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Energy Efficiency and Audits: What They Mean to Building Owners

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Since the 1970 Arab oil embargo, the US has been fluctuating between making serious efforts toward energy efficiency while still engaging in serious energy consumption practices.

The government's increasing efforts toward changing energy consumption practices began with the introduction of motor efficiency regulation in the timid EPA Act of 1992.

The EPA Act of 1992 built the foundation for a stronger EPA Act of 2005, which mandated that all government buildings designed and constructed after a certain cut-off date be designed / constructed with energy consumption rates at 30% below a standard base building that complies with the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 90.1.

Spearheaded by ASHRAE, the commercial HVAC industry has been very active in standardizing measures for energy efficiency beginning with standard Fundamental Handbooks for the latest Green Standard 189. In between, ASHRAE issued six guidebooks detailing measures to achieve the 30% energy savings exceeding the ASHRAE 90.1 Standard for several types of small buildings, namely schools, warehouses, office buildings, retail buildings, healthcare facilities and hotels.

The relatively recent inception of the Leadership in Energy and Environmental Design (LEED) System by the US Green Building Council caused the issue of energy efficiency to jump to the forefront. Owners are eagerly evaluating the possibility of getting their new / existing buildings classified in accordance with the LEED system.

In commercial buildings, lighting systems typically consume the most energy (approximately 33%).



HVAC systems typically follow (consuming approximately 32%), and the plug and process loads typically consume the remainder. In other words, if a building owner pays \$10,000 in energy bills (electricity and fuel) per month, these amounts are broken down as follows: \$3,300 for building lighting, \$3,200 for HVAC system consumption and the remainder for the other miscellaneous loads. As a result, if it is possible to reduce energy consumption by increasing the efficiency of the HVAC and lighting systems, hypothetically, by 30%, then the monthly payment for energy will drop to \$8,050 and a cost savings of 19.5% can be achieved.

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The information presented here is for general knowledge purposes. It is not intended to be offered as specific advice for engineering projects or situations, and should not be treated as such. For specific advice or for more detailed information, please contact The Falcon Group.



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The question then becomes: how can building owners increase the energy efficiency of the HVAC and lighting systems in their buildings?

The simplest answer to this question is to begin with an **energy audit**. Energy audits expose all potential inefficiencies in the building's energy consuming systems, which include the building's lighting and HVAC systems. The lighting systems should have efficient fixtures and ballasts. Lighting controls should divide the entire system into smaller zones so that, if the switch is engaged, the entire building or floor will not be consuming unnecessary energy. Occupancy sensors can potentially conserve a lot of energy if implemented in areas that are unoccupied for long periods of time.

The majority of inefficient energy consumption can be found in the HVAC system. By nature, old boilers become inefficient as time passes, depending on the manufacturer of the product and failure or aging of the tubes (whether fire tubes or water tubes). At best, their controls are rough and their sequences of operation are most likely old. As a result, they do not capture the same benefits as systems with new controls that track capacity to load.

Another issue is the pumping system - is it an old constant flow system with three-way valves? Is it a variable secondary system with constant flow as primary? Is it the most efficient variable primary system? A few years ago, the use of a Variable Frequency Drive (VFD) was very expensive to implement into HVAC systems. Now, the cost of VFDs is little more than the cost of a standard starter. Many companies are using VFDs, even on constant flow systems, to prevent the bump that the electrical system gets with the start of that pump.



The same applies to air conditioning systems. Generally, in the northeast, the air conditioning system's fan consumes the most energy. Constant volume systems waste a lot of energy. For example, the use of a constant volume fan with a 10 hp motor running 24 hours a day, 365 days a year will consume 65,700 KW/year. The same fan with the same motor, if transformed into a variable volume system, will consume 49,275 KW/year, averaging a savings of approximately 25%.

Motors can also be inefficient energy consumers. There are several types of motor efficiencies that can be considered for an existing application that will reduce energy consumption. Older thermostats are good at maintaining a specific temperature in any space; however, new programmable thermostats can be programmed for four different time slots throughout the day and have the possibility of being programmed differently for all 7 days in a week.



New programmable thermostats equipped with the programming possibility for 7 different days will reduce the total energy consumption considerably. They have the potential to save a sizeable amount of money by maintaining 28 different temperatures per week for the same space, taking into consideration whether or not the spaces are occupied or unoccupied, and also include night settings.

Buildings do not have to be inefficient with respect to the amount of energy they consume. Having a simple energy audit performed is relatively inexpensive and can be performed in a very short time. Moreover, simple energy audits assist building owners in uncovering inefficient energy consumption practices that exist within their buildings and deplete their resources. With the help of the energy audit, building owners can easily address these issues / conditions and put their resources to better use.

Capital Replacement Projects: Professional Design and Inspection Produce Quality Results

By Andrew Amorosi, PE, RS, Principal

As your community or building ages, it will require an increasing amount of maintenance and large scale replacement or improvement projects will become necessary. Your association's capital reserve funding plan should anticipate these projects such that proper funding is available when it is needed. Periodically updating your capital reserve funding plan will help ensure proper funds will be available. The larger replacement projects may involve roofs, façades/siding, concrete, waterproofing, retaining walls, parking structures, decks/balconies, pavement, HVAC systems, recreation facilities or other elements of the community or building or related amenities of the site.

While these projects may seem straightforward in terms of scope they are, in reality, construction projects of a major expense. It is important that an association move forward with these construction projects with the assistance of a qualified design professional. Proper designs, specifications, and bid documents along with representation (inspection) during the construction process are paramount to the project's success. Sometimes, associations make hasty or ill-advised decisions regarding these projects and construction defects or excessive costs can result. Merely obtaining three (3) bids with three (3) different approaches from three (3) different contractors can be the start of a project going bad. The bids submitted may be inadequate or incomplete for the desired result and the low bid or selected bid may even be artificially low (possibly resulting in claims for extras) or the bid just does not represent what is actually needed for the project. Even when using contractors with the best intentions, claims for extras are a big concern for a project without proper design or bid documents. Unfortunately, improper scope of work, defects in methods or materials or improper claims of payments for extras may only become evident years after the project is completed and fully paid. Depending upon the type of project, the construction defects may result in water infiltration and damages, a reduced useful life of the new element, a need for premature remedial repairs or even the association having to redo the project entirely. Sometimes lengthy and costly litigation between the association and the contractor occurs as a result of these issues or payment disputes.

Prevention of the above scenarios can be simple and relatively inexpensive. Typically, a design professional's fees range from 6% - 8% of the total construction costs dependent upon the size and type of project.



Many times these costs can be partially or even wholly recovered just by having a cost effective design, having accurate quantity verifications performed in the field during the work and by having verification of adherence to design documents.

If designed and inspected properly, all reconstruction projects can be undertaken and completed with a high quality final work product and limited inconvenience to the residents. The design professional is retained to prepare a proper, cost effective design, construction specifications and bid documents for the proposed improvement. The design professional prepares construction plans, specifications and bid documents based on (but not limited to) the applicable Codes, ordinances, feasibility/needs of the project and the safety and well-being of the association. This effort provides peace of mind to the association that the project is being implemented with proper work scope, limits of work, methods and materials with the seal of an experienced design professional. In short, the scope of work that is proposed is what is needed for the desired result. The association can then obtain competitive bids with an exact scope of work with specific details and requirements of what needs to be done. The design professional may also be involved in the selection and award of a contract to a qualified contractor through a competitive bid process. The competitive bid process ensures that the design plan and specifications are to be followed in full with each contractor providing a quote for the same scope of work. The bid prices should be evaluated as well as the qualifications and experience of the contractor.

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Capital Replacement Projects *continued...*

The design professional's value and responsibility to the association should not end with the preparation of the design documents. Too many times, the construction project begins, proceeds and is completed without the presence of a qualified inspector. The result, in some cases can be an inferior quality work product, unverified or inaccurate quantities for payments, unverified or unnecessary changes or extras and/or worse yet, noncompliance with the original design plans and specifications. To reinforce an earlier point, the potential for problems can be much worse if there are no professional design documents prepared at all and merely a generic bid is used for the project.

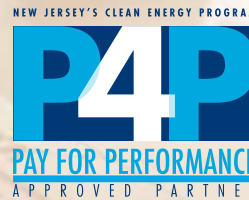
Professional construction inspection of the work being performed is needed for the project to be completed in accordance with the design documents. While each project may have specific requirements, the inspection services should generally include:

- 1 Pre-Construction Meeting
- 2 Review Materials/Staging
- 3 Work Methods
- 4 Daily Field Reports and Contractor Safety Practices
- 5 Prepare/Verify Work Quantity Logs
- 6 Review of Potential Additional Work
- 7 Review/Approve Change Orders
- 8 Progress Meetings
- 9 Punch List Documents
- 10 Prepare Payment Approvals
- 11 Constant Communication with the Contractor and Client
- 12 Final Inspection and Approvals.

The professional inspection provides the assurance to the association that the work is being properly performed and verifies that proper payments are made. The design professional's responsibility during any construction project is to represent and advise the association during the construction process. They provide qualified and objective inspection to lessen or eliminate the possibility of inferior workmanship or non-compliance with the specific design plans and specifications or other issues discussed above. The inspection protects both the contractor and the association in the event of a dispute or a claim for additional work. Every aspect of the project should be well-documented to enable a quick resolution to any real time or future claim.

Lack of involvement of a design professional and lack of professional representation on a construction project can result in problems, even when contractors and associations have the best experience and intentions. Having a professional involved from start to finish provides for a proper end result, demonstrates due diligence on the part of the association and significantly reduces the potential for future problems.

What's New?



We are now an approved partner in the New Jersey Pay for Performance Program.

We Are Very Pleased To Announce **ANTHONY VOLPE, P.E. is now a Falcon Engineering** **Principal Partner.**

Our entire team congratulates Mr. Volpe on this well deserved achievement. In addition to his new responsibilities as Principal, Mr. Volpe will continue to lead the firm's high-rise building re-construction and structural design division with the same skills, integrity and vision that he has displayed for our firm.

Welcome

Michelle Cavalchire, Robert Vella, Michael Popeck and **Joseph Czaszynski** to the growing Falcon team; **Midda Garcia**, and **Karen Kovi**, who recently joined our Administrative Team and **Heather Hunt** has joined us on a full time basis.

Celebrating 5 Years with Falcon

J. Stewart Willis, RS

Senior Project Manager

Construction Official, Bldg. Subcode, HHS

EIFS Special Inspector

Janet Piatkowski

Assistant Project Manager

New Baby joins the Falcon Family

Michael Popeck's new son Ethan Ryan born 12/14/10