



# Preventive Maintenance for University of Minnesota Buildings

## Key Facts and Findings:

- Preventive maintenance is the regularly scheduled work needed to keep buildings and their components operating at peak efficiency, prevent breakdowns, and extend their useful life.
- As of January 2012, the University of Minnesota, Twin Cities (UMTC), was responsible for maintaining 259 buildings, ranging in age from 2 to 131 years.
- Overall, UMTC has implemented a good preventive maintenance program that incorporates, in varying degrees, essential best practices.
- The University has created an effective framework, the Facilities Management (FM) division, to oversee most preventive maintenance on the Twin Cities campus.
- However, FM does not oversee all preventive maintenance in University-owned buildings that generate their own revenue (such as major athletic facilities and student housing), which accounted for about 30 percent of campus buildings in fiscal year 2011.
- Facilities Management maintains an inventory of all University-owned buildings (Facilities Condition Assessment), which it uses to generate information on the current and historical condition of buildings.
- The database that FM uses to manage preventive maintenance work orders (COMPASS) has been an effective tool for short-term planning but has been less effective for long-term planning.
- Facilities Management's *Monthly Scorecard*, which it uses to measure its performance, inflates the percentage of preventive maintenance tasks completed "on time."
- Facilities Management does not have a written training policy or plan for its preventive maintenance staff.

## Recommendations:

- The University should require that all University-owned buildings on the Twin Cities campus have annual preventive maintenance plans developed and overseen by FM.
- Facilities Management should revise how it measures and reports on the timeliness of its preventive maintenance activities.
- Facilities Management should upgrade its computerized management information system for preventive maintenance to incorporate a more predictive maintenance approach.
- Facilities Management should develop a written training plan for all preventive maintenance staff.

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**The University of Minnesota has a good preventive maintenance program that should be extended to cover all University-owned buildings on the Twin Cities campus.**

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**The University is responsible for maintaining 259 of the 276 buildings on the Twin Cities campus.**

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**The University's preventive maintenance program consists of more than 200 unique tasks, which resulted in almost 59,000 work orders in fiscal year 2011.**

## Report Summary

The University of Minnesota is one of the nation's largest public research universities. Founded in 1851, it consists of 5 campuses, 21 research and outreach centers, and 16 regional extension offices. The University of Minnesota, Twin Cities (UMTC), is the largest of the University's five campuses, covering more than 1,200 acres of land and 25 million square feet of space in 276 buildings. Although none of the University-owned buildings on campus are as old as the University itself, many have seen decades of use—21 are at least 100 years old and 52 are between 70 and 99 years of age.

On the Twin Cities campus, the Facilities Management (FM) division is largely responsible for maintaining campus grounds and University-owned buildings. In fiscal year 2011, FM employed about 1,067 full-time-equivalent staff and spent about \$181.3 million to perform its duties.

**Preventive maintenance is the regularly scheduled work needed to keep buildings operating in top condition.**

Organizations can implement various approaches to building maintenance. The University of Minnesota, Twin Cities, uses a preventive maintenance model as opposed to a run-to-failure, predictive, or reliability-based approach. Under a preventive model, building maintenance tasks such as periodic inspections, adjustments, and replacement of minor parts are regular, recurring, and typically scheduled based on elapsed time.

Facilities Management has identified more than 200 unique preventive maintenance tasks and assigned each its own frequency, with each task applying to one or more pieces of equipment in or across buildings. Since the late-1990s, FM has used a computerized database

known as COMPASS to schedule preventive maintenance tasks and generate work orders for their completion. In fiscal year 2011, COMPASS issued about 58,900 preventive maintenance work orders.

**Overall, the University has implemented a good preventive maintenance program that addresses, in varying degrees, best practices.**

The research literature identifies several practices characteristic of effective preventive maintenance programs. Effective programs generally have a person or unit clearly responsible for preventive maintenance, with well-defined duties and responsibilities. At a minimum, effective programs also routinely inventory the current conditions of their buildings and building components; participate or engage in short- and long-term strategic planning; assess their overall efficiency and effectiveness; and properly train their preventive maintenance staff. The University has addressed each of these practices to varying degrees.

**Facilities Management maintains an inventory of campus buildings and their conditions.**

To receive capital funding, state law requires the University to maintain current and historical data on the condition of University-owned buildings. Facilities Management uses a Facilities Condition Assessment (FCA) database to record data on the current and historical condition of buildings and their components. The University uses the data to classify each building's overall condition based on its projected needs over the next ten years. It also uses these data to help prepare its capital budget, request funds from the Legislature, and prioritize building-related projects.

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**Some University-owned buildings on the Twin Cities campus are largely responsible for their own preventive maintenance.**

The University can generate historical data on the condition of buildings or systems by accessing archived FCA data dating back to 2004. Historical data are also maintained in other databases and project files, but they do not interface with the FCA or one another.

**Facilities Management does not oversee all preventive maintenance in University-owned buildings that generate their own revenue.**

The University classifies its buildings as either supported or unsupported, depending on each building's ability to raise funds. While FM oversees preventive maintenance in all supported buildings, it does not uniformly plan for, perform, or oversee such activities in unsupported buildings, which comprise about 30 percent of campus buildings—typically residence halls, athletic facilities, and parking structures. Instead, the departments and programs occupying the space are largely responsible for preventive maintenance. While some unsupported buildings contract with FM for some or all preventive maintenance activities, others hire their own mechanics.

Overall, we found that FM performed the fewest preventive maintenance tasks in student residence halls in fiscal year 2011—70 per 100,000 square feet of building space compared with a minimum of 200 for most other types of buildings. We also found considerable variation from one residence hall to another. For example, FM staff performed only 4 preventive maintenance tasks in Pillsbury Court, which has about 68,000 square feet of space, but 66 such tasks in Roy Wilkins Hall, which is only slightly larger.

It makes little sense to permit unsupported buildings to manage their own preventive maintenance activities without some centralized oversight. To ensure greater consistency campus wide, FM should develop short-term

preventive maintenance plans for unsupported buildings just as they do for supported buildings. Because some unsupported buildings employ their own mechanics, FM could approve individual unsupported buildings to perform selected preventive maintenance tasks on their own.

**Facilities Management should replace COMPASS with a more robust computerized information management system.**

Overall, FM staff gave COMPASS mixed reviews regarding its usefulness as a planning tool. According to some, COMPASS has a great deal of unused functionality. Others said the system was cumbersome and missing features useful for creating a more effective preventive maintenance program. We noted that COMPASS allows users too much freedom in entering work order information, which makes analyzing data difficult. Further, it does not communicate with other FM building-related information management systems.

Effective 2013, COMPASS's developer will no longer support the system, and FM will have to choose a new computerized information system for managing preventive maintenance. We think FM should look for a system that provides for more useful data analysis, thereby allowing FM to do better long-term planning regarding when to replace rather than repair building components. A more robust information system would also permit FM to base more maintenance work on the condition of building equipment rather than elapsed time.

**The Monthly Scorecard that FM uses to report on its performance is somewhat misleading.**

Facilities Management has done a good job implementing some suggested methods for evaluating its

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**At least one-third of preventive maintenance work orders were not completed by their due dates in fiscal year 2011.**

performance. Further, FM routinely measures its progress in meeting key goals and objectives that it has set for itself. For the last few years, FM has produced a *Monthly Scorecard* that identifies, among other items, the percentages of preventive maintenance work orders “completed by the scheduled date.” On average, FM reported completing about 99 percent of fire/life safety and 90 percent of non-fire/life safety work orders on time in fiscal year 2011.

We think that FM’s *Monthly Scorecard* overstates the percentages of preventive maintenance tasks completed on time. We found that FM actually completed about 67 percent of fire/life safety and 57 percent of non-fire/life safety work orders by their scheduled dates in fiscal year 2011. When we discussed this with FM staff, we learned that, instead of measuring whether a task was performed by its due date (as the *Monthly Scorecard* indicates), staff measured whether a task was completed *during the month that it was due*. Thus, a task due by January 3 would be considered on time if completed by January 31. At a minimum, FM should revise its *Monthly Scorecard* to more accurately reflect how FM measures its timeliness.<sup>1</sup> Further, FM should supplement these data with another timeliness measure based on work orders completed by their due dates.

**Facilities Management does not have a training plan or policy for its preventive maintenance staff.**

Because technology and building equipment are constantly changing, it is important that preventive maintenance staff receive continuous training. However, FM does not have a written training policy or plan for its preventive maintenance staff.

Facilities Management requires its general mechanics to complete a series of monthly online training modules. Because the training is generic and not specifically geared to the types of systems found in UMTC’s buildings, FM is planning to supplement the online material with short, hands-on sessions focused on UMTC’s specific needs.

However, FM does not have a similar requirement for the licensed tradespeople that it hires “off the bench” from their respective unions. While each union is responsible for ensuring that its members are fully trained in the generic sense, tradespeople also need additional on-the-job training regarding the nuances of University-owned buildings. While FM offers informal opportunities to its trades staff (many of whom have worked at the University for years), such training should be formalized and readily available to all preventive maintenance employees.

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<sup>1</sup> In May 2012, FM made this change.

## Summary of Agency Response

*In a letter dated June 13, 2012, University Vice President Kathleen O’Brien wrote that the University is “proud of the dramatic progress our Facilities Management department has made since [OLA’s] last audit in 1991.” She said that the University agreed with the findings of the recent evaluation, and she spelled out the steps the University was taking to address each of OLA’s recommendations.*

The full evaluation report, *Preventive Maintenance for University of Minnesota Buildings*, is available at 651-296-4708 or: [www.auditor.leg.state.mn.us/ped/2012/prevmaint.htm](http://www.auditor.leg.state.mn.us/ped/2012/prevmaint.htm)