Too Hot, Too Cold, Too Expensive: Energy, HVAC, and More

Providing efficient energy and a comfortable climate—it can be done!

By Jody Andres, AIA LEED AP

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Although Nekoosa High School was expanded with a 33,000 square foot addition, the district was able to keep energy use per square foot at the pre-addition level due to replacing the school's antiquated HVAC system with an energy-efficient model.

The challenge of keeping everyone comfortable—not too hot and not too cold, not too damp and not too dry—while trying to keep energy expenses down may seem like a lofty goal. Trying to provide energy efficiency and human comfort for hundreds of students or a significant number of community members, all within a school with a significant footprint, may seem beyond comprehension. But it can be done!

Know What You're Using

Understanding your school's energy consumption goes well beyond looking at your bills at the end of each month. The first resource to review is the historical data of energy consumption for your current properties, preferably over several years and with as much detail as possible. Your energy provider should be able to supply that information.

The second source of information that you should pursue is benchmarking. Benchmarking provides performance comparisons against expectations and in relation to other comparable buildings. State education agencies, regional energy-focused groups, and websites such as Energy Star Portfolio Manager (www.energystar.gov/benchmark) can provide critical data. That information is frequently broken down by types of buildings to give you with a quality basis with which to compare.

Once the data are gathered, your team can look for performance patterns, comparing them with the available benchmarks. This process often draws attention not only to areas for improvement but also to successful existing measures. The most accurate way to establish such head-to-head comparisons is by matching your electric and gas usage on a per-square-foot basis (adjusted for heating and cooling degree days) with similar school facilities.

Few schools are truly monitoring and benchmarking their energy consumption. But those that do are reaping the benefits!

Examine HVAC

When it comes to reducing energy consumption, it is vital to evaluate your heating, ventilating, and air-conditioning (HVAC) system's performance. Efficient operation of your HVAC system plays a starring role in reducing energy costs and consumption over the life span of the varied educational facilities under your stewardship. If inefficiencies are corrected, that improvement provides a good return on investment, better air quality, and a more learning-conducive setting because of a more consistent temperature, thus affecting the students' environment positively.

Examining the HVAC system was a significant aspect in the 39,500-square-foot renovation of Nekoosa High School in Nekoosa, Wisconsin. The multilevel facility had an antiquated HVAC system that was supplanted with an energy-efficient system that included state-of-the-art digital controls. In due course, the new system improved air quality while holding energy consumption stable, despite the additional square footage and the introduction of air-conditioning.

Once a system is installed, regular and preventive maintenance is likely the single most important consideration. Regular cleaning and changing of filter media are critical. With modern digital controls, your system is easily monitored weekly, daily, or hourly, and performance can be fine-tuned to optimize energy consumption reductions. Tailoring your system's operation to the actual use of your school can produce a significant return.

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More advanced stages in the battle against escalating energy prices might include tapping into alternative sources of heating and cooling for your school. Different heating and cooling systems also affect user comfort.

Get What You Paid For

Another critical weapon in the fight against rising energy costs is commissioning.

Commissioning is a systematic quality-assurance process used to ensure that building systems operate optimally. This service, performed by a commissioning agent, ensures that school districts achieve the performance and design they funded. Although some would incorrectly assert that commissioning is an excessive cost, our experience demonstrates that it brings great value. Commissioning may also be performed retroactively on existing HVAC systems.

With quality commissioning and open communication, you can consistently improve the performance of a school facility. Ongoing improvements and utility savings are likely to occur for the first few years after initial commissioning, as improvements are made to fine-tune performance, and analysis is completed on the effectiveness of the improvements.

A good case for the benefits of commissioning is provided by Northland Pines High School in Eagle River, Wisconsin. About five months into its operation, the commissioning agent recognized that the building was operating soundly but not at peak performance. In the process of scrutinizing the four energy-recovery units, the agent discovered that two of the heat wheels (which happen to be about the size of a living room) were not operating at the desired speed. The cause was

A proven quality assurance method, commissioning helps ensure that a school's building systems operate per the district's design intent and operational needs.

Guidelines and principles from programs such as U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) can help guide districts toward efficient and healthier schools.

two crossed wires; thus, several sensors were giving incorrect readings. Corrections were made, and performance was heightened.

That's the kind of fine-tuning each school can do to be certain that it operates effectively and that energy savings are maximized.

Begin with the End in Mind

If you're considering a new construction or renovation project, take the advice of author Stephen Covey, "Begin with the end in mind." Leadership in Energy and Environmental Design (LEED) can provide a great road map (even if you don't choose certification) toward efficient and healthier schools. LEED standards, and certification if desired by the district, provide direction for making wise and principled decisions regarding the planning, design, and construction of your next facility.

The U.S. Green Building Council deserves credit for the work it has done with its LEED for Schools rating system to move toward greater sustainability, higher energy savings . . . and healthier educational environments.

Strategize Your Energy Supply Mix

Have you given careful consideration to what the right energy source is for your area at this time? In recent years, many changes in availability and rates have taken place. The right energy choice just years ago may not be the right choice now. In fact, what is right today may not be the best choice in the next few years.

It is imperative to change with the times and think outside the box about your energy choices. The cost of natural gas has plunged because of the growth of fracking throughout the country . . . a significant recent revolution. Natural gas will likely remain at very reasonable rates for the foreseeable future. Likewise, some parts of the country enjoy low-cost electricity, whereas others are watching rates rise quickly. Still other schools are using fuel oil and propane. Are you familiar with all of your options? Do you have an informed strategy? It is important to consider all of the options, looking for the wisest direction for your specific school district.

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Do-It-Yourself Energy?

The cost of renewable (solar and wind) energy has dropped and is currently a viable option for some school systems. In some locations, third-party financing is a possibility for those districts, as tax benefits can be transferred to other entities with these systems.

Third-party financing is a method of funding renewable energy generation. This measure is especially attractive for schools because they cannot claim tax credits used to fund those renewable energy projects, and they often lack the initial investment capital to secure a solar or wind system.

In that situation, investors monetize available incentives, such as rebates, tax credits, and depreciation. The school system or host site then leases space to investors for a privately owned and operated system. Then, at the end of the lease term, the host school can purchase the system for a fraction of the initial installation cost, thus making ownership of the system a sound financial option. Using this model provides schools with the opportunity to maximize system size while minimalizing cost.

Working Toward a Goal

Establish a baseline for your energy use and then set targets for improvement. Measure your performance and savings against those established targets. Get a handle on system performance and energy options and then use the savings to make important educational improvements.

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