

Elevating the Role of the Multifamily Building Operator: How Operators Can Save Energy, Minimize Waste, and Improve the Bottom Line

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ABSTRACT

Recent reports have highlighted disappointing energy performance from green buildings, automated systems that are never fully utilized and major capital improvements that do not result in expected energy savings. All of these factors have one thing in common. In the quest to improve building performance, human behavior is the wild card. This paper will examine how the behavior of one particular person -- the building operator -- can positively influence the performance of a multifamily building. This paper describes a collaborative effort between labor, multifamily building owners and property managers in a major metropolitan city to empower 2,000 operators to increase the energy efficiency of large multifamily buildings. We think this is the first large-scale comprehensive program to both educate superintendents and building operators, and then document the best practices and upgrades these operators make in their buildings.

The presentation will describe innovative teaching techniques, identify barriers that prohibit greater operator involvement in energy management, share student perceptions of the training and review a preliminary list of changes superintendents made in their buildings. After the architects and engineers leave the building it is in the hands of the staff. This paper makes the case that investing in the building operator is perhaps the single most important efficiency investment an owner can make.

Introduction

According to The Department of Energy, well executed operations and maintenance (O&M) programs can save 5%-20% on annual energy bills without significant capital investments (DOE 2009). Due to rising energy costs, the inconsistent results of previous energy efficiency investments, and a cultural shift towards sustainability, the timing is right to make an industry-wide commitment to training building operators, superintendents and all building staff.

To realize optimal efficiency and savings through O&M, Local 32BJ, which represents NYC superintendents, handypersons and other building workers, partnered with the Realty Advisory Board of New York, Urban Green Council USGBC-NY and the Building Performance Institute (BPI) to launch an effort to train 2,000 building superintendents (1,000 per year for two years) to reduce energy usage and operate their buildings in a more sustainable way.

The *1,000 Green Supers* program is the result of nine months of development that included input from owners, property management companies, superintendents, and energy educators to design a program to train the people most responsible for daily building operations. The 40-hour training program incorporates adult education principles pioneered by Malcolm Knowles (Knowles, Malcolm 1980) and the Multiple Intelligences Theories of Dr. Howard Gardner (Gardner, Howard 2004) to design activities, exercises, and presentations that appeal to

a variety of adult learning styles. Students will develop individual green building plans and receive support from a green coach to implement the practices and skills they learn in class.

Due to a \$2.8 million American Recovery and Reinvestment Act (ARRA) grant from the U.S. Department of Labor, this program is already running at close to full scale. Since September 2009, 336 people have been trained (as of May 14, 2010). The program plans to train another 700 people in 2010, and an additional 1,000 in 2011. The current phase of the program will be completed as of January 15, 2012. Superintendents can then continue their training by attending other courses through TSTF, including BPI Multifamily Analyst Training or The Northwest Energy Efficiency Council's Building Operator Certification.

This paper will identify the impetus for creating the *1,000 Green Supers* program, introduce the stakeholders and present an overview of the program's development. It will then review the curriculum, highlight teaching techniques and follow-up activities. Finally it will provide a brief description of program assessment efforts.

Need

Buildings in the United States consume more energy (39%) (Environ IA 2008), and generate more greenhouse gas pollution (38%) than any other sector of the economy, including transportation or industry (Energy IA 2008). In New York City this problem is especially pronounced, with buildings responsible for 75% of city greenhouse gas emissions (NYC 2009).

For years, many leaders in the NYC energy efficiency industry have championed O&M as the most effective means to increase energy efficiency and reduce carbon emission. Professor Richard Koral, of the NYC Technical College and Apartment House Institute and founder of the Superintendent's Technical Association, asks us to "consider this basic rule of thumb: for every one degree that the average temperature in the building is above, say 72 degrees, the building's fuel consumption rises about three percent! If, then, the overheating is, say, five degrees, the heating bill is about 15 percent higher than it should be" (Koral, Richard 2007). Since 1994 he has urged that superintendents learn and perform regular combustion efficiency testing, since they know more about the day to day working of their buildings than anyone else, and thus are in the ideal position to take simple steps to improve efficiency (Koral, Richard 1994).

It is not only in older buildings that energy can be saved through optimal operations and maintenance. The USGBC points out the importance of operations and occupant behavior on energy use in LEED buildings as well: "The biggest issue by far is how the people use the building day-to-day: do they forget to turn out the lights when they leave the room? Leave the water running in the sink? Do the facility managers have protocols for checking automatic controls? Do they know when those controls are malfunctioning?" (Horst, Scott 2009). In most cases, the operating staff is not fully educated on the systems they are expected to maintain. "A major cause for discrepancy between design predictions and actual performance is the divide between building operators and building designers. Only the rarest of projects will include operating personnel in design development phase (Hinge, Adam, Donald Winston and Byron Stigge 2006). From USGBC to DOE to the property managers and staff working in buildings every day, the message is the same: equipment and automated systems do not ultimately run buildings--people do.

1,000 Green Supers Program: A Collaboration of Employers, Owners, Labor and Educators

What makes the *1,000 Green Supers* program unique is the commitment and breadth of stakeholders involved in its design. The program is a collaboration of workers, owners, property managers, educators, efficiency experts, and green building advocates who employ, train, and organize 80% of the large multifamily buildings in Manhattan. This collaboration is informed by the interests and experiences of the key stakeholders in the New York City multifamily residential market.

32BJ Thomas Shortman Training Fund (TSTF) (Training Entity)

The Thomas Shortman Training Fund is a joint labor-management organization, cosponsored by SEIU Local 32BJ and the Realty Advisory Board on Labor Relations. It provides industry, academic, and computer courses to 7,000 Local 32BJ building service workers every year in New York, New Jersey, Connecticut, Pennsylvania, Maryland, Virginia, and DC.

SEIU Local 32BJ (Labor Representative)

SEIU 32BJ is the largest building service workers union in the country, representing more than 120,000 building service workers in seven states and the District of Columbia. 32BJ is affiliated with the Service Employees International Union (SEIU), which has more than two million members.

32BJ President Michael Fishman explained the importance of providing climate change education to people who work in building operations as follows: “With 77% of our city's greenhouse gas emission generated by buildings, we must all work together to protect the environment” (Fishman, Michael 2009). The role of the building service worker has evolved to include an energy management function. Also, as new green technologies and materials are introduced, existing building workers will have to maintain and monitor this equipment. Training workers in these technologies and practices provides job security, makes them more valuable to the employer, and maintains a high industry standard.

Realty Advisory Board on Labor Relations (RAB) (Employer Representative)

The Realty Advisory Board is a multi-employer association serving the real estate industry in New York City, Long Island, Westchester, Connecticut and Northern New Jersey. The RAB negotiates collective bargaining agreements between real property owners and unions that represent their maintenance and operating employees. The RAB believed so strongly in the program that they committed to perform training on company time. “With most building service workers employed at the Realty Advisory Board on Labor Relations buildings and represented by 32BJ, this labor-management partnership is uniquely positioned to give thousands of workers the skills they need to cut waste and costs at buildings across the city,” said Howard Rothschild, President of the RAB (Rothschild, Howard 2010).

Urban Green Council/United States Green Building Council (Certifying Body)

The Urban Green Council is the New York Chapter of the U.S. Green Building Council. Urban Green's mission is to lead the advancement of sustainability in the urban built environment, and serve as a model for other cities through education, advocacy, collaboration, and research. According to Urban Green Council Director, Russell Unger, “The majority of New York City’s greenhouse gases come from existing buildings. Energy demand in large buildings also drives some of the highest consumer energy costs in the country. To tackle these problems, it is vital that building superintendents upgrade their skills and learn new building science concepts to operate their buildings efficiently” (Unger, Russell 2009).

Building Performance Institute (BPI) (Certifying Body)

The Building Performance Institute is an independent not-for-profit organization that develops standards for weatherization, operations and retrofit work that are recognized across North America. The Thomas Shortman Training Fund has been affiliated with BPI for two years. According to BPI CEO Larry Zarker, the *1,000 Green Supers* program is “essential in introducing BPI energy efficiency standards to the operations and maintenance of New York City buildings on a large scale. With the exploding demand for energy efficient buildings it’s critical that the Thomas Shortman Training Fund meets the demand of the New York City real estate industry by producing expert building service workers capable of operating and maintaining their buildings at peak efficiency” (Zarker, Larry 2009).

Development of the Program

The idea for the *1,000 Green Supers* program originated at the TSTF in early 2009. Having seen successful examples of operators and superintendents who reaped energy savings in the buildings and sensing the growing trend towards green building practices, TSTF convened employer and labor/worker committees to define the role of a green superintendent and explore the impact that operations and maintenance staff could have on NYC residential buildings. Employers wanted superintendents with energy efficiency and green knowledge, and the union (with an 80% density in residential building in Manhattan) saw a large-scale training program as an opportunity to set a new standard in building operations and maintenance.

Employer Committee

The Employer Committee, hosted by the RAB, was made up of 15 building owners and property management companies. It included many of the largest residential property managers and owners in New York City, such as Brown Harris Stevens, Related, Douglas Elliman, Glenwood, Midboro, Durst Organization, Akam and Rose Associates. It also included the NYC Coop and Condo Association, which represents hundreds of buildings throughout New York City. The committee met five times over a nine month period. A description and summary of the committee recommendations follows.

Review of existing certifications. The Employer Committee recommended that the training prepare workers for the BPI Multifamily Building Operations Certification (MFBO), which specifically addresses operations and maintenance in multifamily buildings and G-Pro Operations and Maintenance Certification which addresses concepts of sustainability not included in the BPI training. G-Pro is still in development and will be integrated as soon as it is released.

Customized training. NYC's residential building stock varies from pre-war steam heated buildings to high rise glass towers. Employers agreed the training should prepare students for the certification exams and provide a customized experience. The customization would occur through organizing classes around common building systems and offering follow up seminars on specific topics.

Linkage to local legislation. The training should provide superintendents with the skills to help employers comply with local energy efficiency legislation whenever possible.

Member Committee

The Member Committee consisted of resident managers, superintendents, handypersons and union representatives. Several of the superintendents were from LEED buildings. Some had proven track records of saving energy and introducing sustainable concepts into the operations of their buildings, and some had already earned BPI and other industry certifications. The committee met five times over a nine month period. A description and summary of the committee recommendations follows.

Third party certification. Superintendents are hired in buildings based on their experience, licenses and certifications. If a course offers a third party certification recognized by employers it creates a strong motivation to attend.

Hands-on learning. For the most part, superintendents are hands-on people who learn through doing. The committee recommended that a significant portion of the course be field-based.

No mandatory testing. A portion of the superintendent population does not learn well in classrooms and has negative associations with academic settings, especially tests. The committee suggested issuing a completion certificate to those who attended all of the classes but did not want to sit for the BPI written certification.

Training Program Description

The *1,000 Green Supers* program is a 40-hour training that consists of 10 modules and a written and field test upon completion of the class. The modules are as follows:

- **Building science** — Covers the fundamentals of building science and introduces a whole building approach to operations and maintenance. Topics in this class include the Laws of Thermodynamics, air movement, heat transfer, and relative humidity.

- **Building envelope** — Covers the concept of the building envelope and explores ways to keep conditioned air separated from the outside environment. Topics in this class include pressure boundaries, vapor barriers, thermal barriers, air sealing and insulation.
- **Lighting, electricity, and plug loads** — Covers electricity, lighting, and appliances. Topics in this class include electrical science, lighting types, lighting retrofits, lighting audits, lighting controls, and appliance maintenance and purchasing.
- **HVAC** — Reviews best practices to efficiently operate the most common heating, ventilation, and air conditioning systems. Topics in this class include combustion science, combustion efficiency, controls, and distribution.
- **Field exercise: HVAC** — Onsite visit to a building's machine room, elevator room and roof where instructors teach superintendents how to perform steady state efficiency tests, maintain rooftop ventilation equipment, and properly log the daily use of the building's mechanical systems.
- **Indoor environmental quality** — Topics include typical pollutants in a building and the strategies to address them. Also includes a brief introduction to green cleaning.
- **Water conservation** — Covers the essentials of water use and conservation strategies. Topics include analyzing water bills, metering, low flow appliances, and leak detection.
- **Field exercise: hallway, lobby, apartment** — Onsite exercise where superintendents use diagnostic equipment to evaluate air flow, identify air leaks, perform a sample lighting audit and address wasted energy in a variety of locations throughout the building.
- **Quantifying energy usage** — Covers energy usage and benchmarking, including analyzing energy bills, determining base usage, and building metrics. The culmination will be for each student to perform a basic benchmark of their building.
- **Green building plan and communications** — Superintendents draft a plan outlining improvements they will make when they return to their buildings. This module also provides strategies and techniques to present to building owners, tenants, and staff.

Typical Schedule

The course can be offered to accommodate various schedules, but the most common method of delivery has been one full day per week for five consecutive weeks.

Class Size and Recruitment

The optimum class size is 12-15 superintendents. A smaller class is too costly in terms of teacher/student ratio and use of space. A larger class size requires additional instructors because of the hands on exercises and field training. As the training develops, TSTF will experiment with recruiting classes based on specific building types (boiler systems, scale of buildings, LEED buildings, etc.) and customize some of the training to these systems.

Instructors

The TSTF employs a diverse group of instructors who represent a wide range of backgrounds and experience. The instructors are architects, operating engineers, building auditors, superintendents, service technicians, experienced energy consultants and education

minded vendors (lighting, green cleaning, IEQ). Instructors attend ongoing trainings to develop their teaching abilities, learn how to operate new tools and equipment and discuss best practices.

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Adult Learning Styles and Multiple Intelligences

Students attending this program have extensive work histories. The average class has close to 200 years of combined building industry experience. Due to this fact, the course integrates both adult learning practices that stress active student participation and varied presentation styles that appeal to a variety of learners.

Field Training

HVAC. Whenever possible, field training is held in a building managed by one of the superintendents in the class. The class tours a boiler room where the instructor demonstrates a 'steady state' efficiency test on a boiler using a combustion analyzer. The class tours a boiler room, reviewing best practices as required for the BPI field exam (i.e., health & safety, preventive maintenance, logs and record keeping). The instructor, as part of the tour, also demonstrates and has students use diagnostic equipment, including gas detectors, carbon monoxide meters, and infrared thermometers. The field trip ends with an inspection of the roof and elevator room where students evaluate these areas in terms of BPI best practices and compare notes with the instructor.

Hallway, lobby and apartment. The class returns to the same building to complete the tour with an inspection of a vacant apartment, common area and exterior of the building. Again, the instructor will demonstrate and have students use diagnostic equipment, including drip gauges, moisture meters, and light meters. Again, students evaluate these areas in terms of BPI best practices and compare notes with the instructor.

Classroom Training

The classroom training includes activities, demonstrations, group work, lecture and exercises. Below is a selection of teaching techniques.

Stackolator. The Energy Wright Stackolator Model is a tube mounted vertically on a base with an incandescent light bulb serving as an internal heat source. There is a cap on the top of the tube and holes spaced evenly every few inches. The model represents a building. The cap represents the roof and the holes represent doors, windows, or other unsealed portions of the

building envelope. Students use a smoke stick to determine where air is infiltrating or exfiltrating and which parts of the building are under positive or negative pressure. By placing tape over the holes and removing the cap, the students see how the neutral plane can shift. Many students make the correlation between stack effect and open stairwells, elevator shafts, and compactor chutes. This is a concrete way to demonstrate an abstract concept. This activity also meets the goal of presenting material in a manner that appeals to multiple learning styles.

Lighting exercise: color temperature box. Many superintendents have stories about changing lighting in their building. Here is a typical story. “A couple of years ago I changed my lighting in the lobby to CFLs. When the board president walked in, he hated it and made me change it back. Since then I don’t make as many suggestions” (Gately, John 2008). The Color Temperature Box is a great way to show superintendents how lighting can change the color of a space and make it appear warm and inviting or cold and clinical. The box is three cubes with sockets mounted inside. Each cube has a bulb with a different temperature ranging from 2700 Kelvin to 6500 Kelvin. This demonstrates how drastically the choice of lamp changes the mood of a room or space and thus how important it is to consider energy efficiency and the comfort of tenants if the changes are to be accepted.

Lighting photo exercise. Students assemble into small groups and are given general descriptions and images from a building's lobby, hallways, basement, laundry room, garage, etc. As a group they identify the type of fixtures, lamps, and controls depicted in each image. They assess the adequacy of the light level for the space, count the number of fixtures, and determine if the area is over lit or too dark. Finally, students evaluate the efficiency and discuss retrofits and opportunities for improved lighting controls. This exercise allows the students to apply the knowledge they just gained in the lighting module.

Quantifying energy project. Superintendents review a set of fuel bills from three sample buildings: The first set represents a building using #2 oil, the second set uses natural gas; the third uses #6 oil. Each group performs calculations to identify and subtract Domestic Hot Water (DHW) use from the fuel bills. Superintendents sum up the building’s energy use (total BTUs), convert to an Energy Use Index (BTU/SqFt/HDD) and compare to other buildings. Then they answer questions about trends throughout the year, and identify unexpected patterns.

Green Building Plan

As the course proceeds, students add project ideas to their Green Building Plan. The list is focused on changes that are within a superintendent’s scope of work to perform but may also involve larger projects that can be recommended to a board or property manager. In either case the superintendent defines the idea and then determines the approval process, cost and next steps. Below are some common items included in Green Building Plans.

- **Installing lighting controls and performing retrofits.** Motion sensors in compactor rooms, bi-level lighting in stairwells and hallways, timers in basement and laundry rooms and sensors on exterior lights and garages. Replace T12 fluorescent fixtures in hallways with T8s and replace incandescent bulbs in EXIT signs with LEDs.

- **Improving boiler and distribution performance.** Insulate basement steam pipes, perform a boiler efficiency test at least three or four times per year, clean boiler tubes, lower boiler pressure if possible, institute a regular steam trap replacement program. Explore cost and feasibility of gas boiler conversion from steam. Upgrade and educate self on heating controls.
- **Reduce energy used to heat hot water.** Lower temperature of domestic hot water supply, purchase a hot water heater for use in the summer months instead of using the boiler.
- **Improving efficiency of ventilation system.** Clean filters and grills, check rooftop fan belts regularly, explore variable speed motors.
- **Educating tenants.** Flyers or contributions to existing newsletters to inform tenants about recycling and conservation tips and promote what the superintendent is doing to improve the environment in the building.

Follow Up Services

A goal established early in the process of designing the *1,000 Green Supers* program was to put in place a comprehensive system of follow-up services to help alumni apply what they learned in the classroom to the systems in their building. The three principle follow-up services are:

Green Coaching Sessions

Once a program participant completes the class and leaves with their Green Building Plan, they are provided the opportunity for one-on-one coaching sessions with technical experts. The coach guides the superintendent as he/she looks to improve their building. They also serve as a resource and motivator. This person is available to consult over the phone or make a site visit to work on projects identified in the superintendent's Green Building Plan. Typical projects include; helping a superintendent design preventative maintenance schedules, calculating specific energy usage, using EPA Portfolio Manager, and accessing incentive programs. Coaches (drawn from the instructor pool) will be dispatched to requesting superintendents based on the nature of the project and the expertise of the coach. This service is not designed to provide direction that conflicts with service contractors nor is the visit a comprehensive building audit. Rather, it is a supportive service offered by an instructor who has a knowledge base of lessons learned to share with the superintendent.

Online Community

TSTF hired a blogger to manage a web site designed to help encourage and educate program alumni. The community, located at www.1000supers.com, has two goals. First, it will serve as a technical resource for superintendents and building operators to learn about energy efficient O&M, ask questions on issues they face in their buildings, and view technical how-to

style demonstrations of simple upgrades. One section of the website, titled Green Operator, will be devoted to following along with one of TSTF's star superintendents as he makes a series of significant energy efficient upgrades in his building. Second, TSTF's online community will provide a vehicle to reward stand-out program alumni who do make significant changes in their building. TSTF intends to recognize those students on the website and in an eNewsletter. TSTF's intention in recognizing stand-out superintendents is to reward those who are making a real difference and encourage others to apply what they learned to the systems in their building.

Continuing Education

Advertised through its online community and eNewsletter, TSTF will be offering a variety of continuing educational opportunities for program alumni. Opportunities include BPI Multifamily Building Analyst Training, Building Operator Certification (BOC), TSTF's Green Building New Technologies and Materials course, and a LEED Green Associate preparation course.

Student Perceptions

- **Mary Kearney, resident manager at related management.** Mary was one of the first superintendents who attended the Local 32BJ *1,000 Green Supers* program. "Since completing the *1,000 Green Supers* program, I have a better understanding of a building as a group of systems. It also reminded me of the smaller things, changing incandescent bulbs to fluorescents and installing motion sensors. When new tenants join us I give them an orientation to tell them about the features of the building and recommend types of green cleaning products."
- **Victor Nazario, superintendent at Douglas Elliman.** Victor has been working in the building service industry for 29 years, 20 of them as a superintendent. Victor was a participant in the first pilot class with Douglas Elliman property management class. When asked about what he was now doing in his building Victor replied, "the first thing I did was to work on two access doors that go to the roof. These doors never closed properly and always had gaps around the edges. I learned that this was causing a tremendous amount of heat to be lost through the cracks. Next, I'm going to present a green building plan to my co-op board that includes LED lights for exit signs, bi-level lighting for stairwells, automatic light shut-off switches for the laundry and basement mechanical rooms, and insulation for pipes in our boiler room."

Management Perceptions

- **Michael Wolfe, president of Midboro Management.** Michael attended the *1,000 Green Supers* class and documented his first hand experience on a weekly blog at *Habitat Magazine*. "We all came away with options to save money for our buildings, reduce energy consumption and reduce our carbon footprint. And that's just day one."

- **Jeff Brodsky, president of Related Management.** Related has already trained over 50 superintendents and handypersons and is providing building energy data to track the effectiveness of the program. “Our building staff is the best and the brightest in the industry and this new training curriculum will go a long way to ensure that we pursue all avenues to reduce our impact on the environment.”

Program Impact Assessment

TSTF has adopted an assessment approach which affords multiple avenues to evaluate the *1,000 Green Supers* program. Additionally, TSTF has limited its evaluative effort to residential common space only. First, TSTF is attempting to collect three years worth of energy use figures from participating property management firms to detect changes in use before and after training. TSTF’s goal is to get energy use statistics for 10% to 20% of the participating buildings. Second, TSTF is surveying program alumni to determine how this training impacted the way they perform their jobs. Third, TSTF is conducting case studies of some of its stand-out superintendents to demonstrate the power that energy efficient O&M can have on a building.

The *1,000 Green Supers* program can be adapted for other localities. However, it would be best to reshape the program and curriculum based on input from local stakeholders and experts with hands-on experience with the building stock in question.

Conclusion

Buildings utilize heating, cooling, electrical and mechanical systems that consume more energy than any other sector. In large multifamily buildings it is up to the superintendent who operates and maintains these systems to make sure they run as efficiently as possible.

The *1,000 Green Supers* program trains superintendents, helps them develop a Green Building Plan and provides support as they make improvements in their buildings. Because of the program’s scale and broad based employer support it also offers a unique opportunity to gather data and demonstrate how superintendents and operators can impact energy usage in buildings.

Energy efficient building operation is a vital strategy that will help New York City achieve its energy reduction goals. It will also ensure that the temporary efficiency gains achieved by weatherization and retrofitting do not erode in the coming years. Making a training investment in the building operator is perhaps the most important efficiency investment an owner can make.

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