After decades of virtually no new construction, downtown Houston is experiencing a revitalization. 5 Houston Center, owned by Wells Real Estate Funds, is a 27-story, 580,875-square-foot Class-A office tower on McKinney Street. Completed in September 2002, the property is one of five multitenant towers built in the Houston central business district since 2000. Wells’ portfolios include 113 buildings, with more than 23 million square feet of space, across 27 states and the District of Columbia.

**A Property Designed With Tenants in Mind**

Designed by HKS, Inc., the lobby consists of brushed stainless steel columns with grey granite and white marble floors. Its exterior facade of reflective insulated glass and aluminum curtain wall system is enhanced by precast architectural accents. Throughout the interior, imported marbles and granites, along with mahogany paneled walls, highlight the property’s aesthetic quality.

**Maintenance System Focuses On Tenant Convenience**

Proper maintenance and responsiveness to tenant requests are important to maintaining efficient operations. Wells installed an electronic preventive maintenance and tenant work order system. With all building equipment logged into the system, along with corresponding maintenance and inspection tasks, the maintenance team is notified via wireless device as each task becomes due. Tenants also can log on to a Web site and use a simple menu interface to request maintenance, repair, and janitorial services, with requests dispatched quickly to an appropriate staff member. Because the system resides on the provider’s servers, it is essentially maintenance-free, allowing us to focus on our core business rather than time consuming data backups and software maintenance issues that would ordinarily be required by our staff.

**Present Owner/Management**

Wells Real Estate Funds REIT II

Local Wells Real Estate Funds Management Team

General Manager Rob Nelson

Operations Manager Lubie Martin II

Assistant Property Manager Kelly Blesins

Administrative Assistant Ila Fontenot

**Building At A Glance**

- **Building Name:** 5 Houston Center
- **Location:** 1401 McKinney Street, Houston
- **Size:** 580,875 square feet
- **Completed:** September 2002
- **Use:** Office
- **Distinctions:** Building of the Year in 2007 by the Houston Building Owners and Managers Association

**Design Team**

- **Architect:** HKS
- **General Contractor:** Beck
- **Mechanical Engineer:** HLM Design
- **Civil/Structural Engineer:** Walter P. Moore
- **Lighting Consultant:** BOSS Lighting
- **Elevator Consultant:** Persohn/Hahn Associates
- **Landscape Architect:** The Office of James Burnett
- **Parking Consultant:** Walker Parking Consultants
- **Previous Owner/Developer:** Crescent Real Estate Equities

**Taking Care of Tenants**

The design features of 5 Houston Center contribute to a decreased electricity consumption of 8% when compared to similar properties in the Houston and Dallas markets.
A commitment to service also means cost savings for tenants. For example, by partnering with a key lighting supplier for all its buildings, Wells recently identified lightbulbs that were more efficient—and more than 35% cheaper—than through a previous supplier.

**Tenant Comfort Meets Energy-Saving Features**

5 Houston Center includes many leading conservation features that are exemplary of today’s approach to the environment. We were fortunate that the building already included many state-of-the-art energy-saving features because of its recent construction.

However, we continue to raise the bar for water and electricity savings and have many projects in the pipeline that will make our operations even better. We’re in the beginning stages of pursuing LEED-EB O&M certification, and a number of conservation projects are in the works.

According to assistant property manager Kelly Blevins, who has spearheaded the kickoff of our recent recycling program, “We estimate that we have reduced building waste taken to the landfill by approximately 50% to 60%. Several tenants formally requested a recycling program and we were pleased to kick off a program with such immediate success. Waste taken to the recycling center continues to increase as we work with tenants to educate their employees.” Blevins has also teamed up with our janitorial provider to transition to using LEED-approved cleaning chemicals.

The building features innovative heating and cooling features designed to maximize tenant comfort while achieving optimal efficiency.

**Flexible Centralized Control System**

5 Houston Center uses a building management system (BMS) to give operators an easy-to-use interface for tracking and adjusting building systems from the convenience of a single workstation. The system’s graphical interface allows the operator to easily review the status of the HVAC equipment, perform scheduling activities, and respond to alarms. The system allows operators and service personnel to access the control workstation remotely via modem for off-site monitoring, schedule changes, or necessary adjustments. This convenient feature means that authorized personnel do not have to be physically on site to make adjustments to HVAC settings.

Another service feature allows tenants to conveniently call to schedule after-hours air conditioning. The system tracks the additional use and generates a monthly report for billing purposes.

**Optimizing Comfort and Economy**

The air-conditioning system incorporates variable air volume (VAV) technology controlled by the BMS, which modulates the electronic chilled water valve to maintain the leaving air temperature setpoint. When an air-handling unit (AHU) starts or stops, the system activates the chiller control.

Variable speed drives on the air handlers allow the system to supply the exact amount of cooling needed to maintain comfort, yet can back off on the required fan motor horsepower when full capacity is not required. By managing and reducing the amount of AHU horsepower and chiller capacity required, the VAV system minimizes wasted energy from running excess air-conditioning capacity.

**Meeting Tenant Comfort Needs**

The Tower floors (Floors 9 through 27) have an average of 31 terminal boxes per floor, each with electronic controls networked to the BMS. Each terminal box has an electronic thermostat that can vary the temperature in its immediate geographical area and allow for greater control in meeting tenants’ comfort needs. Other floors in the building, including areas that don’t contain usable tenant space, are controlled and scheduled by the BMS. The garage takes up the basement floor through Floor 8, except for Floors 1 and 3, which contain the building’s lobby areas and some tenant space. The BMS maintains temperature setpoints in these areas. The garage elevator lobbies are air conditioned through small fan coil units with two-position chilled water valves. The lobby
tenant space are air conditioned by several multizone AHUs with electronic modulating chilled water valves and staged electric heat.

**Chiller Control Minimizes Energy Consumption**

A direct digital control system orchestrates the air-conditioning system’s chiller controls. The BMS monitors the temperature of chilled water leaving and entering the system to determine cooling load. The system can then stage or automatically sequence the chillers on and off to meet cooling load demand. By adding or subtracting chillers from the run sequence as the load changes, the system optimizes the number of chillers required to meet the building’s actual cooling load while minimizing the central plant’s energy consumption. This feature allows for adjustments due to occupancy and weather and determines the most efficient time to start cooling individual floors to achieve a comfortable temperature at occupancy time.

5 Houston Center has three chillers: one 300-ton unit and two 200-ton units. Running a minimal number of chillers reduces operating costs. The 200-ton unit is used during low cooling load conditions to further enhance energy savings.

### A Breath of Fresh Air

Fresh air is brought into the building to ensure that indoor pollutants are diluted via an outside air-handling unit. This unit filters and preconditions the outside air according to the season, using heating and cooling coils. The outside air intake system is designed to deliver 70,000 cfm of fresh air to the building, equating to 20 cfm per person based on an estimated maximum occupancy of 3,500 people. (ASHRAE’s estimated maximum occupancy is seven persons per 1,000 square feet of net occupiable space.)

Historically, porous fiberglass insulation matting has been used to line the ductwork of air-conditioning systems and to provide thermal insulation and sound attenuation for the interior of AHUs. However, these porous surfaces provide favorable conditions for microbiological growth when they become damp and activate any dirt that may have become lodged in the insulation. The building’s systems are designed to minimize the exposure of conditioned air to porous insulation surfaces.

This, combined with routine maintenance of the AHUs and air filters, enhances indoor air quality for building occupants.

5 Houston Center’s AHUs feature double-wall construction that encases the insulation between the inner and outer casing, taking the insulation out of the airstream and providing a smooth interior surface that is easily cleaned during routine maintenance. The air is distributed to the terminal boxes through externally insulated sheet metal ductwork that prevents conditioned air from coming into contact with fiberglass insulation. In addition, the AHU condensate drain pans are sloped in two planes to promote positive drainage of condensate water, which eliminates another challenge to indoor air quality.

### Energy Efficiency

5 Houston Center initially earned the U.S. Environmental Protection Agency’s ENERGY STAR® designation in 2005 and received the label again in 2006 and 2007. The EPA’s national energy performance rating system provides a 1 to 100 scale that helps organizations assess how efficiently their buildings use energy relative to similar buildings nationwide. A building that scores a rating of 75 or higher is eligible for the ENERGY STAR, a mark of superior energy efficiency that identifies the building as one of the most efficient in the nation. Commercial buildings that earn the ENERGY STAR use an average of 40% less energy than typical buildings.

By achieving this designation, we have demonstrated our commitment to environmental stewardship while also lowering our energy costs. We last scored an energy performance rating of 80 out of a possible 100. The building’s management tracks monthly electrical costs with the ENERGY STAR Portfolio Manager, including any tenant submeters. Data are used to compare the building’s energy consumption with similar buildings and provide a rating.

With the support of major tenant Ernst & Young, Wells is also pursuing LEED-EB O&M certification for 5 Houston Center.

### Other Energy-Efficient Features

**Efficient Window Construction**

Double-pane insulated vision glass with high performance reflective coating is used throughout the building, further reducing the heating and cooling energy load. According to the manufacturer, the vision glass has a relative heat gain of only 59 Btu/ft²/square foot, compared to 109 for the typical 1-in. double-pane clear window.

**Energy-Saving Lighting**

Building standard lighting fixtures use energy-saving T-8 lamps with electronic ballast, and compact fluorescent downlighting is used throughout most of the building. Historically, the typical lighting fixture that has been used for office space has been the three-lamp fixture using 40 watt T-12 lamps. In the case of 5 Houston Center, energy-efficient T-8 fixtures were part of the original construction and use energy-efficient T-8 lamps that consume 30% less energy than the T-12 fixtures.

Wells has a national purchasing agreement with supplier Regency Lighting, which includes a cross-over provision to buy new, low-wattage lamps rather than older technology lamps, when building staff places an order. This process is seamless, making it easy to upgrade lighting as technology continues to change. For example, when a building maintenance person places an order for a typical 32 watt T-8 lamp, the system automatically crosses over the lamp to a 28 watt T-8 lamp which is 12.5% more energy efficient.

**Water-Conserving Plumbing**

All restrooms in the building have water-conserving toilets and urinals that use 1.6 gallons and 1 gallon per flush, respectively. To save even more water, building management is exploring using 0.5 gpm aerators on all sink faucets instead of the existing 2.2 gpm units. We estimate this project to save 129,000 gallons of water and sewer per year, and the resulting savings to pay for the retrofit in approximately six months.

**An Attractive, Yet Practical Roof Cover**

The mechanical penthouses and cooling tower are located on the roof and covered by an aesthetically pleasing mechanical screen that serves as a prominent identifying feature of the building. This screen also protects at least half of the roof area from direct sunshine and helps reduce any radiant heat gain to the roof’s covered portion. The resulting reduction in the roof’s surface temperature reduces the amount of solar heat absorbed into the building and lowers the required cooling load for the 27th floor.
The attractive oculus in the main lobby uses incandescent downlighting as part of the original design. The downside is that the lamps are challenging to replace when they burn out due to their height above the main floor. A different lighting technology that features long-lasting energy-efficient lamps would have made more sense. To work around this issue, we coordinate group re-lamping with tasks that require lifts such as window and metal refinishing activities to reduce the cost of multiple lift rentals.

In the future we hope to develop a future replacement strategy that incorporates the design intent with long-lasting, energy-efficient lighting fixtures.

**Equipment Access**

The central plant piping is supported by many pipe stands and has control wiring run along the floor. This contributes to a congested work area, which makes chiller repairs more time consuming. A better solution would have been to design piping support that was suspended from the ceiling, and route the conduits overhead to provide free space to move dollies, carts, and technicians throughout the plant freely. Equipment location also needs consideration during the construction phase. Several air-handling units placed in the mechanical room require maintenance staff to leave the room and enter through another door to gain access to other side of the AHU to perform preventive maintenance. Easy access helps ensure that the equipment is properly maintained in a time-efficient manner. Relocating the AHU 2 ft in one direction within the room would have resolved this issue.

**Variable Speed Drives**

Two of the three cooling towers were not originally equipped with variable speed drives for the motors. Since motor horse power has a cube relationship with fan speed the energy savings would be enhanced. 5 Houston Center plans to install VFDs on the remaining two cells, and incorporate their operation into the control scheme.

**Retrocommissioning**

This will play an important role in the near term to ensure that systems are operating at peak design. This includes simple steps, several of which have been taken recently, such as auditing HVAC schedules to ensure that lease requirements are met, but also making sure that no rogue schedules have been left in place. We all know that even the most efficient machine running when it is not needed wastes energy. We have audited schedules and adjusted where needed to bring the schedules in line with lease requirements.

**Education**

Inadequate education often derails maintenance teams. Examples include adjusting airflow dampers to correct a programming issue; improperly entering an overtime air schedule so that it isn’t automatically deleted after an event; installing a toilet flush valve repair kit (1.6 gallons per flush) in a urinal that is designed for a 1 gallon per flush kit. Maintenance personnel need to ask more questions when a temperature complaint occurs: Is a draft the problem? When does the problem occur? Does the problem occur with the office door open or closed (indicating a return air problem)? Also, verify that the temperature sensor is the one that should be in the space.

**Conclusions**

The many design features of 5 Houston Center working in concert with each other contribute to a decreased electricity consumption of 8% when compared to similar properties in a sampling of 150 buildings in the Houston and Dallas markets prepared by our energy consultant Summit Energy Services. This equates to 20 cents per square foot savings. With today’s soaring energy prices, we must constantly raise the bar when looking for opportunities to further reduce energy usage. This includes embracing new technologies as they emerge, and using the existing building enhancements to their fullest extent. Also, it is critical that we include partnering with our tenants to provide them with energy awareness information that they can distribute to their employees. Our employees, vendors and corporate initiatives play an important role as we partner with our resources to not only maintain the energy conservation we have achieved, but to build upon the solid foundation that 5 Houston Center has already established. Our near-term plans call for further reducing energy consumption by retrofitting the two remaining cooling tower cells with variable frequency drives and modifying the outside air intake system to monitor CO₂ levels to optimize the fresh air delivery to the building’s occupants based on ASHRAE standards. We anticipate these two items will reduce annual electrical expenses by approximately $50,000, or an additional 4% of our energy expenditure.

### ABOUT THE AUTHOR

Lubie Martin II is operations manager with Wells Real Estate Funds. He has more than 25 years of experience in commercial real estate, and holds a Texas air conditioning contractors’ license, BOMI’s Systems Maintenance Administrator® designation, and an associate degree in HVAC&R.