In 2009 the Epsten Group, a sustainable design and consulting group, outgrew its original LEED v2.2 Platinum certified office in the Old Fourth Ward, a historic district near downtown Atlanta. The firm looked at options that would allow it to continue operating out of a LEED Platinum office while remaining in the Old Fourth Ward to keep its commitment to support the neighborhood’s rich history and promising future.

The neighborhood has seen revitalization during Epsten Group’s tenure there. Early on, sidewalks and streets needed maintenance, and many buildings remained unoccupied. In the past five years, the development of the Atlanta Streetcar, BeltLine (a former railway corridor being developed into a network of parks and trails) and the Historic Fourth Ward Park have helped reconnect the neighborhood to downtown Atlanta. The city has reinvested in the area, an eclectic array of new restaurants and nightlife have infilled many historic storefronts, and the Martin Luther King Jr. Historic Site, part of the National Park Service, has remained a major attraction.

Acting as owner, architect and LEED consultant, Epsten Group set its sights on a challenging existing building down the street from its original location that would be transformed into its new headquarters. The former hardware and saw-blade sharpening shop was originally built in the 1940s. The building had very few updates over the years, and provided open space on two stories with plenty of opportunities for daylight.

While often less glamorous than their gleaming newly constructed counterparts, existing buildings hold tremendous potential for reducing the overall environmental impact of energy used by buildings. One Atlanta design firm sought to prove the possibilities for energy excellence in an existing building by transforming a 1940s former hardware shop. Located in a historic neighborhood undergoing revitalization, the project also exemplifies the complexities involved and care required to maintain ongoing performance in a living, breathing building.
All building systems had to be replaced, and the entire building envelope had to be upgraded. Additionally, since the building is located in a historic district, all exterior improvements had to be approved by the city’s urban design review board.

The upgrades required to implement the sustainability measures did not add a premium above the initial cost due to the reuse of existing materials, using open ceilings and an open floor plate where possible, the availability of sustainable materials in the marketplace, and selection of state-of-the-shelf systems.

The goal of LEED Platinum certification under the New Construction v2009 rating system meant that the building team had to design all systems for maximum efficiency. Early collaboration was integral to achieving this goal.

The design team relied on energy models to inform the design, including the sizing of systems, exterior envelope, placement/size of the new windows, size of the roof monitor, and extent and type of the shading devices to be installed.

HVAC
The selection of the HVAC systems for The Edge was based on high-performance expectations for energy, occupant comfort and indoor air quality. These goals were achieved using off-the-shelf components that met budget requirements and allowed for zoning and programming based on occupancy needs.

The building is served by a single rooftop air-handling unit with direct expansion (DX) cooling and electric preheat (for outside air only). The unit provides approximately 20 tons of cooling capacity and operates as a variable air volume (VAV) unit with associated air terminal units.

The air handler fan speed modulates via variable frequency drive (VFD) based on duct static pressure. The unit also includes economizer capability with a building relief fan integral to the unit.

Minimum outside air volume is maintained by modulating the outside air damper based on actual airflow measurement through an outside airflow measurement station. Duct static pressure setpoint reset and discharge air temperature setpoint reset were used to ensure system optimization. A separate mini-split cooling unit is provided for the server room to maintain accurate temperature and humidity control.

Cooling and heating demand is dictated by space temperature sensors, which allow for occupant control with limiting parameters set through the building automation system (BAS). CO₂ sensors are installed in all densely occupied spaces, with the terminal units opening upon a rise of CO₂ levels above the desired setpoint until the CO₂ levels drop below the setpoint.

Sustainable Features
The completed design features a 5 kW thin film rooftop photovoltaic (PV) system that offsets at least 4% of annual electricity consumption. Factors such as weather conditions and energy demands affect the actual electric energy offset.

The thin film PV system was selected instead of a typical angle...
**CASE STUDY  THE EDGE, EPSTEN GROUP HEADQUARTERS**

**BUILDING AT A GLANCE**

Name: The Edge, Epsten Group Headquarters  
Location: 399 Edgewood Ave, Atlanta  
Owner: Epsten Properties, LLC  
Principal Use: Offices  
Includes: Server room, training room  
Employees/Occupants: 50  
Expected (Design) Occupancy: 50  
Percent Occupied: 100%  
Gross Square Footage: 9,208 ft²  
Distinctions/Awards: LEED-NC v2009 Platinum; LEED-EB O+M v4 Platinum; 4 Green Globes; Better Buildings Challenge Top Energy Saver  
When Built: 1946  
Major Renovation: 2009–2010  
Renovation Scope: Major renovation of building interior; systems upgrades; envelope improvements; replaced windows; new roof monitor; new roof systems; vegetated roof systems; PV system; low-flow and no-flow restroom fixtures; new central connecting stair; low-emitting materials  
Total Renovation Cost: $990,000  
Cost per Square Foot: $107  

**ENERGY AT A GLANCE**

Annual Energy Use Intensity (EUI) (Site): 33.7 kBtu/ft²  
Electricity (From Grid): 32.4 kBtu/ft²  
Renewable Energy (solar): 1.3 kBtu/ft²  
Annual Net Energy Use Intensity: 31 kBtu/ft²  
Annual Source (Primary) Energy: 102.9 kBtu/ft²  
Savings Vs. National Median Source EUI: 49%  
(Energy Star Portfolio Manager, 2015)  
ENERGY STAR Rating: 92  
Carbon Footprint: 54 metric tons CO₂e/yr  
Percentage of Power Represented by Renewable Energy Certificates: 23% after applying on-site renewables contribution  
Number of Years Contracted to Purchase RECs: 5  
Heating Degree Days (Base 65°F): 3,004  
Cooling Degree Days (Base 65°F): 1,823  
Annual Hours Occupied: 12 hrs/day M-F; 4 hrs/day SS  

**WATER AT A GLANCE**

Annual Water Use: 64,500 gallons (predicted), 46% below LEED baseline design  

**KEY SUSTAINABLE FEATURES**

- **Water Conservation**: Dual-flush water closets; waterless urinals; low-flow lavatories; low-flow showers; low-flow kitchen sinks.  
- **Recycled Materials**: Carpet; countertops; furniture; task seating.  
- **Daylighting**: Centrally located roof monitor; windows surrounding three sides of perimeter.  
- **Renewable Energy Certificates**: Number of Years Contracted to Purchase RECs: 5  
- **Savings Vs. National Median Source EUI**: 92%  
- **Total Renovation Cost**: $990,000  
- **Cost per Square Foot**: $107  
- **Expected (Design) Occupancy**: 50  
- **Percent Occupied**: 100%  
- **Gross Square Footage**: 9,208 ft²  
- **Annual Net Energy Use Intensity**: 31 kBtu/ft²  
- **Annual Source (Primary) Energy**: 102.9 kBtu/ft²  
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**BUILDING TEAM**

- **Building Owner/Representative**: Epsten Properties, LLC  
- **Architect, Energy Modeler, LEED Consultant**: Epsten Group, Inc  
- **General Contractor**: Deruki Construction  
- **Mechanical, Electrical Engineer**: Covalent Consulting, LLC  
- **Structural Engineer**: Nielson-Harrell Structural Engineers  
- **Commissioning Agent**: LEED-NC v2009 Total Systems Commissioning, Inc  
- **Commissioning, Inc**: LEED-EB O+M v4 Epsten Group, Inc  

**BUILDING ENVELOPE**

- **Roof**: Type White thermoplastic polyolefin (TPO) membrane/vegetated roof area  
- **Overall R-value**: R-32  
- **Solar Reflectance Index**: 110  
- **Walls**: Type concrete block  
- **Overall R-value**: R-22  
- **Windows**: Solar Heat Gain Coefficient (SHGC): 0.28  
- **Visual Transmittance**: 42%  
- **Location**: Latitude: 33.75°  
- **Orientation**: North  
- **Total Systems**: 38%  
- **Annual Energy Use Intensity (EUI) (Site)**: 33.7 kBtu/ft²  
- **Annual Energy Use Intensity (EUI) (Site)**: 31 kBtu/ft²  
- **Annual Source (Primary) Energy**: 102.9 kBtu/ft²  
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**Envelope Upgrades**

All exterior walls were furred out with wood studs and all stud cavities super-insulated with spray foam to achieve an R-22 rating. The roof is insulated with 5 in. of polyisocyanurate to achieve an R-32 roof rating. 

Special attention was also given to air sealing at the windows and doors to reduce air leakage. To validate the proper installation of the insulation,
Infrared thermography was used toward the end of construction. It was determined that all insulation was properly installed except at the roof monitor, where gaps in the installation were present. To remedy that, the design team specified blow-in cellulose insulation to fill in the gaps for complete thermal insulation continuity.

**Indoor Environment**

The design team incorporated many design features to enhance the indoor environment for building occupants. MERV 13 filters were installed to reduce dust and allergens. Low-emitting carpeting was installed throughout the upstairs open-office work space and the private offices.

A portion of the second floor and the roof was removed to make room for the installation of a central communicating stair and roof monitor. The central stair was a significant design component that proved vital to the successful reuse of the historic building. Since the original building was not designed for office space, useful natural light was limited.

The central stair opened up the office, allowing for additional light on both floors and unifying the unconnected work areas. It was also installed to encourage active occupants.

Workstations are surrounded by windows on three sides of the building perimeter. LED task lighting is provided for each workstation, while the shared spaces offer multi-level manually controlled lighting. Overhead lighting for the open office work space is provided by dual T8 lamp fixtures.

The abundant daylight is monitored by daylight sensors, which modulate the perimeter lighting. Most occupants find that the use of overhead lighting and task lighting is not necessary.

The daylight sensors are provided for all perimeter zones of the building.

Epsten Group renovated an existing building in Atlanta's Old Fourth Ward neighborhood for its new headquarters office, reducing the need for new materials and in turn reducing impact on the environment. Edgewood Avenue, pictured here, is a main thoroughfare in the neighborhood that has seen revitalization in recent years as an eclectic mix of restaurants and nightlife spots has filled vacant buildings.

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*The daylight sensors are provided for all perimeter zones of the building.*
Programmable multi-level lighting controls are provided throughout, along with occupancy sensors. The architectural overhangs added to the building exterior provide glare control for the occupants and limit heat gain along the east elevation.

Materials
More than 97% of The Edge’s existing building shell was reused, and new building materials contained 29% recycled content. The existing hardwood floors were maintained, wherever possible.

The ceiling joists removed for the installation of the central circulation stair were repurposed as stair treads and as a feature wall in the lobby. The design team selected GREENGUARD certified systems furniture and task seating containing recycled components, all of which are recyclable at the end of useful life. Low-VOC adhesives and finishes are used throughout. In addition, an environmental life-cycle assessment was performed on all selected building materials to evaluate their potential environmental impact.

Operations and Maintenance
While the initial LEED New Construction certification focused on the physical assets and anticipated performance of the building, LEED-Existing Buildings Operations+Maintenance v4 focuses on the complete operational aspects of a building, including policy development and actual collection of sustainable performance data. The Edge earned LEED-EB O+M v4 Platinum certification in the fall of 2014.

The LEED-EB O+M v4 process creates a holistic building picture that includes continuous energy performance and water use data. The post-occupancy performance data was tracked using the Energy Star Portfolio Manager.

As of March 2015, The Edge had an annual energy use intensity (EUI) of 33.7 kBtu/ft² (Figure 1) and an Energy Star score of 92. The annual energy picture created by the Energy Star Portfolio Manager allows the building management to plan for any necessary upgrades and set goals for increased energy efficiency.

The Edge is predicted to reduce potable water use by 46% from the LEED baseline design through the use of dual-flush water closets, waterless urinals, low-flow lavatories, low-flow showers, and low-flow kitchen sinks. Fixtures were not upgraded during the LEED-EB O+M certification, but the owner plans to review fixtures efficiency every five years. Additionally, the moderate amount of site landscaping and the roof garden consist of drought tolerant plants and require no permanent irrigation.

Ongoing personnel training and education are part of the operational policies. Epsten Group creates a bi-monthly newsletter to inform occupants of potential energy- and water-saving strategies, and building performance. Occupants are encouraged to
Lessons Learned

- **Evaluating Envelope Upgrades for an Existing Building.** The existing structure remained in place, so all improvements had to work around any existing features. To ensure proper installation of the specified insulation, infrared thermography was used toward the end of construction.

- **Allowing Time for Historic Review Board Approval.** The completed design had to be approved by the local historic review board, which limited the changes that could be made to the building exterior and affected the timeline for the design process. For example, any added building elements, such as the permanent window awnings and the signage, required approval.

- **Timing of Thermal Comfort Surveys.** The occupant comfort survey is most effective when performed at least twice a year, preferably during summer and winter. Instead of responding to individual complaints made to building management, the survey provides a unified understanding of any thermal comfort issues.

- **Common Barriers for Adaptive Reuse Projects Pursuing Energy Improvements.** Existing conditions, especially those discovered during the construction process, can greatly affect the available budget for energy improvements. It is important to establish a design team member to be an advocate of innovative solutions.

For example, careful evaluation of the rafters was required to determine strength and possible availability for reuse in other design components, if removed. Additionally, some rafters required sistering with new wood to ensure the roof maintained structural integrity.

- **Off-the-Shelf HVAC Systems.** While the HVAC system selection is usually seen as a deterrent to high energy performance goals, off-the-shelf systems are available to meet the needs of standard building typologies.

- **Alternative Transportation Commute Incentive.** Epsten Group offers a $30 a month incentive to employees to use alternative commuting options. The alternative transportation rate of 45% is a result of employees who reside downtown increasing how often they bike or walk to work, and employees residing outside of the city’s core making arrangements to carpool. Not only has this resulted in lower single-occupant vehicle use, it has resulted in employees who report improved happiness in their daily commutes.

provide feedback on building performance and provide suggestions.

**Post-Occupancy Commissioning**

The commissioning process was initially performed as part of the initial renovation, ensuring envelope integrity and efficiency, potentially improving life-cycle expectancy of building components and systems, and verifying trade responsibility.

An ASHRAE Level 1 Energy Audit and retro-commissioning were performed later as part of the LEED-EB O+M v4 certification process. The analysis and assessment included all constituent parts described in ASHRAE’s Procedures for Commercial Building Energy Audits, Second Edition.

The retro-commissioning (RCx) activities were performed by Epsten Group to validate the systems operation. This included the development of a commissioning report, a list of suggested energy efficiency upgrades and low-cost improvements, and the development of a systems manual, which includes systems operational and maintenance information.

The retro-commissioning analysis of The Edge after the two-year initial operational period found that the building systems were providing deficient airflow distribution and identified insufficient ventilation. A thermal comfort survey helped to pinpoint the critical areas, especially with building temperature ranges.

It was determined that the occupants of the open-office area and the private offices had different thermal comfort expectations. An interview with the maintenance staff identified the history of changes made to the original design setpoints in an attempt to assess these issues and respond to individual complaints.

Additionally, it was noted that the designed ventilation outdoor air...
that occupancy comfort issues are addressed in a timely manner, establishes a building operational baseline, provides a comprehensive energy use assessment, and payback analysis. It ensures that the building remains fully functional and efficient, and provides operational tools, testing requirements and guidelines for maintenance staff.

**Benefit**

The initial benefits of having a twice LEED Platinum certified office include having a healthier and more flexible work environment and lower energy and water use costs, which are tracked quarterly. The owner’s commitment to sustainability and an environmentally friendly workspace ensures that The Edge will continue to perform well over time.

The Edge demonstrates that any building can be high performing, proving to be a valuable educational tool for the firm’s prospective clients and the community.

**Conclusion**

The major lesson learned throughout the initial design process, ongoing building operation, and two LEED certifications is that a sustainable building is a living and changing entity that requires continuous care and consideration. Attempts made to increase daylighting can impact the energy performance. Attempts to quickly respond to occupant comfort issues can negatively impact building ventilation, underscoring the need to examine issues holistically.

Attempts to reduce water use and increase lighting efficiency through occupant education and fixture upgrades will positively impact annual performance. Finally, the benefits of occupying a twice LEED Platinum certified building outweigh the any additional first costs and maintenance costs required to ensure optimal building systems performance.

**ABOUT THE AUTHOR**

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