
Deferred Maintenance

CHAPTER 2

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.

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.¹ The University's estimate was based on a theoretical model that considered the life expectancy, age, and replacement cost of major building components.

¹ 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.

Each agency is responsible for estimating its deferred maintenance needs.

Definitions of Deferred Maintenance

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.²

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.

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.

² 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.

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 ^a	17,357,000	8
Department of Administration	2,960,000	16,976,000 ^b	6
Department of Human Services	4,464,000	20,306,000	5
Department of Transportation	4,392,000	Minimal	0

^aExcludes square footage for Faribault buildings because facilities will soon be transferred to the Department of Corrections.

^bExcludes \$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
Types of Deferred Maintenance								
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 ^a	<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%

^aOther 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.³

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

³ 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.

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.⁴

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

⁴ 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.⁵

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

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

⁵ 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.**

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."⁶

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.⁷ According to University staff, the library's stacks are the University's worst fire safety deficiency.

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

⁷ 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.**

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.**

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.⁸ 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.

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.

⁸ 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.

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.

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.

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.

