condition of these ten buildings would cost about \$80 per square foot in 1997.

- **Most of the cost of correcting deficiencies in the buildings scheduled for renovation under the University's capital plan involves upgrading mechanical systems to modern standards and meeting fire/life safety, asbestos, and accessibility standards.**

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**The assessment reports estimate the costs of modernizing University buildings.**

This includes the cost of upgrading heating, ventilation, and air conditioning to modern standards (41 percent of the total cost), correcting fire, life safety, asbestos, and accessibility deficiencies (30 percent), replacing old single-pane windows that do not meet today's energy standards (8 percent), repairing and upgrading electrical systems to meet current needs (6 percent), and repairing exterior walls (6 percent). The building assessments recommended replacing steam heating systems with hot water even if they were in good working condition because hot water systems are more efficient and would allow the University to more effectively control the temperature throughout the building.

The assessment reports also recommend installing central air conditioning and ventilation systems in each building. While central air conditioning is more efficient than room air conditioners and small rooftop systems, it is not clear that the efficiency gains alone justify the cost. For several buildings, University staff claim that central air conditioning is necessary to support high technology equipment and labs to be included in building renovations.

The University's rationale for replacing the five building JOML complex and the Studio Arts Building is that the cost of renovating them is so high (\$155 per square foot) that it is not worth preserving them. In the case of the JOML complex, the consultants concluded that even after completing the renovation, "basic inadequacies of floor-to-floor height and column spacing will always prevent JOML from serious consideration as a research facility."<sup>6</sup>

To estimate the cost of bringing all state supported buildings on the Twin Cities campus (excluding dormitories, parking ramps, and other buildings supported by user fees) to modern standards, we applied average cost per square foot estimates from building assessments to other University buildings with similar ages. We used the building assessments described above plus five building assessments for buildings constructed after 1960 and renovation cost estimates for three Knoll area buildings. We conclude:

- **Building assessments conducted by University consultants are generally consistent with the University's 1994 estimate that it would cost roughly \$923 million to renew all state-supported University buildings.**

### **Fire/Life Safety, Accessibility, and Asbestos Deficiencies**

The University has many buildings with serious fire/life safety, environmental health, or accessibility deficiencies. As of 1997, the University's rough estimate for correcting known serious deficiencies is \$82 million for fire and life safety, \$30 million for environmental health, and \$13 million for accessibility. Many University buildings lack fire sprinklers, separation of stairways, and fire-rated corridors. These figures exclude deficiencies in Walter Library, which the University plans to renovate.<sup>7</sup> According to University staff, the library's stacks are the University's worst fire safety deficiency.

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<sup>6</sup> Rafferty Rafferty Tollefsar Architects, *JOML Building Needs Assessment Project* (St. Paul, MN: 1993).

<sup>7</sup> These figures also exclude deficiencies in JOML, which the University plans to replace.

The most common environmental health issue involves asbestos containment. Removing all asbestos from the University would be very expensive. As a result, the University only includes the cost of removing asbestos when it is judged necessary to prevent asbestos from becoming airborne.

### **Roofs, Windows, and Walls**

Under the University's Envelope Management Program, a consultant for the University assesses the condition of roofs, windows, and walls of 192 state-supported buildings on the Twin Cities campus.

- **University consultant reports indicate that there is about \$18 million in deferred maintenance of roofs, windows, and walls on the Twin Cities campus.**

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### **The 1997 estimate of the University's repair needs exceeded its budget.**

The consultant regularly inspects the roofs and identifies needed repairs. To identify which roofs need to be replaced, the consultant performs an economic analysis that compares the cost of repair with the cost of replacement for each roof section. In Spring 1996, the University of Minnesota's roof consultant recommended \$4.2 million in roof replacements and \$1.2 million in major repairs within one year. However, since the University's annual budget for roof repairs and replacements is about \$2 million per year, the University deferred about \$3.4 million of these recommended projects. In 1997, the roof consultant recommended \$7.1 million in roof replacements and repairs, an amount that again exceeded the University's roof budget.

In 1997, the consultant also recommended \$5.6 million in tuckpointing and other external wall repairs. Since the University's annual budget for wall repairs is about \$300,000, most of these repairs will be deferred.

In addition, the consultant analyzed the payback periods for replacing old single-pane windows with low-maintenance energy efficient windows. The payback period is the number of years it takes for the energy and maintenance savings to offset the cost of installing a new window. The consultant found that almost all of the windows that had payback periods of less than 10 years were old single-pane windows with wood frames that required painting. The cost of replacing windows with payback periods of less than ten years would be about \$9.1 million, including \$1.3 million to replace windows that had a payback period of less than 2 years.

## **Minnesota State Colleges and Universities**

To assess the deferred maintenance of buildings under the jurisdiction of the Minnesota State Colleges and Universities system, we reviewed the list of projects submitted in MnSCU's request for Higher Education Asset Preservation and Renewal (HEAPR) funds, and we interviewed MnSCU officials and campus physical plant directors. We found:

- **MnSCU's request for \$91 million in Higher Education Asset Preservation and Renewal funds is only a rough indication of its deferred maintenance needs.**



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**Some MnSCU campuses did not include all deferred maintenance needs in their HEAPR request.**

MnSCU's \$91 million request is based on a list of projects submitted by individual campuses. These projects are primarily for repair and replacement of building components and correction of fire/life safety, accessibility, and asbestos deficiencies. About 21 percent of this request is for repairing or replacing heating, ventilation, and air conditioning systems; 18 percent addresses life/safety, asbestos, and accessibility deficiencies; and 17 percent is for roof replacements. Approximately 8 percent is for remodeling projects, only part of which would be considered deferred maintenance.

MnSCU officials consider the HEAPR request to be a conservative estimate of deferred maintenance and renewal. In fact, some MnSCU campus officials told us that they did not include all of their deferred maintenance in their HEAPR request to MnSCU. For example, Moorhead State University submitted a HEAPR request for \$16.2 million, although it estimates that its deferred maintenance and renewal is \$30 million. While a consultant estimated that it would cost \$3.4 million to tuckpoint all of the buildings on campus, Moorhead included only \$800,000 in its HEAPR request to take care of the most important tuckpointing needs. Also, St. Cloud State University included several million dollars worth of deferred maintenance projects as part of two major renovation projects that were capital requests separate from their HEAPR request. In addition, St. Cloud estimated that it has a backlog of about \$300,000 in small corrective maintenance projects that were not included in the capital request.

To examine the extent to which roof repairs have been deferred, we contacted the three MnSCU campuses with the most roof replacement requests. Roofs account for \$16 million out of MnSCU's \$91 million request under HEAPR for 1998. Forty percent of this \$16 million is for roof replacements at three state universities (St. Cloud, Moorhead, and Bemidji). In 1997, a roof consultant recommended that all five of the roof replacements requested by Moorhead State University be completed within a year, including one and part of a second that were recommended for immediate replacement in its 1995 inspection report.<sup>8</sup> At Bemidji State University, a roof consultant recommended completing one of the four requested roof replacements in 1997 or earlier. The recommended replacement dates for the other three roofs were 1997-98 or 1998-99 (the recommended times were two year intervals). The physical plant director for St. Cloud told us that two of the five roof replacements requested are past the time that they should have been replaced and three roofs are due for replacement in 1998.

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**MnSCU plans to develop a more comprehensive assessment of its building conditions.**

Recognizing that not all campuses have thoroughly inspected their facilities and that funding requests may be based on varying standards among all of its campuses, MnSCU plans to hire a consultant and establish a work group of college campus officials to develop a more comprehensive assessment of building conditions. This should help MnSCU obtain a comprehensive measure of deferred maintenance that is based on consistent methods across campuses.

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<sup>8</sup> Inspec, Inc., *1997 Roof Management and Update Survey Report* (Minneapolis, MN: 1997).

## Statewide Estimate

Statewide, the amount of deferred maintenance is not known with precision for several reasons. First, available estimates of deferred maintenance have been prepared by individual state entities using their own definitions. In addition, state agencies, colleges, and universities varied in how thoroughly they inspected their buildings and how they estimated the cost to correct the deficiencies.

Nevertheless, the evidence presented in this chapter suggests that the statewide level of deferred maintenance based on physical deterioration alone is substantial, but well under \$1 billion. Together, state agencies and MnSCU have identified roughly \$230 million in deferred maintenance, most of which is attributable to physical deterioration. While the University of Minnesota's deferred maintenance estimate is much higher (\$923 million), most of it involves the cost of upgrading buildings to meet modern standards rather than physical deterioration. The fact that the University of Minnesota's buildings have the same average age as state agency buildings suggests that it may have roughly the same amount of deferred maintenance per square foot. Allowing for a possibly large amount of unidentified deferred maintenance,

- **We estimate that the statewide level of deferred maintenance attributable to physical deterioration is between \$300 million and \$600 million.**

Based on the broader view of deferred maintenance, the best available evidence comes from comprehensive building assessments conducted by the University's consultants. Results from these assessments are generally consistent with the University's estimate that it would cost roughly \$923 million to bring all state-supported University buildings to modern standards.

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**The costs for meeting modern standards exceed the costs for physical deterioration.**

Applying the same method to state agencies and MnSCU would certainly increase their deferred maintenance estimates, but it is difficult to estimate how much. For example, the cost of meeting modern standards is probably less for MnSCU because it has newer facilities and most of MnSCU's buildings already have modern heating, ventilation, and air conditioning systems in place. However, even if we assume that the cost of meeting modern standards for state agencies and MnSCU is only half as much as the University (on a square-footage basis), the statewide amount of deferred maintenance under the broad definition would be roughly \$2 billion.

## IMPACT OF DEFERRING MAINTENANCE

To assess the impact of deferring building maintenance, we interviewed physical plant directors, architects, and engineers, and reviewed literature on building maintenance. We concluded that:

- **While there is general agreement that deferring maintenance is often undesirable, the statewide effect of deferring maintenance is not known.**

The statewide effect of deferring various types of maintenance is not known because agencies generally do not track the effects of deferring maintenance. In a few cases, we obtained information on the effects of deferring maintenance, but these are illustrative and not necessarily representative of the impact of the state's deferred maintenance.

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### **Agencies generally do not track the costs of deferring maintenance.**

Deferring repair (or replacement) of roofs, exterior walls, and foundations usually leads to further physical deterioration, although the amount is generally not measured. Because of deferring five roof replacements, Moorhead State University spends about \$40,000 to \$70,000 annually in repair costs just to minimize the damage caused by leaks. In addition, the roof leaks damaged ceilings, walls, insulation, and some equipment. In turn, the wet insulation leads to higher energy costs. Since replacing the five roofs costs about \$2.4 million, the annual cost of roof replacement would be about \$100,000 if the roofs last 24 years.

Deferring roof replacements also may affect the programs that take place within the buildings. For example, a large section of the library at St. Peter Regional Treatment Center was covered with plastic to protect it from a leaking roof. Nicholson Hall Auditorium at the University of Minnesota was closed after roof leaks caused plaster to fall from the ceiling.

Deferring maintenance of mechanical systems risks premature failure, service interruption, and more costly repairs that must be done on an emergency basis. The Hastings Veterans Home provides an example of how emergency maintenance can cost more than scheduled maintenance. In Spring 1997, one of its two boilers was condemned. Under the CAPRA program, the Department of Administration provided emergency funds to purchase a new boiler. However, because the power plant's floor was not structurally sound, the new boiler had to be installed outdoors on an emergency basis until the floor could be repaired. As a result, it cost an additional \$60,000 to build a temporary outdoor shelter for the boiler, to reconnect the pipes, and to cover the higher cost that occurred because it had to be purchased on short notice.

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### **Deferring maintenance can affect a variety of other costs.**

Deferring window replacements postpones the chance to reduce energy and maintenance expenses, though one must analyze on a case-by-case basis whether the expense reduction justifies the replacement cost. Replacing old windows with low-maintenance, energy efficient windows can reduce energy and maintenance expenses, but the payback period varies greatly. For example, the University of Minnesota's consultant concluded that only single pane windows that require painting have payback periods of less than 10 years. Older windows may also have greater condensation problems, but again this must be assessed on a case-by-case basis.

Deferring the replacement of faulty or inefficient steam traps can significantly reduce the operating efficiency of a heating system. Steam traps are designed to increase the efficiency of steam heating systems by letting condensate return to

the boiler while trapping steam where it can most efficiently provide heat. Failing to repair or replace faulty steam traps generally will not be noticed by building occupants, but may reduce the efficiency of the heating system. For example, in 1993, the steamfitter for St. Peter Regional Treatment Center estimated that 50 to 60 percent of the facility's 800 steam traps were blowing steam. The chief engineer estimated that replacing one type of leaking steam trap commonly used at the treatment center would create annual energy savings equal to three times the replacement cost of the trap.

The effect of deferring handicapped accessibility projects on access to services is also not known on a statewide basis. The Department of Administration's 1997 accessibility report cites accessibility deficiencies in state agencies and MnSCU that would cost about \$53 million to correct, but it has not measured how significant these deficiencies are. In contrast, the University of Minnesota and other individual colleges and state agencies have rated the seriousness of accessibility deficiencies. In the next year, Administration plans to examine whether identified deficiencies actually impede access to public services.

## SUMMARY

Overall, we confirmed that there is a large backlog of deferred maintenance in state buildings, though there is considerable uncertainty about the exact amount. State agencies, colleges, and universities use different approaches to measure deferred maintenance. While agencies consistently include the cost of correcting defects due to physical deterioration, they vary in whether they include the cost of building improvements designed to bring their buildings up to modern standards. Most of the \$140 million in deferred maintenance reported by state agencies involves correcting building defects caused by physical deterioration. The University of Minnesota also has deferred maintenance due to physical deterioration, but most of the deferred maintenance for its older buildings involves improvements designed to meet modern building standards, including fire and life safety codes, accessibility standards, environmental health standards (such as asbestos), and heating, ventilation, and air conditioning standards.

Based on a narrow definition of deferred maintenance that emphasizes physical deterioration, available evidence suggests that the amount of deferred maintenance is between \$300 million and \$600 million. But using a broader definition that includes the cost of upgrading buildings to modern standards, the total may reach \$2 billion. While most state buildings are in reasonably good physical condition, there is a substantial amount of physical deterioration, particularly in the basic infrastructure of some veterans homes, correctional facilities, and residential treatment centers. In addition, many buildings do not meet modern standards for fire/life safety, accessibility, heating, ventilation, and air conditioning.



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# Maintenance Practices

## CHAPTER 3

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**T**he current condition of the state's buildings and the backlog of deferred maintenance is in part a product of the maintenance practices used by state departments and institutions of higher education. We wanted to identify good maintenance practices and to determine whether state government entities follow these practices and are able to keep up with the maintenance needs of their buildings. In this chapter we address the following questions:

- **How do the state's maintenance practices and policies compare with those recommended by architectural and engineering experts?**
- **To what extent are preventive maintenance practices used?**

We briefly reviewed the national literature on maintenance practices and standards and consulted with architectural and engineering experts. Since building management responsibility is decentralized within the state, we collected information about the maintenance practices of state agencies and public higher education institutions by surveying physical plant directors and facilities managers and conducting follow-up interviews.<sup>1</sup> We also toured numerous buildings at 11 sites.<sup>2</sup>

Many state departments and higher education institutions are doing basic maintenance work, but many also reported moderate to large backlogs of corrective maintenance. Many of these entities do not have maintenance schedules for building components, may not follow those schedules even if they have them, and frequently do not document their preventive and corrective maintenance work. Computerized systems get high marks from the agencies that

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<sup>1</sup> We mailed the maintenance questionnaire to 123 staff at state organizations that owned and maintained buildings. We selected a representative from the central office in nine agencies: Administration, Human Services, Natural Resources, Corrections, Military Affairs, Transportation, MnSCU, the University of Minnesota, and the Veterans Homes Board. We also mailed questionnaires to seven staff at six other state agencies including the Center for Arts Education, the Historical Society (2), IRRRB, Economic Security, Minnesota State Academies for the Deaf and Blind (residential academies), and the Minnesota Zoo. The remaining 107 questionnaires we mailed to individuals, one per location, identified as having responsibility for maintenance services at local sites. Local sites included Department of Transportation districts, Department of Natural Resources regions, and MnSCU and University of Minnesota campuses. Over 90 percent of all questionnaires were returned.

<sup>2</sup> We visited Itasca State Park, Fort Snelling State Park, Fergus Falls Regional Treatment Center, St. Peter Regional Treatment Center, Hastings Veterans Home, Stillwater Prison, Moorhead State University, Inver Hills Community College, the University of Minnesota (Twin Cities campus), the Transportation Building, and the Capitol Square Building.

use them and their use seems to help state entities complete necessary work. However, effective system use requires staff commitment and additional organizational resources, both to implement the system and to keep it operating.

## THE NATIONAL PERSPECTIVE

We reviewed the national literature on the maintenance of public buildings and institutions of higher education. We found:

- **Nationwide, maintenance for public buildings is often neglected.**

According to a study conducted by the Building Research Board of the National Research Council, “credible analyses indicate that we are systematically neglecting the maintenance of public facilities at all levels of government.”<sup>3</sup>

Maintenance should be a part of the usual cost of operating a building, according to experts, but it is more likely to be shortchanged relative to other operating costs and there is a “persistent problem of underfunding of maintenance and repair.”<sup>4</sup> “Public agency managers and elected officials, faced with the constant challenge of balancing competing public priorities and limited fiscal resources, often find it easy to neglect the maintenance and repair of public buildings.”<sup>5</sup>

“Preventive maintenance” includes planned actions taken to keep a building at a specified level of performance before failure; “corrective maintenance” is usually equated with repair of existing problems. Preventive maintenance needs are often hidden. It is easy to see the need to repair a broken window, but it is less obvious that staff should routinely check or replace furnace filters. As one national author stated: “Unlike roads, bridges and sewers and other elements of the infrastructure, deterioration in public buildings often does not immediately affect peoples’ lives and is only indirectly brought to their attention . . . .”<sup>6</sup>

Although preventive maintenance needs are difficult to quantify, foregoing maintenance has a price; inadequate preventive maintenance generates increased corrective maintenance and may have other economic implications. Delays in completing preventive maintenance tasks usually do not cause problems in the short term but may lead to substantial long-term costs.<sup>7</sup> Inadequate preventive maintenance may lead to: (1) emergency breakdowns that are expensive to repair; (2) an ongoing series of corrective maintenance or repair needs, leading to the performance of even less preventive maintenance; (3) corrective maintenance

<sup>3</sup> Building Research Board, *Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings* (Washington D.C.: National Academy Press, 1990), ix.

<sup>4</sup> Building Research Board, 3.

<sup>5</sup> Building Research Board, 2.

<sup>6</sup> Eric Melvin, *Plan. Predict. Prevent. How to Reinvest in Public Buildings* (Kansas City, MO: APWA Research Foundation, 1992), 1.

<sup>7</sup> David G. Cotts and Michael Lee, *The Facility Management Handbook* (New York: American Management Association, 1992), 200-201, and Building Research Board, 11.

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**Maintenance is often shortchanged relative to other operating costs.**

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**It is difficult to identify universal maintenance standards for Minnesota's wide variety of buildings.**

problems that become increasingly severe as time passes; or (4) increased operating costs that are less obvious than a breakdown in service.

Minnesota's government buildings vary widely by type and function, and state agencies, colleges, and universities differ in the mix of buildings that they manage, making it difficult to identify universal maintenance standards. We asked our consultants to identify a few preventive maintenance procedures that we should expect government entities to perform as they maintain state buildings. The national literature and our consultants emphasized the value of establishing a formal preventive maintenance program, including written schedules for building components, regularly following those schedules, and keeping records of the preventive and corrective maintenance performed.<sup>8</sup>

## PREVENTIVE MAINTENANCE NEEDS

We wanted to know whether the local site managers directly responsible for the maintenance of state buildings felt that they currently performed enough preventive maintenance. We surveyed these site managers and categorized respondents by the type of state government entity represented, specifically state agencies, Minnesota State Colleges and Universities (MnSCU), or the University of Minnesota. As shown in Table 3.1,

- **Site managers representing state agencies and educational institutions said they should be doing more preventive maintenance.**

Staff from state government entities responsible for more than 96 percent of state buildings' square footage said that they should be doing more preventive maintenance in order to properly maintain their buildings. Respondents for over 40 percent of the square footage said they should be doing much more.

In comments on the questionnaire and during interviews, maintenance personnel told us about tasks that they had neither the money nor the time to complete, including tasks as simple as painting. Others mentioned that they would like to do more frequent checks of equipment and systems. We were told that some systems are not checked until they break; sometimes electrical systems can function virtually unmonitored for years at a time.

On several site visits we heard about problems created by inadequate preventive maintenance. For example, in one new building, a pump failed within two years for lack of lubrication. Although it was within the warranty period, the manufacturer would not pay for a \$50,000 replacement because the users had failed to provide appropriate preventive maintenance.

Overall, those we surveyed reported doing more preventive maintenance now than five years ago, as shown in Table 3.2. However, the trend was mixed. The University of Minnesota reported doing more preventive maintenance than five

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<sup>8</sup> Cotts and Lee, 203, 214-215.



**Table 3.1: Views About the Amount of Preventive Maintenance That Should be Performed**

<u>“What is your opinion of the amount of preventive maintenance you should perform to properly maintain your buildings?”</u>	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
“We should perform much more preventive maintenance.”	53%	58%	5%	41%
“We should perform somewhat more preventive maintenance.”	40	39	95	55
We are performing about the right amount of preventive maintenance.”	7	3	0	4
“We should perform somewhat less preventive maintenance.”	0	0	0	0
We should perform much less preventive maintenance.”	0	0	0	0
“We should perform much less preventive maintenance.”	0	0	0	0
Number of respondents	55	46	4	105
Square footage maintained by respondents, in millions	23.6	21.3	17.1	62.0

NOTE: Individual responses were weighted by the building square footage that each respondent maintained. Percentages for any state organization may not sum to 100 due to rounding.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

**Table 3.2: Ability to Complete Preventive Maintenance**

<u>“How does the amount of preventive maintenance performed now compare with five years ago?”</u>	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
Doing “much more” or “somewhat more”	42%	33%	97%	54%
Doing “about the same”	17	22	0	14
Doing “much less” or “somewhat less”	41	43	3	31
“Don’t Know”	0	2	0	1
Number of respondents	55	45	4	104
Square footage maintained by respondents, in millions	23.8	20.5	17.1	61.4

NOTE: Individual responses were weighted by the building square footage that each respondent maintained. Percentages for any state organization may not sum to 100 due to rounding.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

years ago. For state agencies and state colleges and universities, the percentage of state agencies doing more was about the same as the percentage doing less preventive maintenance. State college and university campuses reported declining levels of preventive maintenance slightly more often than increasing levels of preventive maintenance.

The inability of entities to do as much preventive maintenance work as they would like to do may sometimes result from stagnant spending and reduced staff levels. Maintenance personnel told us that in the last five years, maintenance budgets and number of staff seldom increased. Fifty-nine percent of state agencies and 84 percent of state college and university campuses reported fewer maintenance staff than five years ago. Sixty-one percent of state agencies and 89 percent of state college and university campuses reported that their budgets were the same or smaller than five years ago. Static funds and staffing were sometimes exacerbated by increased demands. Several state college and university maintenance personnel told us that the merger has increased the number of buildings for which they are responsible with no increase in staff. Simultaneously, facility use at some sites has reportedly increased on weekends and evenings.

## PREVENTIVE MAINTENANCE PRACTICES

To determine how well state agencies and higher education institutions perform preventive maintenance, we examined how they used schedules, performed routine maintenance tasks, and were able to keep up with corrective maintenance requirements.

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**About half of the state's buildings have no maintenance schedules for exteriors, roofs, or interiors.**

### Preventive Maintenance Schedules

As part of our building maintenance survey, we asked whether respondents had schedules, written or unwritten, for preventive maintenance of five building components—building exteriors, roofs, mechanical systems, electrical systems, and interiors. We also asked how often they followed their schedule, if they had one. Responses are shown in Tables 3.3 and 3.4.

State entities were more likely to report having written than unwritten schedules, but overall,

- **Most state entities have written schedules for only two of the five major components.**

Only about one-fourth to one-third of the total square footage of state buildings have written schedules for exteriors, roofs, and interiors compared to nearly three-fourths coverage for the mechanical and electrical components.<sup>9</sup> While some state entities have unwritten schedules, about half have no schedules for exteriors, roofs, and interiors.

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<sup>9</sup> Manufacturers are most likely to provide schedules to facility managers for these system s.

**Table 3.3: Prevalence of Preventive Maintenance Schedules**

<u>“Do you have a written schedule for preventive maintenance?”</u>	<u>Written Schedules for “Almost All” or “Some” Elements</u>	<u>Unwritten Schedules</u>	<u>Do Not Have a Schedule</u>	<u>Don’t Know</u>
Exterior	23%	21%	56%	1%
Roof	29	22	49	<1
Mechanical	73	16	11	0
Electrical	65	12	23	0
Interiors	32	18	50	0

NOTE: Individual responses were weighted by the building square footage that each respondent maintained. Responses were received from 106 respondents who maintained 62.5 million square feet of state buildings.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

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### **Most of those with written schedules follow them.**

Most state entities that do have written schedules follow them, as shown in Table 3.4; an exception is the maintenance of interiors. State agencies with written schedules, particularly for exteriors, electrical, and interiors, reported that they follow those schedules less frequently than many state colleges and universities and the University of Minnesota, although the University was less likely to have written schedules. Generally, respondents reported that they were more likely to follow written schedules than unwritten schedules.

Finally, we asked how much preventive maintenance work was documented in written records and summarized those responses in Table 3.5. We found:

- **State agencies and state college and university campuses do not consistently document their preventive maintenance work.**

These entities reported documenting about two-thirds of their preventive maintenance work, but there was considerable variation among components and types of government entity. Staff documented mechanical work most often and interior preventive maintenance least often, a similar pattern to that found for following written schedules. The University of Minnesota reported the most documentation for any component, followed by state agencies; state college and university campuses reported substantially less documentation for any component.

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### **Mechanical work is documented most often.**

## **Specific Practices**

We asked our consultants to identify a set of eight maintenance tasks and performance standards that would allow us to assess organization performance. We asked maintenance staff if they performed these common preventive maintenance tasks, and if so, with what frequency. The responses to those questions are shown in Table 3.6. Generally, mechanical system practices were more likely to be performed regularly.

**Table 3.4: Extent to Which Entities Report Following Schedules**

“If you have a schedule, how often would you say you follow the schedule?”	Percent of Those with Written Schedules That “Regularly” or “Frequently” Follow Them			
	State Agencies	MnSCU Campuses	U of M Campuses	All State Organizations
Exterior	68%	97%	100%	80%
Roof	88	98	—	92
Mechanical	82	98	100	93
Electrical	63	94	100	85
Interiors	55	91	100	71
Number of respondents	37	22	4	63
Square footage maintained by respondents, in millions	17.6	11.0	17.1	45.7
	Percent of Those with Unwritten Schedules That “Regularly” or “Frequently” Follow Them			
	State Agencies	MnSCU Campuses	U of M Campuses	All State Organizations
Exterior	88%	78%	100%	85%
Roof	28	74	100	64
Mechanical	60	83	—	77
Electrical	26	67	—	53
Interiors	49	67	95	69
Number of respondents	43	35	3	81
Square footage maintained by respondents, in millions	19.2	16.3	16.6	52.1

NOTE: Individual responses were weighted by the building square footage that each respondent maintained.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

**Maintenance practices vary widely among agencies.**

Nearly all respondents reported inspecting belts, changing ventilation filters, and lubricating bearings at intervals that met minimum standards. Preventive maintenance of steam system components and roofs were more likely to fall below the recommended standards. For example, 27 percent of roofs are not regularly inspected, and only 8 percent met the standard of twice yearly inspection. As discussed in more detail in Chapter 2, failure to adequately maintain these components adversely affects the energy efficiency of the system. There was considerable variation among government entities. The University of Minnesota most often conformed to the minimum standards suggested by our consultants, followed by state college and university campuses.

**Table 3.5: Documentation of Preventive Maintenance**

"How much of your preventive maintenance work do you document in written records?"	Percent That Document "Almost All" or "Most" of Their Preventive Maintenance Work			
	State Agencies	MnSCU Campuses	U of M Campuses	All State Organizations
Exterior	66%	36%	93%	64%
Roof	60	56	93	68
Mechanical	69	49	97	70
Electrical	57	41	93	61
Interiors	46	30	93	54
Number of respondents	54	45	4	103
Square footage maintained by respondents, in millions	23.3	21.0	17.1	61.3

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. Respondents omitted this item somewhat more often than other items; organizations representing up to 7 percent of total square feet declined to respond.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

## Corrective Maintenance

As noted earlier, corrective maintenance involves making repairs to correct existing problems. Failure to complete corrective maintenance tasks may lead to accelerated facility deterioration and this deterioration may require even more corrective maintenance which may take an increasingly disproportionate share of staff time.

We asked state departments and higher education institutions how promptly they attended to corrective maintenance needs and whether they had accumulated a backlog of corrective maintenance tasks. They reported that they were usually able to meet the goal of prompt attention to problems, but

- **Many agencies reported large corrective maintenance backlogs.**

Only 13 percent of state agencies and 3 percent of state college and university campuses gave the response "not too well" to a question about how well they could meet the goal of prompt attention to problems. However, as shown in Table 3.7, we learned that there is a "large" or "very large" backlog of corrective maintenance for about four-fifths of the University of Minnesota's buildings and nearly half of state agency property, compared with 15 percent of state college and university campuses. It is unlikely that this backlog will be eradicated any time soon, since maintenance staff for about one-half of state agencies' and state college and university campuses reported that it is more difficult to complete their corrective maintenance work now compared with five years ago, as shown in Table 3.8. This generally agrees with the responses for preventive maintenance shown in Table 3.2.

**State entities can usually attend to problems quickly, but most still have a large backlog of corrective maintenance.**

**Table 3.6: Performance of Specific Maintenance Tasks**

"How frequently does . . . ?"	Percent That Perform the Task At Least as Frequently as the Standard				
	Standard	State Agencies	MnSCU Campuses	U of M Campuses	All State Organizations
" . . . a qualified roof inspector inspect your roofs?" <sup>a</sup>	Twice Yearly	12%	6%	5%	8%
" . . . your staff clean out roof drains?"	Twice Yearly	42	53	5	36
" . . . your staff inspect belts and check belt tension?"	Twice Yearly	77	93	97	88
" . . . [someone] check the pH of the water as part of a chemical treatment program?" <sup>b</sup>	Yearly	74	91	82	82
" . . . your staff blow down the strainers (steam systems)?"	Quarterly	52	21	82	51
" . . . your staff check the steam traps?" <sup>c</sup>	Twice Yearly	41	19	0	21
" . . . your staff change filters in the ventilation system?"	Twice Yearly	84	82	97	87
" . . . your staff lubricate bearings in fans and pumps?"	Twice Yearly	74	79	93	81

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. We also accepted as meeting the standard any notation that staff followed manufacturer's requirements. Responses were received from 105 respondents who maintained 62.4 million square feet of state buildings.

<sup>a</sup>Those surveyed responded that roof inspections were performed yearly for 40 percent of state agencies, 54 percent of MnSCU buildings, and 93 percent of the University of Minnesota buildings.

<sup>b</sup>Limited to those that had an appropriate system.

<sup>c</sup>A large percentage responded "as needed."

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

Documentation for corrective maintenance is at least as important as that for preventive maintenance. We asked government entities about documentation and, as shown in Table 3.9, staff reported little corrective maintenance documentation for over one-third of state agencies and nearly half of state college and university campus square footage.

**Corrective maintenance is not consistently documented.**

## COMPUTERIZED MAINTENANCE SYSTEMS

One way to manage the maintenance scheduling process is by the use of a specialized computer software package. These software programs can generate prescheduled work orders and track completed preventive and corrective maintenance work. About 40 percent of state agencies, 34 percent of state college

**Table 3.7: Corrective Maintenance Backlog**

<u>"We have a ... backlog of corrective maintenance"</u>	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
"Very large" or "large"	45%	15%	82%	45%
"Moderate"	40	55	7	36
"Small" or "little or no"	15	30	11	19
Number of respondents	52	45	4	101
Square footage maintained by respondents, in millions	21.7	21.1	17.1	59.9

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. Percentages for any state agency may not sum to 100 due to rounding.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

**Table 3.8: Change in Ability to Complete Corrective Maintenance**

<u>"Over the past five years, how has your ability to complete all your corrective maintenance tasks changed?"</u>	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
"It is 'much easier' or 'somewhat easier' to get things done."	27%	22%	93%	43%
"Our ability to complete all our tasks has not changed."	19	25	0	16
"It is 'somewhat more difficult' or 'much more difficult' to get things done."	53	53	7	40
"Don't know"	1	0	0	<1
Number of respondents	56	46	4	106
Square footage maintained by respondents, in millions	24.1	21.3	17.1	62.5

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. Percentages for any state agency may not sum to 100 due to rounding.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

and university campuses, and the largest campus of the University of Minnesota use computerized maintenance systems. Several additional agencies told us that they were evaluating or purchasing a system. We found:

- **Computerized maintenance systems are highly rated by those who use them but there are start-up and ongoing costs.**

**Table 3.9: Corrective Maintenance Documentation**

<u>“How much of your corrective maintenance work do you document in written records?”</u>	<u>State Agencies</u>	<u>MnSCU Campuses</u>	<u>U of M Campuses</u>	<u>All State Organizations</u>
“Almost all” or “most”	64%	55%	97%	70%
“Some” or “little or none”	36	45	3	30
“Don’t know”	<1	0	0	<1
Number of respondents	56	45	4	105
Square footage maintained by respondents, in millions	24.1	21.1	17.1	62.3

NOTES: Individual responses were weighted by the building square footage that each respondent maintained. Respondents omitted this item somewhat more often than other items; organizations representing up to 7 percent of total square feet declined to respond.

SOURCE: Program Evaluation Division Building Maintenance Questionnaire.

**Computerized systems can help manage schedules and documentation.**

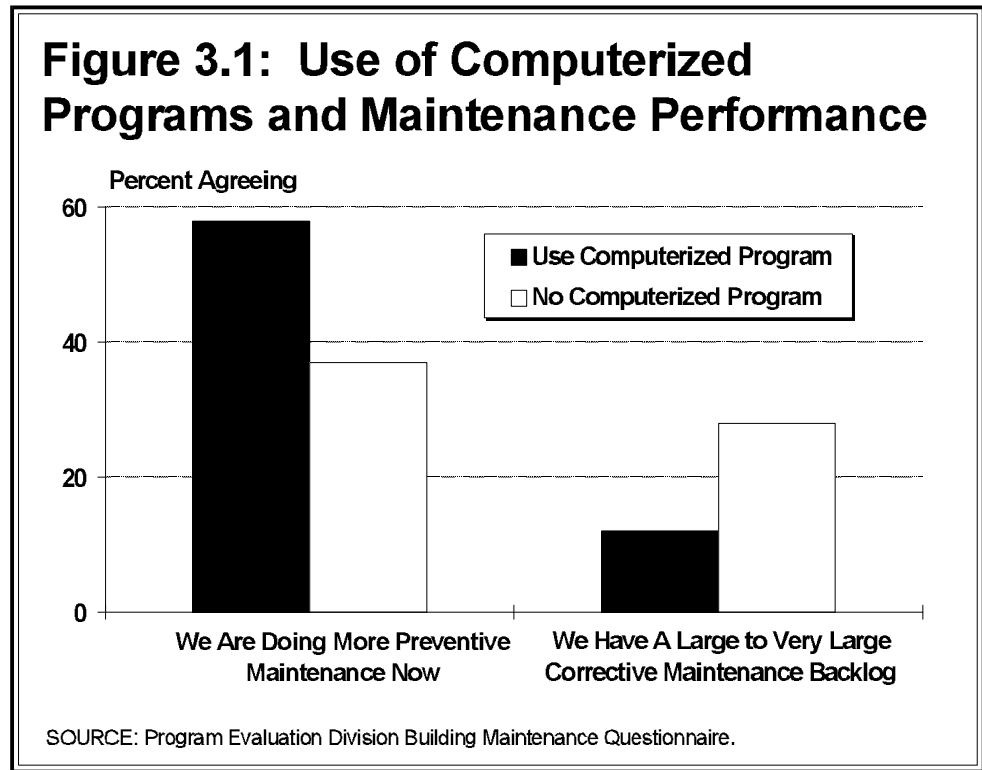
Of those government entities that use such a system, almost all rated it moderately useful or very useful. However, during site interviews at locations that use or are considering using computerized systems, we were told that there is a substantial amount of clerical work required when the program is first installed. There are also start-up costs for computer hardware and recurring costs for computer hardware and software licensing. For example, the Department of Human Services spent about \$5,500 per site several years ago for a five-user license for each Regional Treatment Center; additional costs included clerical staff to input a large set of data and the cost for additional computers. Ongoing costs vary somewhat across sites depending on the size of the facility and the number of modules or functions that the site wishes to use. Systems require on-going clerical support (between one and two clerical FTEs per site) to record and track work orders, although those costs may be similar to other expenses for non-computerized systems. Other costs include an annual software license fee (\$550 to \$840) and occasional computer upgrades needed to keep up with the demands of the software.

We compared agencies that used computerized maintenance programs with those that did not use such programs to determine whether there were any differences in how well they were able to complete their preventive maintenance tasks and whether they have a corrective maintenance backlog. As shown in Figure 3.1, we found:

- **State agencies and higher education institutions with computerized systems were more likely to report completing maintenance tasks and had smaller reported backlogs.**

State entities may follow a preventive maintenance program based on schedules, standards, and documentation without using computerized systems. However, entities without computerized systems also include those that have no preventive maintenance program.





## SUMMARY

Nationwide, public building maintenance is often neglected. Foregoing maintenance has a price and inadequate preventive maintenance generates increased corrective maintenance. Ideally, state departments and higher education institutions should have written schedules for building components, those schedules should be followed, and agencies should keep records of the preventive and corrective maintenance they perform.

While state government entities in Minnesota report that they want to do more preventive maintenance, they are split on whether they are doing more now than five years ago, and they report that resources to pay for maintenance have been fairly flat. According to their self-reports, state agencies, MnSCU, and the University of Minnesota met the performance standard over half of the time for five of the eight practices identified by our consultants.

There are no written maintenance schedules for many of the state's buildings. In those instances where written schedules exist, agencies and higher education institutions differ in how likely they are to follow those schedules. Many government entities incompletely document the preventive maintenance work that they do, making it difficult to effectively use schedules. State college and university campuses were less likely than other state government entities to have written schedules and to document their work.

Many of those we contacted reported that they were able to meet the goal of prompt attention to problems but government entities representing about half of the state's square footage reported large corrective maintenance backlogs and about two-fifths said it was more difficult to get things done.

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# Discussion

## CHAPTER 4

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In Chapter 2, we confirmed that there is a large backlog of deferred maintenance in buildings under the control of state agencies and higher education institutions. While it is difficult to measure how much of this backlog is due to poor preventive maintenance practices, inefficient use of existing resources, or inadequate spending, it is likely due to a combination of these factors. In this chapter, we discuss the policy implications of our findings, particularly on the role of the Legislature and central state entities such as the Department of Administration and MnSCU. This chapter discusses ways to improve maintenance practices and spending policies. It concludes by examining how well the Facility Audit Survey can help the Legislature make maintenance funding decisions.

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### **Many state entities need to improve their maintenance practices.**

We found that preventive maintenance practices vary greatly among state agencies, colleges, and universities. We think that it is important that maintenance practices, particularly preventive maintenance, be improved. Many physical plant directors recognize that they need to strengthen their preventive maintenance practices but said they do not have enough resources (staff and dollars) to establish an effective preventive maintenance program. We think that even if funding is inadequate, many state entities should do a better job of preventive maintenance. Agencies, colleges, and universities should ensure that they have preventive maintenance programs that cover the most important maintenance activities. Some staff who say that they do not have enough funds have improved their maintenance by establishing formal preventive maintenance programs that reflect both their budget and maintenance priorities.

In fact, some preventive maintenance practices pay for themselves very quickly. For example, one area that many agencies neglect is preventive maintenance of steam traps. Approximately half of state agencies, colleges, and universities with steam heating systems did not check their steam traps at least twice per year, as our consultant recommended. Steam traps are designed to increase the efficiency of steam heating systems by letting condensate return to the boiler while trapping steam where it can most efficiently provide heat. Failing to repair or replace faulty steam traps generally will not be noticed by building occupants, but will reduce the efficiency of the heating system. The chief engineer at St. Peter Regional Treatment Center estimated that replacing a typical steam trap that was leaking steam would annually save three times the replacement cost of the steam trap.

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**The Department of Administration and MnSCU could provide additional technical assistance to facility managers.**

We think that maintenance programs could benefit from greater oversight by central agencies and the Legislature. The state has a long term interest in preserving its building assets and should ensure that proper maintenance practices are used. The Department of Administration and MnSCU could provide additional technical assistance to state agencies, colleges, and universities and report back in future years on the status of maintenance practices. The department has architects, engineers, and a roof specialist that could help state agencies develop formal preventive maintenance programs. The department has worked with several state agencies and community colleges to improve their maintenance practices. For example, it organized the Statewide Facilities Management Group, which includes facility management professionals from state agencies and MnSCU. Its objectives include developing facility management information systems, establishing common benchmarks and best practices, and sharing facility management information. We think that these are important objectives for the Department of Administration and other state entities to support. MnSCU could also help set up a similar group for its colleges and universities.

We found in our survey that computerized maintenance systems can be a useful tool and that entities with computerized systems were more likely to report that maintenance tasks were completed satisfactorily. While computerized maintenance systems are highly rated by those that use them, familiarity and experience with computerized systems varies among physical plant directors. For example, the physical plant director for one college said that he was unaware of computerized preventive maintenance systems. The Department of Administration could, when appropriate, help state agencies become familiar with and set up computerized systems, building on the experience of existing users. MnSCU could perform a similar service for state colleges and universities. The Legislature may wish to help fund the start-up costs of these computerized systems, with the understanding that the ongoing operational costs would be the entity's responsibility.

We do not think that it would be wise for the Legislature to mandate specific preventive maintenance programs because the types of buildings and their requirements vary so much from facility to facility and specific practices and schedules are matters of professional judgment. Nor do we recommend creating additional bureaucracy to oversee state agencies and higher education institutions. But more legislative oversight hearings focused on maintenance practices would be appropriate and could prompt more executive branch action.

We did not examine the efficiency of maintenance operations across the state, but we found that comparative information on maintenance staffing and spending is not readily available either in Minnesota or other states. Such information could provide useful benchmarks that might raise issues of efficiency (if they are unusually high) or adequacy (if they are unusually low).

The size and prevalence of deferred maintenance among Minnesota's state agencies and higher education institutions suggest that maintenance spending levels may also be a reason that Minnesota has a large amount of deferred maintenance. We found that state entities generally spent less on maintenance and repair than the middle of the range recommended by the Building Research Board of the National Research Council. These national standards reflect the judgments of experienced facility managers but are not based on systematic studies. In

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**Recently the state has increased maintenance funding both in capital and operating budgets.**

addition, maintenance operating spending levels by our sample of six state colleges and universities, the Department of Natural Resources, and the Department of Administration were below that of private sector office buildings. While these comparisons suggest that Minnesota's spending is low, they are not definitive.

In any case, recent executive and legislative initiatives have increased maintenance funding. During the 1990s, the Legislature has placed greater emphasis on asset preservation in the capital budget process by increasing funding of the Capital Asset Preservation and Replacement Account (CAPRA) and the Higher Education Asset Preservation and Renewal (HEAPR) program. Under CAPRA, the Department of Administration allocates funds for specific projects based on need. This helps ensure that funds are used on maintenance projects that have been externally reviewed. One concern with using this approach indefinitely is that it rewards agencies that let their buildings deteriorate by neglecting proper maintenance.

Overall, it makes sense to address the existing deferred maintenance problem with the capital budget process because of the magnitude of the problem. The capital budget process allows the Legislature to set priorities among large deferred maintenance projects and delegate decisions for smaller projects to the Department of Administration (under CAPRA) and MnSCU and the University of Minnesota (under HEAPR).

As a long term goal, however, we agree with the Capital Budget Reform Steering Committee's 1992 recommendation that capital financing be reserved for "new construction, substantial adaptive remodeling, expansion, or improvements that are long term and not predictable or recurring." The operating budget is the appropriate place to fund routine and preventive maintenance and recurring repair and replacement projects such as roof and boiler replacements and masonry repair. These projects occur too frequently to be effectively managed by the Legislature and can be accomplished more efficiently if conducted as part of a well planned maintenance program.

The 1997 Legislature increased maintenance operating funding for several state agencies and both higher education systems. The advantage of this approach is that it allows agencies to plan their maintenance program and use the funds for preventive maintenance instead of waiting for building components to fail. A potential disadvantage is that agencies may not use the funds to increase their maintenance spending because agencies are currently not required to spend a fixed amount of their appropriation on maintenance.

To help ensure that state entities spend as much on maintenance as intended by the Legislature, the Legislature could mandate that a certain level of funding be set-aside for maintenance. The arguments in favor of set-asides are that (1) they would ensure that maintenance spending is addressed on a continuous basis, rather than waiting until problems mount, (2) there is no natural constituency for building maintenance as there is for state programs, and (3) the state is ultimately responsible for maintaining buildings and may have to make up for past maintenance omissions. An argument against set-asides is that state entities are in the best position to decide how to allocate funds between maintenance and programs.

Alternatively, the Legislature could require entities to report their maintenance spending levels. This would be less intrusive than earmarking, though it would require active legislative oversight to be effective. Whether the Legislature increases funding through operating or capital budgets, additional Legislative oversight may be necessary to ensure that the money is used effectively. A reasonable approach might be to require maintenance spending reports and follow up with set-asides if entities do not devote sufficient resources to maintenance.

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**Requiring reports on maintenance spending may help the Legislature oversee maintenance programs.**

To improve how maintenance funds are allocated to state entities, the Legislature may want to adopt a formula for funding building maintenance within the operating budget. A funding formula should reflect the variation in maintenance requirements among buildings due to factors such as square footage (or replacement cost), type of buildings, intensity of use, age of buildings, and whether the buildings have been renovated. The Legislature could direct the Department of Finance, in consultation with the Department of Administration, the University of Minnesota, and MnSCU, to recommend a specific formula for consideration during the 1999 legislative session.

The Facility Audit Survey was designed to help legislators broadly assess the condition of the state's buildings and to help set priorities for asset preservation funding. To determine how well the Facility Audit Survey meets its objective of helping the Legislature make funding decisions, we considered three criteria: (1) consistency of ratings, (2), the completeness of the data, and (3) whether the data are current.

Interviews we conducted and results from the OLA building maintenance survey show that different agencies use different approaches to rate their buildings. Some agencies hired consultants to rate their buildings, some used a team of employees to rate all their buildings, and some had different employees rate different buildings. Other than written instructions, the Department of Administration does not provide agency personnel with any formal training to ensure that ratings will be consistent across agencies. Also, it does not check the ratings to ensure the consistency of the data. The Department of Administration recognizes that the current system does not ensure consistent ratings but cites resource constraints as the reason it cannot check the ratings made by state agencies and higher education institutions.

In addition, the system is incomplete, containing ratings for only about 75 percent of the state's total square footage. As of September 1997, the database was missing about half of the academic buildings (weighted by square footage) of the Minnesota State College and University system and about 80 percent of the buildings maintained by the Veterans Homes Board. In addition, the database contains very limited information about the age of building components and the estimated cost of needed building repairs.

The Facility Audit data are also several years old, with 97 percent of the data collected between 1993 and 1995. Only 10 percent of the ratings have been updated since their initial entry in the Facility Audit System.

In summary, the Facility Audit Survey currently does not meet any of the three criteria. As a result, we conclude that:

- **The state's present system for assessing building conditions is not yet adequate for allocating asset preservation funds.**

In addition, the Facility Audit Survey is a very detailed system, requiring staff to rate each of 98 elements in every building as being in poor, fair, or good condition. Participants in the Facility Audit Survey told us that collecting and maintaining the data are costly because the rating process requires a substantial commitment of staff time, particularly for agencies with many buildings. For example, the Department of Natural Resources maintains about 2,000 structures. Department staff think it is impractical to keep such a detailed data system up-to-date.

In summary, we think that keeping the level of detail found in the Facility Audit Survey is not necessary for policy purposes. It is more important to ensure that the data are reliable, current, and complete. In any case, we think that the Legislature should consider how it wants to use building condition data before deciding what type of data system should be maintained. Specifically,

- **If the Legislature intends to use building condition data to make funding decisions, we recommend that the Department of Administration should develop a less detailed but more uniform system for assessing the condition of the state's buildings.**

Assessors who rate building conditions need training to ensure that ratings will be comparable. The Department of Administration should check the accuracy and reliability of the ratings on a sample basis, and there should be a plan for updating the ratings, perhaps also using a stratified sampling approach that focuses on buildings most likely to have needs.

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# Building Construction

## CHAPTER 5

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**Legislators are concerned that some state buildings are too expensive and take too long to build.**

State agencies, Minnesota State Colleges and Universities (MnSCU), the University of Minnesota, and local units of government spend millions of state bonding dollars each year constructing new buildings. We did not conduct a complete analysis of the factors affecting the cost and time to construct public buildings, but we did gather some information relating to this issue.<sup>1</sup> This chapter presents our preliminary findings on the relative costs to construct state and private buildings and notes the specific factors that private consultant designers and construction contractors (private contractors) and state staff believe add to the cost of constructing public buildings.

Legislators have expressed concerns about how state building costs compare to private sector costs and what factors, if any, inflate state building costs. Some legislators believe that the Department of Administration does not act as a watchdog for the state agencies that use its services, contributing to unrealistic expectations and increased costs. A few legislators would like to see increased use of outside consultants to advise the Legislature on designs and plans, particularly in light of recent experience with the Rush City prison and the Revenue building where there were higher costs than anticipated. They are also concerned that state departments and higher education institutions may be encouraged to “dream” a project far beyond what is needed. A few state employees told us that requirements for the Americans with Disabilities Act (ADA) are not well defined, contributing to bottlenecks in project completion and confusion about what projects were required under federal and state law.<sup>2</sup> We were also told that certain types of projects, especially those requested by local units of government, can be particularly time consuming for state staff, sometimes because the local governmental unit does not understand the commitment needed to obtain state funds. Finally, some legislators expressed considerable concern about how the Minnesota State Colleges and Universities merger has affected construction timelines and budgets.

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<sup>1</sup> We did not have sufficient resources to conduct an extensive examination of these issues. Such a study would require a thorough review of state building project documentation, including budget documents and change orders. Also, at the time we began our study, the Department of Administration’s Building Construction Division was in the process of temporarily relocating its offices. Many of the files that we would need to examine in a full study were boxed for the move and were not organized in a way that would have allowed us to easily identify individual projects and locate specific project documentation.

<sup>2</sup> The Americans with Disabilities Act (ADA) requires that state-owned properties be made accessible to programs and services for people with disabilities. The Statewide Building Access (SBA) program implements the state’s ADA plan by allocating funds to agencies and administering the use of funds for approved projects.



We focused on the following question:

- **What state policies and practices add cost or time to the construction of new state buildings?**

To answer this question, we talked with staff of the Finance and Administration departments, reviewed available literature and identified a core set of factors that might affect building costs after project approval. We then surveyed a sample of 92 staff from state agencies and higher education institutions involved in construction and 76 representatives from private design and construction firms. Seventy-three percent of state staff and 70 percent of private companies surveyed returned the questionnaire.

According to the Department of Finance, several factors may delay a project. Although we have not analyzed these factors, many are required by statute or are part of the legislative review process:

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**A variety of factors, including some in law, can slow building projects.**

1. Under *Minn. Stat.* §16B.335, many projects must prepare a predesign package “sufficient to define the purpose, scope, cost, and schedule of the project.” A premature request for funds before completion of predesign work may create a less well-developed project concept or add time for project planning that should have preceded the request for funds.
2. Local matching funds are commonly required for grants to local governments. If the sources for matching funds do not materialize, construction may be slow to start or the project may be dropped completely.
3. Grants to local governments for construction projects undertaken by private organizations require fairly intense program oversight by the local government sponsor (*Minn. Stat.* §16A.695). But the local governments may be unaware of the oversight requirements and take more time to fulfill the requirements or become unwilling to remain involved in the project. In addition, moneys cannot be spent on the local project until there is assurance of a funding source to operate the facility.
4. Prior to the preparation of final plans and specifications for many construction and major remodeling projects, several legislative committee chairs must review the program plan, cost estimates, and significant changes to the project made since the Legislature enacted the appropriation (*Minn. Stat.* §16B.335). Availability of these key legislators, particularly if the Legislature is not in session, may cause some delays.
5. The Legislature sometimes provides appropriations in stages or phases. It is common practice to fund separate planning and construction phases that facilitates a careful review before committing to the entire project. However, phasing the dollars needed for known construction costs may contribute to increased total costs and delays for the project.

6. The majority of construction projects are authorized in the even year of the biennium. Authorization of a large number of projects may overwhelm some agencies' resources and some projects may be substantially delayed. On the other hand, a project funded during the odd year (such as the new Revenue Building) may proceed fairly quickly if agencies have more time and resources to devote to the project.

While many of these factors could cause project delays, we did not determine how often they actually have occurred.

## SURVEY RESULTS

In our survey we asked private contractors to compare the cost of constructing state buildings with that of similar private buildings. Over twenty percent of private contractors rated the cost of state buildings as "much higher" than similar private buildings, and another half reported that the costs for state buildings were "somewhat higher." Only one respondent said that the costs were lower.

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**Private contractors identified the number of meetings and reports as the most important factors increasing the cost of state buildings.**

Our survey then asked contractors to rate how much each of 11 factors increased or decreased state building costs, as shown in Table 5.1.

Private contractors identified the number of meetings and reports (37 percent), time to make decisions (27 percent), and use of "targeted vendors" who are offered special preferences by law (25 percent) as factors that made the cost of state buildings "much higher" than comparable private buildings.<sup>3</sup> Only a few contractors rated any of the factors as likely to contribute to lower costs for public buildings.

We also asked both state staff and private contractors about how many state building projects were completed on time and within budget compared to original costs and timelines. State staff and private contractors reported that state buildings were somewhat more likely to be within budget (about 70 percent) than on time (about 51 to 57 percent), as shown in Figure 5.1.

Finally, we asked state staff and private contractors about how much each of eight factors increased the cost of state buildings compared with the original costs and timelines. Both private contractors (58 percent) and state staff (39 percent) rated state decision-making delays as likely to cause moderate or large increases in project budget and time lines compared with original project costs and time lines.

Both state staff (37 percent) and private contractors (38 percent) were also concerned about targeted vendor participation and selection. Fifty percent of private contractors also rated changes made by state government entities as a contributing factor to higher costs, as shown in Table 5.2.

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<sup>3</sup> "Targeted vendor" is a short-hand reference to a business identified by the Commissioner of Administration as a targeted group business that is majority owned and operated by women, persons with a substantial physical disability, or specific minorities. Such businesses are awarded a preference in the amount bid and in some cases the award may be limited to businesses of this type. (*Minn. Stat.* §16B.19, subd. 2(b)-2(c)).

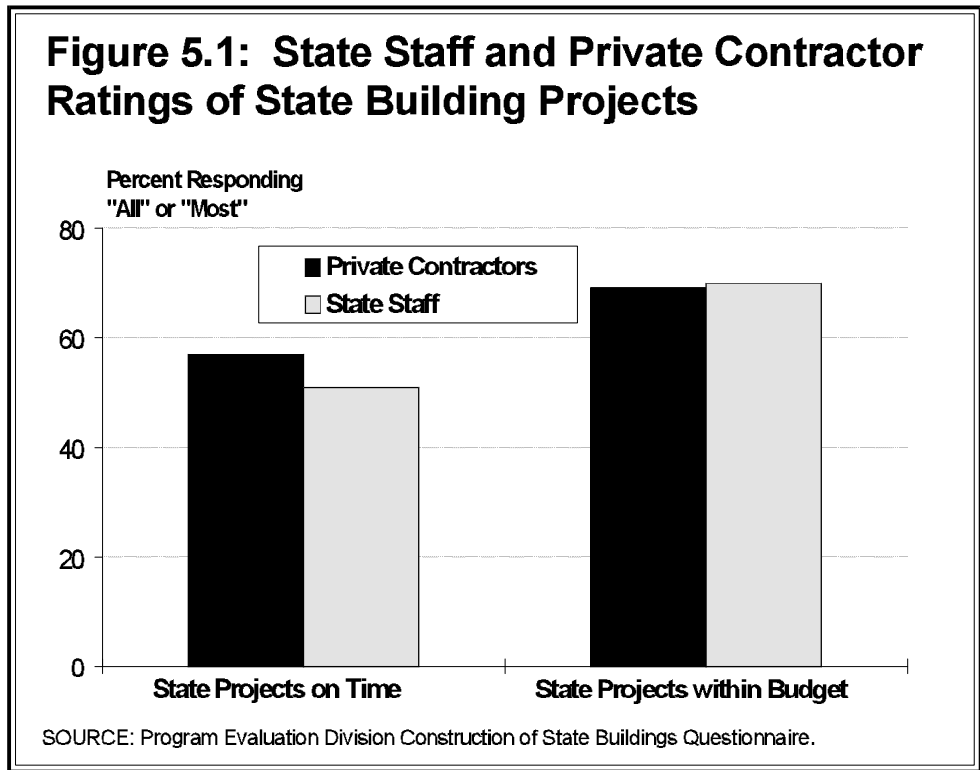
**Table 5.1: Private Contractor Ratings of the Cost of Constructing State Buildings and Factors That Affect Costs**

“In your experience over the past five years, how does the cost of constructing state buildings compare with the costs of similar private buildings?”	Much Higher	Somewhat Higher	Neither Higher Nor Lower	Somewhat Lower	Much Lower	Unsure
“The cost of constructing state buildings is:” (N=46)	22%	54%	22%	2%	0%	0%
In your experience over the last five years, how much did each of the following factors affect the costs to construct state buildings compared with similar private projects?”	This factor made state project costs:					
	Much Higher	Somewhat Higher	Neither Higher Nor Lower	Somewhat Lower	Much Lower	Unsure
The quality of construction and materials (N=51)	16%	53%	27%	2%	0%	2%
Changes to project plans by those who will use the building (N=50)	4	36	46	6	0	8
Legislative changes to project plans and/or budgets (N=51)	18	12	49	4	2	16
The process used to select contractors (N=51)	10	25	61	2	0	2
The time it takes to make decisions (N=51)	27	51	18	2	0	2
The number of meetings held and reports required (N=51)	37	33	29	0	0	0
Prevailing wage requirements (N=52)	17	37	37	0	0	10
Targeted vendor requirements (N=51)	25	49	20	0	0	6
Procurement requirements other than those listed above (N=47)	6	28	38	0	0	28
Project management (N=52)	13	37	38	6	0	6
The use of strategies such as design-build or turnkey (N=46)	0	9	41	4	0	46

SOURCE: Program Evaluation Division Construction of State Buildings Questionnaire.

We asked for written comments about practices that have helped state projects stay within budget and meet their time lines. State staff and private contractors mentioned three practices most frequently. The first practice was the use of a predesign stage where “the purpose, scope, cost, and schedule of the complete

**Figure 5.1: State Staff and Private Contractor Ratings of State Building Projects**



**Both private contractors and state staff reported that state buildings were more likely to be within budget than on time.**

project are defined and instructions to design professionals are produced.”<sup>4</sup> The second practice was advance determination that contractors and architects have the ability, including experience and other resources, to bid on a specific project (sometimes referred to as prequalification). The third practice was the use of qualified project managers, most often an independent manager or firm hired to guide a large project from development through completion.

We did not design the questionnaire to evaluate specific agencies. However, respondents volunteered a variety of comments. There were positive statements about the current predesign process such as: “clearer definition of project requirements earlier in the process of project development [helps projects meet their timelines and budgets].” There were also compliments for the Department of Administration’s Building Construction Division including: “I believe the Dept. of Admin. personnel have become more customer focused.”

However, there were a few negative comments about issues related to the Americans with Disabilities Act (ADA) program, such as: “You cannot get a decision made in St. Paul; ADA reimbursement has been a two-year ordeal . . . .” There was also criticism of the targeted vendor program: “Many non-targets will not bid, thus price increases due to a lack of competition.” Just over 10 percent of all respondents volunteered comments critical of MnSCU, including: “Our experience with MnSCU has been less than good,” “radically dysfunctional project administration by MnSCU in terms of design review, design standards,

<sup>4</sup> Department of Administration, *Predesign Manual for Capital Budget Projects* (St. Paul, 1997), 49.

**Table 5.2: Effect of Selected Factors on the Cost or Time Needed to Construct State Buildings**

“In your experience over the last five years, how much did each of the following factors increase the cost or time to construct state buildings compared with the original costs and timelines?”	Percent Responding That The Factor Creates A “Moderate Increase” or “Large Increase”	
	Private Contractors	State Employees
Changes due to unforeseeable circumstances	33%	33%
Changes in project plans and specifications made by state organizations	50	32
Legislative changes including budget reductions or changes in project scope	30	28
Unexpected complexities or delays in the bidding process	30	27
Delays in state organizational decision making	58	39
Required targeted vendor participation	38	37
Difficulties and/or delays in site selection	10	6
Lack of effective project oversight by state organizations	27	37
Number of respondents	53	83

NOTE: Other valid response options included “small increase,” “no increase,” and “unsure.”

SOURCE: Program Evaluation Division Construction of State Buildings Questionnaire.

and contract requirements,” and “loss of central staff from community colleges to MnSCU means little or no cohesive planning.”

## SUMMARY

Respondents generally agreed that state buildings cost somewhat more to build than similar private buildings. The factors identified as most likely to contribute to this increased cost included delays in state decision making, the number of state-required meetings and reports, and targeted vendor participation. Several of these results agree with concerns we heard from legislators.

A full study of the factors that affect state building project budgets and timelines might be useful. Such a study would probably have to focus on a few key programs and practices since the amount of work needed to adequately review a representative sample of project files would be considerable.



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February 3, 1998

James R. Nobles  
Office of the Legislative Auditor  
1st Floor, Centennial Building  
658 Cedar Street  
Saint Paul, MN 55155

Dear Mr. Nobles:

Thank you for inviting the Department of Finance to provide a response to your report on *State Building Maintenance*. This letter has been prepared to summarize our reaction to the findings and conclusions of your report.

Since the early 1990's, the Department of Finance has been active in pursuing a variety of important capital budget reforms in close cooperation with Governor Carlson and the Minnesota Legislature. During preparation of recent capital and operating budgets, the department has had a strong interest in ensuring that state capital investments are adequately protected and state buildings are adequately maintained.

We have been concerned for some time as to the size of the state's long-standing deferred maintenance backlog and question whether this situation has come as a result of poor preventive maintenance practices, inefficient use of existing resources, inadequate spending, or a combination thereof. As the Governor and Legislature now consider adoption of the 1998 capital budget which contains significant requests for asset preservation funding, your report is very timely.

Overall, the Department of Finance supports the major facts and conclusions reached in the *State Building Maintenance* report and congratulate your staff on the effort taken to complete this study. We believe that the following points deserve special attention by the Legislature:

1. Your conclusion that the state's deferred maintenance "iceberg" may be approaching \$2 billion supports similar analysis of the Department of Administration. More importantly, your estimates that approximately \$300-600 million of this amount represents actual physical building deterioration (rather than merely suitability deficiencies) leads us to the conclusion that additional resources may need to be committed in order to alleviate this on-going problem. This is reinforced by the observation that state agencies currently spend less on maintenance and repair than the mid-point recommended by at least one national standard of the Building Research Board.

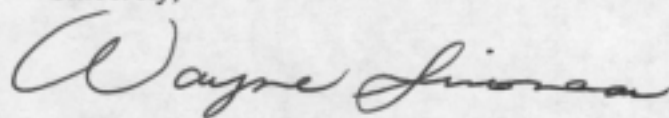
2. Your survey of physical plant directors in which 96% indicate that the state should be doing more preventive maintenance and a majority believe that we should be doing *substantially* more preventive maintenance is a powerful statistic. We agree with your conclusion that agencies should be encouraged to develop formal preventive maintenance schedules in order to resolve minor problems before they become major expenses.
3. Beginning in 1994, a significant increase in asset preservation funding has been included in capital bonding bills. This has been appropriate given the size of the state's deferred maintenance backlog. However, CAPRA, HEAPR, ADA and other asset preservation requests have now grown to staggering levels. When bond proceeds are used, the cost of such items increases due to additional debt service costs.

Prudent financial management suggests that paying for asset preservation repairs with cash from the general fund through agency operating budgets would reduce long-term costs by avoiding interest expenses and encourage preventive action early rather than paying for expensive repairs later. With that in mind, Governor Carlson has proposed in his bonding bill that the Department of Administration, in cooperation with the Department of Finance and the state higher education institutions, recommend a formula (or series of formulae) that agencies should utilize when budgeting for repair and replacement expenses. We believe that this recommendation should be given strong consideration by the Legislature in the 1998 session, in order to provide direction to agencies as they prepare FY 2000-01 operating budget requests for consideration in the 1999 legislative session.

4. In regards to concerns about the cost and time to construct state buildings, the Department of Finance is willing to work cooperatively with the Legislature and/or the Legislative Auditor if subsequent studies are desired or an interest is expressed in evaluating opportunities to reduce costs and improve project completion schedules.

If I or my staff can be of further assistance, please feel free to contact me.

Sincerely,



Wayne Simoneau  
Commissioner



# Admin MINNESOTA

Department of Administration

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February 4, 1998

Roger Brooks, Deputy Legislative Auditor  
Office of the Legislative Auditor  
First Floor South, Centennial Building  
658 Cedar Street  
St. Paul MN 55155

Dear Mr. Brooks:

Thank you for the *State Building Maintenance* report. We appreciate the diligence and respect you and your staff gave to the work of the report and the treatment of Admin personnel.

The essence of the report deals with the preservation of the State's building assets. We in Admin are committed to the business of maintaining the State's assets. The Statewide Facilities Management Group (SFMG) is our principal vehicle for determining best maintenance practices and identifying deferred maintenance requirements. The group consists of all state agencies including the University of Minnesota, Minnesota Historical Society and MNSCU. The SFMG's Facility Audit Survey is a work in progress and will continue to be developed until it reaches its goal to provide a report that accurately reflects the maintenance needs of state agencies.

Admin is also committed to excellence in the technical aspects of asset maintenance and preservation. An Indoor Air Quality guideline was produced by cooperative efforts of DOER, MnDOT, Admin, DOH and DHS and distributed to facilities through the state's network of safety officers. We continue, as we have for more than 10 years, to hold maintenance seminars at various locations throughout the state for personnel of state facilities. We also support the efforts of the Chief Engineer's Guild annual conference that has training on various technical subjects relative to care and maintenance of state building. The conference is where we first introduced preventive maintenance software packages for agencies' consideration. In addition to the Department of Human Services and some of the colleges, the Veterans Home Board recently purchased preventive maintenance software. Also, Admin assisted MnDot in implementing a software package for their facilities.

The auditor's report cited the Rush City prison project as evidence for a need to have more legislative oversight in the design of state buildings. The cost of the prison occupied many hours of legislative debate. It should be noted that the project was out of sequence as the dollar amount for the prison was set before the predesign process was done. A normal process would set the cost of a building at the end of predesign and planning.



Roger Brooks  
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February 4, 1998

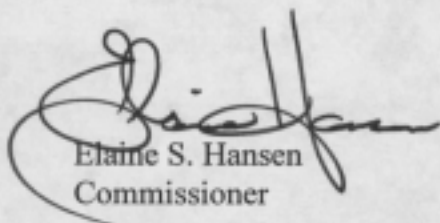
Another important distinction concerns why it costs more for the state to build a building than is does for the private sector. There are several issues that cause state buildings to have a higher initial cost.

- ▶ The state builds to a lower cost of ownership over a longer life than typical of the private sector, which may increase the initial cost;
- ▶ The survey shows that 69 percent of the respondents indicated a higher cost of state construction due to quality and materials, which supports the previous statement;
- ▶ The survey shows that 74 percent of the respondents attributed the targeted vendor program as contributing to higher cost;
- ▶ The survey shows that 70 percent of the respondents indicated that the number of meetings and reports contribute to higher cost. Without further definition of "meeting and reports," it is impossible to determine the accuracy of this statement. This statement should be referenced to the practices of the specific agency responsible for executing the work.

"Watchdog" is used in the report in terms of Admin considered to be a watchdog. Admin does not dictate program needs to agencies. Admin accepts the program needs for facilities and develops a structure that serves the agencies' needs.

We would also hope that future discussion would focus on the need for appropriate planning, or "predesign," before any project proceeds to an appropriation phase.

Sincerely,



Elaine S. Hansen  
Commissioner

esh/mh



## Minnesota State Colleges & Universities

February 4, 1998

Mr. James Nobles, Legislative Auditor  
Office of the Legislative Auditor  
1st Floor Centennial Building  
658 Cedar Street  
St. Paul, Minnesota 55155

Dear Mr. Nobles:

Thank you for the opportunity to comment on the recently completed *State Building Maintenance* report prepared by the Program Evaluation division of the Office of the Legislative Auditor. I was particularly interested in the finding of the study concerning statewide deferred maintenance estimates and the possible methods for assuring continuous investment in the state's and MnSCU's physical assets. I was also interested in the comments concerning project management. In the past year MnSCU has undertaken several initiatives in the facilities management area which I believe will substantially improve all of the conditions you cite in the report.

**Development of Facilities Management Plans.** The MnSCU Board of Trustees has directed the preparation of a Facilities Management Plan for each of our 36 institutions and 53 campuses. The effort will address over 400 buildings and 22 million square feet of property. The plans will include comprehensive facilities inspections, asset preservation and renewal schedules including ADA, OSHA and deferred maintenance, the results of a comprehensive space utilization survey and new or updated campus master plans.

The plans will be completed by the end of 1999 and will form the basis for operating budget standards, capital budget planning and academic space programming for years to come. We will use system office and campus staff as well as outside consultants to complete the effort. The Department of Administration and Finance will also be asked to participate in the standards and guidelines phases.

**Streamlining Project Administration.** The Board has also recently approved a proposed restructuring of capital project administration which is designed to streamline the construction process, expand Board oversight and presidential authority and focus system office staff on policy and long term planning. In the coming months we will be updating MnSCU design standards and contract forms to industry standards, establish regional technical support contracts and developing pre-

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Mr. James Nobles  
February 4, 1998  
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qualification methods. It is our goal to add schedule, budget and scope rigor to the current environment. We have also begun discussions with members of the legislature concerning statutory assistance in streamlining the process.

**Development of Capital and Operating Budget plans.** MnSCU has also developed a substantially improved capital budget planning process which has a six year planning cycle and emphasis on asset preservation. The Board of Trustees is strongly committed to the principle that we are "short term stewards of long term assets" and that management's foremost obligation is the care of current facilities. Our 1998 capital budget request includes \$91 million for HEAPR projects. These projects represent our best current knowledge regarding the investment needed in our buildings.

Industry standards suggest that MnSCU should be spending \$60 million *per year* on our physical plant. We have committed to a program which would essentially split this obligation between the operating and bonding bills. The next two capital budgets include \$50 million each biennium. We would make a similar investment out of operating funds. A cost this size represents 12 percent of the annual state appropriation to MnSCU colleges and universities, a substantial dedication of program funds.

The above three initiatives all share the goal of assuring the Board of Trustees, the legislature and the public that valuable higher education facilities across the state are properly cared for. The three efforts will improve the planning for new investments, assure timely delivery of new construction and hold us accountable for the preventative maintenance that is so critical to building life expectancy.

Warmest regards,



Laura M. King  
Vice Chancellor - Chief Financial Officer

c: Chancellor Morris J. Anderson

# UNIVERSITY OF MINNESOTA

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February 6, 1998

James Nobles  
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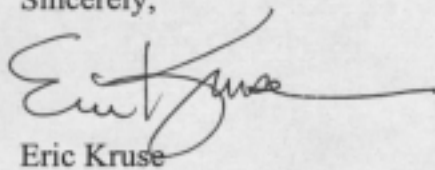
Dear Mr. Nobles:

The University of Minnesota has appreciated the opportunity to participate in the development of your report, "State Building Maintenance". As the largest institution in the State, the stewardship of publicly funded facilities continues to be of great interest and concern for the University. President Yudof and the Board of Regents have established facility stewardship as a top priority with initiation of Beautiful "U" Day and their theme of historical preservation and the renovation of existing facilities to accommodate new academic program initiatives rather than investing primarily in new facilities. The University's 4-Year "Capital Plan in Support of Academic Priorities for the 21<sup>st</sup> Century" is a major part of the University's strategic direction.

As you know, we have had only a few days to review your report. We have found that your report describes many challenges facing not only the University of Minnesota but all governmental entities regarding the stewardship of facilities. We are acutely aware of the statewide importance of the issues raised in your report and feel that we must look very carefully at your recommendations prior to giving you a formal response. As such, the University is giving your report a thorough review and will transmit a more detailed response to your office as soon as possible.

Again, thank you for the opportunity to review the report and we will respond in more detail within the next few days.

Sincerely,



Eric Kruse  
Associate Vice President  
Facilities Management