



School Construction / by Russ Watson

# Course of Action

Roof asset management saves school district millions in taxpayer dollars



Florida's Brevard County Public Schools saved millions of dollars and was able to fund roof construction and maintenance by putting in place a novel management and financing program. The program was instituted in 1995 when a \$350-million county bond referendum was defeated. The approach could work for other institutional and commercial owners with numerous roof assets and no capital financing.

## The Bottom Line

Schools without capital funds still can afford construction projects

An innovative roof asset-management program has saved Florida's Brevard Public Schools (BCPS) millions of dollars in maintenance and replacement costs over the past six years and has generated over \$1 million in energy rebates. The program was instituted in 1995 when a \$350-million county bond referendum was defeated that would have provided much-needed funds for educational facility upgrades.

Historically, in any commercial, institutional or government organization, facility initiatives such as roof management or pavement management have been viewed as overhead cost burdens. Spending on books and new technologies is considered an investment while funding roof maintenance and repairs in order to defer roof replacement is considered an expense.

Faced with fixed budgets for capital and expense dollars and a growing list of deferred maintenance and repair issues, BCPS elected to try an *asset-management approach* in order to reduce their significant backlog of deferred maintenance and capital renewal. The program gave BCPS an integrated approach to managing, operating and maintaining their facilities assets.

## A roofing inventory

In 1995, BCPS comprised some 80 facility sites, with educational facilities ranging in size from 30,000-sq.-ft. elementary schools to 210,000-sq.-ft. high schools with 25 or more buildings. The roof inventory included over 9 million square feet of different roof types, systems and assemblies. The school system had a fixed annual capital budget for roofing of \$6 million and an annual expense budget for maintenance and repairs of \$250,000. After the budgets were spent, the condition and performance of roofs continued to be an issue, as evidenced by over 850 roof-related work orders in 1994 alone. >

BCPS eventually retained MACTEC Engineering and Consulting, Inc. to develop a roof asset-management program. To undertake this specialized program management task, the firm employed Roofer software, an "engineered management system" developed by the U.S. Army Construction Engineering Research Laboratory. The Roofer program is basically a database of:

- Objective condition assessments.
- Actuarial projections of remaining roof life.
- Modeling of various scenarios comparing repair vs. replacement.

The initial phase included a baseline to inventory the roof assets and document conditions. The software then analyzed the data to calculate a roof condition index (RCI) for each roof or facility based on the quantity, severity and frequency of observed deficiencies. The baseline survey revealed an RCI of 47 out of a possible 100. An RCI of 33 or below indicates that it is more cost effective to replace a roof than maintain it.

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**Roof cost data**

At an average replacement value of \$6.75 per square foot — including tear-off and replacement — the roof portfolio was valued at just over \$60.7 million. Based on the RCI of 47 and an asbuilt expected roof service life of 20 years, the estimated life expectancy of the average roof was found to be 12 to 14 years. When the program was launched initially, the bond rate for the school system was 4.5 percent. Given the average realized roof life of 12 years, the depletion rate was more than \$4.6 million annually (\$60.7 million amortized over 12 years at 4.5 percent). Each additional year of service life was worth about \$4.6 million.

After analyzing the baseline data, a strategic plan ranked roof assets by condition index. By ranking roof assets from worst to best, 100 percent of the capital dollars could be directed at the worst roofs, while the expense dollars were directed at stopping leaks or maintaining good roofs to mitigate early signs of deterioration.

The result was a system-wide RCI improvement of approximately 50 points. The effort also earned energy rebates from the local utility company in excess of \$1 million, and a reduction of annual roof leaks to fewer than 40 incidents. Other benefits derived from the program:

- A reduction in capital requirements for roof replacements of more than 30 percent.
- Five added years of roof service life.
- Sole-source negotiations with manufacturers, which reduced material costs.
- Reduced energy costs due to new insulation.
- Objective bid evaluation based on consistent specifications and bid documents.
- Funding of other projects with the savings, including HVAC, lighting and ceiling systems.

**Software Change-out**

Recently, the BCPS roof program converted from the Roofer database to a software called "Vertex," developed by NexDSS, a division of MACTEC Engineering and Consulting, Inc. While it is

based on the same algorithms and strategy as Roofer, Vertex allows owners like BCPS more flexibility in reporting on roof assets. Also, Vertex software can integrate other significant and costly facility components such as mechanical systems and pavement projects.

Proactive management practices, competitive bidding and manufacturer partnering have contributed to the success of the BCPS roof-management program. Now that BCPS has an extensive roofing-system inventory and a fully documented, manageable repair-and-replacement plan, they are able to make quick, accurate projections of costs and budgets — and even to secure the additional funding they need.

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**Hard Dollars: Calculating Roofing ROI**

For the Brevard County Public Schools, the benefits of strategically managing existing roof systems were proven by the bottom line. The most important goal was the ability to extend the average life expectancy of existing roofing systems and improve the return on of the school district's roof inventory of 9 million square feet, just under 4 million square feet was replaced. The remaining 5.2 million square feet was assumed to be about 12 years old on average; those roofs were expected to fail or require replacement in about two years.

To calculate **roof ROI**, divide the annual *cost of ownership* for the number of years of increased service life by the *cost of maintenance and repair*. As shown below, the roof-management program extends life expectancy by five years — with an ROI exceeding 450 percent.

<b>Square Footage of Roofing Under Maintenance</b>	<b>5 million</b>
<b>Roof Replacement Value</b>	<b>\$33.75 million</b>
<b>Current Average Age</b>	<b>12 years</b>
<b>School Bond Rate</b>	<b>4.5 percent</b>
<b>Annualized Cost of Ownership</b>	<b>\$2.48 million per year</b>
<b>Investment Opportunity</b>	<b>\$2.25 million in repairs</b>
<b>Roof Design Life</b>	<b>20 years</b>
<b>Remaining Useful Life at Program Start</b>	<b>2 years</b>
<b>Adjusted Remaining Life</b>	<b>7 years</b>
<b>Benefit/Years Added Life</b>	<b>5 years</b>
<b>ROI</b>	<b>451 percent</b>
<b>Dollar Value of ROI</b>	<b>\$10.17 million</b>



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