

LEED Platinum-Certified Apartment Building Uses Submetering to Dramatically Reduce Water Consumption



360 State Street building in New Haven, Connecticut. Among the building's sustainability features — along with a fuel cell-energized Combined Heat & Power System (CHP), electric car charging stations, a green roof and low-emitting materials — is a submetering system from H2O Degree. The system tracks individual residents' real-time water and energy consumption. (Courtesy: Robert Benson Photography.)

A comprehensive submetering system at a new construction, multi-family apartment building enables building owners/managers to track energy and water usage to recoup utility costs. The building has approximately half the water consumption as similar-sized buildings not using submetering systems. Meanwhile, residents have the ability to use an interactive website to view and control their thermostats to reduce their own utility usage.

INTRODUCTION

When designing the 32-story, 500-unit apartment building known as 360 State Street in New Haven, Connecticut, Bruce Becker, president of the architecture and development firm Becker + Becker, wanted to install an innovative submetering system to track the residents' water and electrical usage. However, in 2010, when the building was constructed, water submetering was allowed in the state, but electrical submetering was not. So, initially, Becker + Becker only installed water meters for billing and thermostats for billing the heating load in the winter. Thanks to the lobbying efforts of Becker and his team, in 2016 the Governor of Connecticut and the Department of Energy & Environmental Protection ultimately agreed that the electrical submetering system could be installed. They cited the system's potential for energy conservation benefits as the reason for giving electric

submetering the green light. Today, submetering water is a common practice in Connecticut apartment buildings, and more recently in the 2016, electric submetering has been allowed.

This article describes the submetering system installed at the 360 State Street apartment building. It also demonstrates the submetering system's significant cost benefit for both the building manager and residents, such as using dramatically less water — almost half the amount — as non-submetered buildings.

INSTALLING THE SUBMETERING SYSTEM

Michelle Lauterwasser, AIA, LEED AP, at Becker + Becker, described why the building owner chose H2O Degree as their submetering partner at the 360 State Street property. A major consideration, she said, was their "willingness to work with our unique circumstances to customize and integrate all of our metering and monitoring needs across a single platform." H2O Degree was also able to assist them with the necessary state applications and regulatory approvals, and to help them set up financing for the system with the billing vendor.

In 2011, H2O Degree supplied the submetering system consisting of 1,000 water meters (the system was dual point-of-entry,

one meter for hot water and one for cold) and 591 thermostats. The system was installed by B-G Mechanical of Manchester, CT and H2O Degree provided supervision and commissioning. The battery-powered wireless meters (Figure 2) communicate with the thermostats that function as both a thermostat and a transceiver (Figure 3). The thermostats act as transceivers, a unique feature of H2O Degree's wireless network, and the results in substantial savings compared to using traditional wireless repeater networks. Lauterwasser also noted that the submetering manufacturer offered "the best pricing" when taking into consideration the minimal wiring it took to set up the radios and wireless mesh network that the system uses.

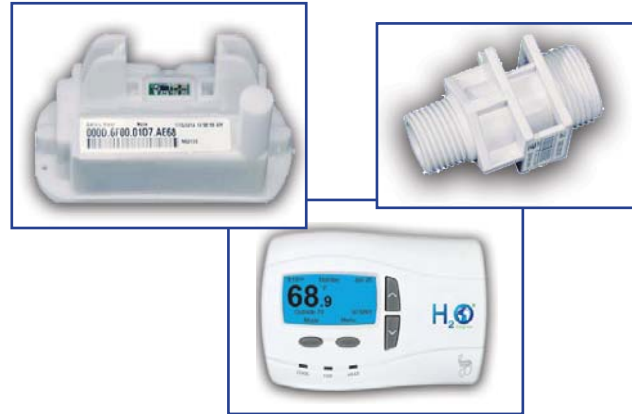


Figure 2. H2O Degree's battery-powered wireless water meter (M54120) is used to measure water consumption at 360 State Street while the wireless thermostats (M54450-HP) monitor and control HVAC functions and simultaneously act as a wireless transmitter.

The dual point-of-entry submetering at 360 State Street means that the plumbing is configured so that one riser branches into the apartment for cold water. A second riser delivers domestic hot water created centrally by recovering heat from a CHP system. Water enters the apartment in the utility closet, there are two meters in each apartment, one for cold and one for hot water.



Figure 3. Two water meters are configured for point-of-entry monitoring for each unit at 360 State Street.

As illustrated by the green line in Figure 4, wireless water meters communicate directly to any wireless mesh transceiver that responds. The wireless transceivers (thermostats) act as a transceiver and a transmitter, sending data from one device to another. Data is transmitted via a mesh network (red lines) to the H2O Degree Coordinator and Internet Gateway to cloud-based servers that can be accessed from any web-enabled location.

Wireless Battery Powered Water Meter Building Configuration Diagram

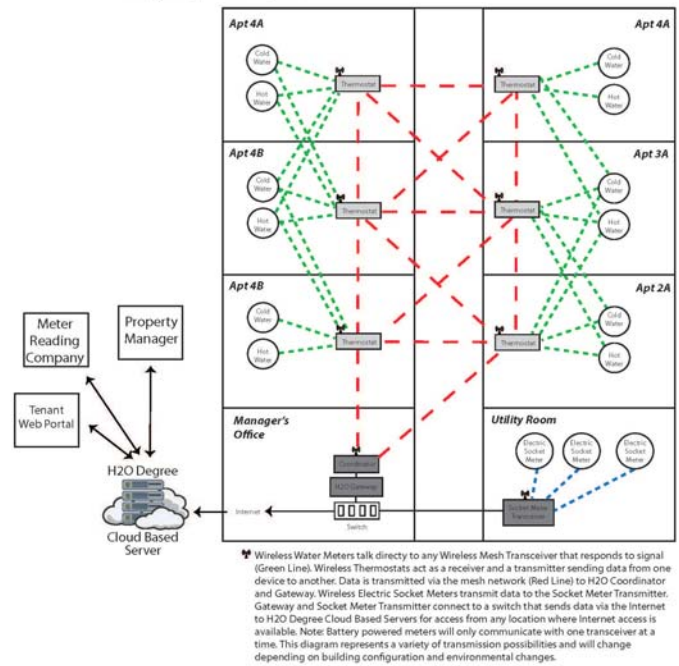


Figure 4. H2O Degree metering system diagram.

To track and display the data collected by the meters, H2O Degree designed a customer facing web portal at the 360 State Street facility so that the building's tenants can see their water consumption and their energy usage for hot water heating. The website enables them to view and compare their usage to their own personal historical data, understand how and when they use energy, and to see how they are doing compared to typical apartment dwellers. Just as important, it gives them control. By using a tablet, smart phone or computer, tenants can remotely adjust their thermostats and program their settings as needed.



The data collected by the H2O Degree system is sent to PayLease — a leading third-party meter reading company in San Diego, CA — for tenant billing, and to the property manager for leak detection and energy & water conservation and analysis. Chris Stimac, PayLease's Submeter Specialist, stated, "Because the data flow from the H2O Degree system is accurate and seamlessly integrates into our billing system, we're able to consistently deliver timely and reliable bills to the tenants. The flexibility resulting from leak detection and thermostat controls, plus the ability to monitor other utilities such as electricity, has made the partnership between Becker + Becker, H2O Degree and PayLease a success for both the management and the tenants at 360 State Street."

REDUCING WATER CONSUMPTION

According to ongoing water usage reports for 360 State Street, the average gallons per apartment per day is between 45 to 55 gallons (Figure 5). H2O Degree calls this critical metric “ADC” or Average Daily Consumption. This is a remarkable result since typical one bedroom with one bath apartments, or a two bedroom with one bathroom apartment, uses almost double that amount at about 70 to 90 gallons of water per day. (Source: H2O Degree’s database of over 20,000 apartments and the HUD Water Conservation Guide for Apartment Owners & Managers.)

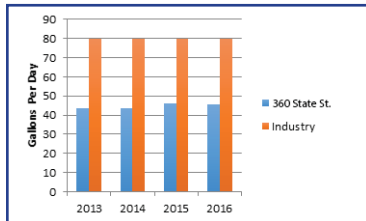


Figure 5. Comparison of daily water consumption at 360 State Street vs. Industry Averages.

Table 1 quantifies the financial impact of the water savings at 360 State Street on an annual basis. Water savings yielded an annual cost reduction of over \$64,000.

360 State St. Estimated Water Savings	
ADC-Industry Average	80 Gallons
ADC-360 State Street	45 Gallons
ADC Below Industry Average	35 Gallons
Number of Apartments	500 Apartments
Total Gallons Saved Per Day	17,500 Gallons
Days in a Year	365 Days
Estimated Annual Gallons Saved	6,387,500 Gallons
Average Cost Per Gallon	\$0.01
Estimated Annual \$ Saved	\$63,875

WATER LEAK REPORTS

Every day, H2O Degree emails water consumption and leak detection reports to the property manager, Bozzuto Mgmt. to show the submetering data being tracked. (Figure 6). On the very first day that the reports were sent, the property manager was alerted to a problem with a flapper on a newly installed toilet. As a result, the maintenance staff was able to immediately pinpoint the leak in the specific unit and repair the faulty toilet flapper.

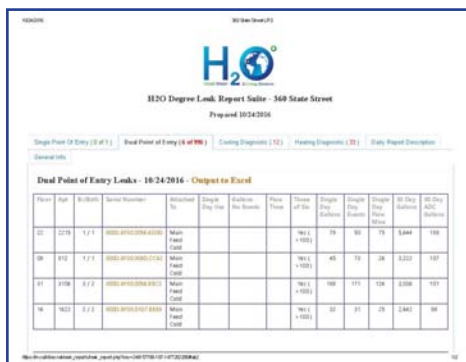


Figure 6. Daily report data sent to the property manager identifies locations of leaks.

The sophisticated leak-detection technology has influenced the

day-to-day behavior of building management by enabling them to see — and respond to — water that is wasted due to leaks. The maintenance team can review the leak detection reports and determine the type of leak say on a toilet, broken flapper valve, chain stuck, cracked fill valve, etc. Once identified, the maintenance team can grab the exact replacement equipment it needs and fix the problem in an efficient manner. The dramatic water savings has helped the property manager at 360 State Street keep water and sewer bills as low as possible for residents, which, in turn, has reduced operating expenses and increased its net operating income (NOI).

According to H2O Degree’s VP of Sales, Dennis Carapezza, who worked directly with Bruce Becker on the 360 State Street Project, the building’s average per-unit, per-day water consumption of 45 to 50 gallons is “excellent.” In his experience of evaluating other properties’ water and sewer bills over 12 to 18 month periods to see how they are consuming water, he said he has “seldom if ever” seen properties even achieving the standard level of 70 to 90 gallons of water per apartment per day, much less the 45-55 gallons typical at 360 State Street. “What we typically see are properties in excess of 120 gallons — and as high as 225 to 250 gallons — per apartment per day,” According to Carapezza, undetected leaks are causing many building owners to pay a premium for their water and sewer bills.

VALUE FOR RESIDENTS

Similar to how the water leak report data gives building managers insight into usage that enables them to reduce water consumption, the energy web portal gives the residents of 360 State Street the ability to view their water consumption history and make adjustments as needed. In addition to benefiting from lower water bills due to behavior changes and reducing their own water consumption, they also benefit from management fixing water leaks proactively.

REDUCING ENERGY USAGE

In addition to monitoring water consumption, H2O Degree’s “smart” water meters evaluate water consumption levels in each apartment and use the information as a proxy for detecting occupancy. For example, if a unit goes 36 hours without water usage, the meter can assume no one is home and automatically set the thermostat to an energy-saving level.

VALUE FOR THE PROPERTY MANAGER

The H2O Degree solution allows the building management at 360 State Street to bill residents fairly and accurately for the heat energy used by each unit. The thermostats installed in each apartment act as both a thermostat and a wireless repeater, providing run-time information that is used to allocate heating costs to each tenant. By providing clarity and transparency via

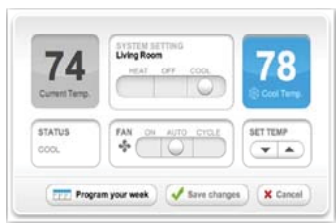


the customer-facing web portal, the managers also avoid potential tenant disputes.

Another energy saving benefit for the property manager is their ability to control the thermostats. This is very effective when a vacant unit needs maintenance or upkeep. Rather than leaving on the air conditioner or heater in anticipation for work crews whose schedules often change, the property manager can remotely adjust the temperature set-point in each unit as needed. This pinpoint control saves on wasted energy & costs.

VALUE FOR RESIDENTS

H2O Degree was able to develop a custom program for the project that used water meters as occupancy sensors to save thermal energy by setting back the thermostats.



By viewing their energy usage on the customized web portal, residents can adjust their thermostats — either in their apartments or remotely. Compared to apartment residents without

submetering, tenants at 360 State Street save 10 to 20% in heating and cooling bills.

SUBMETERING PROVES ITSELF

As reported by the New Haven Independent, the 360 State Street building has been hailed by Senator Chris Todd as a “living model for what can happen across the state.” and the Becker + Becker website cites the CT Green Building Council Award of Honor and LEED Platinum — the highest level of LEED Certification — among its many “green” bona fides.

The ongoing benefit of the submetering system for Becker + Becker, said Michelle Lauterwasser, is its “ability to recover utility costs and track usage.” The submetering system at 360 State Street has resulted in water consumption savings of almost half that of non-submetered buildings — and saves an estimated 10 to 20% on heating costs. In addition to the environmental benefits of this reduced water and energy usage, are the significantly lower utility costs enjoyed by the building owner — and passed on to residents.

WATER SUBMETERING SUCCESS LEADS TO ADDITION OF ELECTRIC SUBMETERING

After the success of the initial installation, Becker + Becker decided to add submetering for tracking electricity usage at 360 State Street. Once again, Bruce Becker lobbied the state of Connecticut to get the necessary approvals, and, in April of 2016,

500 electric socket meters were installed at the property, one for each apartment at the property. (Figure 7.)

Prior to electric submetering, electricity costs were a major expense of 360 State Street since there was no incentive for the tenants to conserve. Once the meters were installed and the tenants were billed for their own usage, they felt they had control over their expenses and were proactive at energy conservation.



Figure 7. Electric submeters provided incentives for each tenant to conserve electricity at 360 State Street.

SUBMETERING SUCCESS IN NEW HAVEN, CT LEADS TO PROJECT IN HARTFORD

Since its opening, the property at 360 State Street has enjoyed being marketable to prospective tenants and has been fully occupied. Becker + Becker, along with the building’s tenants, have been very happy with the submetering system’s water and energy conservation features. These positive results led Becker + Becker to choose H2O Degree’s system for its next project, the 777 Main apartment building in Hartford, Connecticut.

The 777 Main project is a 290-unit complex with one hot water meter and one cold water meter installed in each apartment in the closet above the washer and dryer. In addition, electric meters were installed in the utility closet on every third floor. Close to 1,000 meters and transceivers are reporting wirelessly throughout the building. The data is sent to a third-party meter reading company, National Water & Power in California, for billing purposes. Construction at the building was completed in 2015 and the award-winning building is now on target for LEED certification.

For more information on H2O Degree products or the successful project at 360 State Street, contact H2O Degree at (215) 788-8485 or visit us online at www.H2ODegree.com.



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