When the Jacksonville, Fla., design and construction firm Stellar advises clients on sustainable projects, it speaks from experience. In 2007 it built a LEED® Silver office building on its headquarters campus, experiencing the benefits and demands of sustainable construction from the perspective of a design-builder and as an end user and owner. The firm monitors the performance of its new building and an existing office building, which is used for similar purposes, analyzing how the higher performance requirements of LEED certification affects operating costs and the indoor environment.

### Site Characteristics
As Stellar’s growth drove the need for expansion, the company considered leasing space elsewhere, but ultimately decided to build on the existing headquarters campus. However, because the company’s main building is in a desirable location southwest of Jacksonville off Interstate 295, the area is fully developed, as was Stellar’s own campus.

The company decided to demolish an older campus building to make room for a more efficient structure, Stellar’s Commercial Building. The compact site offered benefits but also limited options for building orientation, parking options and storm water mitigation. Its location, bordering on wooded residential areas, also required measures to prevent light pollution.

### Building Design
The compact lot and external site adjacencies forced the main lobby orientation of the building to the southeast. This meant that low-e glass was needed for the curtain wall, which encompasses two sides of the entrance lobby and second-floor training room. The low-e glass reduces relative heat gain, improving energy efficiency.

---

**BY AARON SCHREIBER**

---

**SITE CHARACTERISTICS**

**Building Name:** Stellar Commercial Building

**Location:** Jacksonville, Fla.

**Size:** 25,806 ft²

**Started:** March 2007

**Completed:** December 2007

**Use:** Divisional headquarters offices for design and construction firm

**Cost:** $5.2 million

**Distinctions:** LEED® Silver; Associated Builders and Contractors—Florida First Coast Chapter, Excellence In Construction Award; USGBC North Florida Chapter, Innovation in Construction Waste Management Award

---

**BUILDING TEAM**

**Owner:** Stellar

**Developer:** Stellar

**General Contractor:** Stellar: Ron Foster Jr., CEO; Richard Lovelace, LEED AP

**Architecture Team:** Stellar: Steve Black; Alan Coffin; Aaron Schreiber, LEED AP

**MP Design Team:** Powell & Hinkle Engineering: Kevin Wood, senior mechanical designer; Brian Ebach, senior plumbing designer; Rich Mathews, P.E., LEED AP; Lane Hinkle, P.E., LEED AP

**Electrical Design Team:** Stellar: Steven Sicignano, Mark Goslo

**Energy Modeling:** Powell & Hinkle Engineering: Rich Mathews, P.E., LEED AP

**Commissionsing:** Powell & Hinkle Engineering: Lane Hinkle, P.E., LEED AP

**Structural Engineer:** Structures International: Dan Charletta

**Civil Engineering Team:** Stellar: Jerry Pecoreca, EIT, LEED AP; Tim Focht, EIT, LEED AP; Phil Kelly, P.E.

**Landscape Architect:** Janet G. Whitmill, RLA

**LEED Consultant:** TLC Engineering: Mark Garbo, LEED AP

**Building Management:** W.K. Gap: service and installation Stellar: owner/operator
In addition to the exterior canopies and setbacks used to mitigate solar gain in the energy model, interior solar shades were used to increase thermal comfort and reduce heat gain in these areas when not in use and during peak morning hours. Although they do not apply to the energy model calculations, the shades make a noticeable temperature difference in the rooms. Clear glazing was used throughout the rest of the building to allow employees to make maximum use of natural light.

The development team took advantage of the naturally shaded site and adjacent wooded lots and wetlands to reduce the heat island impact of the new building. As many of the mature large lobby windows provide an open feel, embracing the natural environment.

Sustainable materials promote a higher quality of indoor air, which saves energy by reducing the need for ventilation.
oak trees as possible on the existing site were left in place. A highly reflective roofing material was used as well as covered parking with the same solar reflective index to further relieve higher temperatures due to the hardscape.

HVAC

The building is zoned with individual comfort control in mind. The variable-air-volume HVAC system provides enhanced occupancy comfort and takes advantage of thermal diversity within the building to improve part-load operating efficiency.

The 60-ton rooftop unit specified by the mechanical designer has the capacity to produce 21,400 cfm and incorporates a maximum of 5,350 cfm of outside air. It also uses a 6 in. thick MERV 13 filter. The unit is designed to use R-407C refrigerant, a hydrofluorocarbon that does not contribute to ozone depletion and contributes little to global warming.

Mechanical engineers specified a variable volume air handler with an on-demand ventilation scheme. CO₂ sensors and occupancy sensors control ventilation air.

Outside air is a major source of energy consumption, but it has a direct positive impact on indoor air quality. The engineers designed the system to provide up to 30% more outside air than required by code and ASHRAE Standard 62.1-2004, but also to regulate the outside air based on occupancy rather than by preprogrammed schedules. A properly controlled building ventilation rate is a key benefit for this building’s indoor air quality and energy efficiency.
day. This results in less energy used each day.

**Lighting**
With a quick response time and lower percentage of false positives from moving air or fluttering papers on a desk, dual technology occupancy sensors are becoming the best option in reducing energy consumption of lighting. Engineers placed these sensors throughout the interior, using ultrasonic and passive infrared motion sensors to lower the lighting cost of unoccupied spaces.

They also used low mercury T-8 fluorescent lights for the main lighting in the building. The efficient lighting is controlled by occupancy sensors, but occupants also have the option of inboard/outboard switching on their individual office lights. They can use ambient lighting at three different light levels. Some might opt to use one light rather than two, and many offices need little supplemental light during the day. This results in less energy used in the men’s restroom. The employees, while skeptical at first, have now realized that when properly maintained, these fixtures are a great benefit. Of course, water savings is the biggest reward, but another benefit is the absence of the flushing valve noise.

**Plumbing**
The use of low-flow flush valves and motion sensor lavatory faucets has noticeably reduced water use. The building also uses waterless urinals in the men’s restroom. The employees, while skeptical at first, have now realized that when properly maintained, these fixtures are a great benefit. Of course, water savings is the biggest reward, but another benefit is the absence of the flushing valve noise.

**Lighting**
With a quick response time and lower percentage of false positives from moving air or fluttering papers on a desk, dual technology occupancy sensors are becoming the best option in reducing energy consumption of lighting. Engineers placed these sensors throughout the interior, using ultrasonic and passive infrared motion sensors to lower the lighting cost of unoccupied spaces.

They also used low mercury T-8 fluorescent lights for the main lighting in the building. The efficient lighting is controlled by occupancy sensors, but occupants also have the option of inboard/outboard switching on their individual office lights. They can use ambient lighting at three different light levels. Some might opt to use one light rather than two, and many offices need little supplemental light during the day. This results in less energy used each day.

**Plumbing**
The use of low-flow flush valves and motion sensor lavatory faucets has noticeably reduced water use. The building also uses waterless urinals in the men’s restroom. The employees, while skeptical at first, have now realized that when properly maintained, these fixtures are a great benefit. Of course, water savings is the biggest reward, but another benefit is the absence of the flushing valve noise.
**Electricity Comparisons — Yearly Totals**

<table>
<thead>
<tr>
<th>Building Analyses</th>
<th>Stellar Commercial Building</th>
<th>Stellar Headquarters Building ( Existing )</th>
<th>Percentage Savings: Commercial compared to headquarters*</th>
<th>Headquarters building with projected implementations of efficient technology similar to the Commercial Building</th>
<th>Projected savings resulting from implementation of efficient technology in headquarters building*</th>
</tr>
</thead>
<tbody>
<tr>
<td>kWh/ft²</td>
<td>13.33</td>
<td>22.39</td>
<td>40.5%</td>
<td>13.33</td>
<td>40.5%</td>
</tr>
<tr>
<td>kWh/employee</td>
<td>6,573.26</td>
<td>6,515.95</td>
<td>–0.9%</td>
<td>3,842.97</td>
<td>41.0%</td>
</tr>
<tr>
<td>kWh consumption</td>
<td>377,000</td>
<td>1,730,040</td>
<td>78.2%</td>
<td>1,030,236</td>
<td>40.5%</td>
</tr>
<tr>
<td>$/kWh**</td>
<td>$0.116</td>
<td>$0.103</td>
<td>–12.6%</td>
<td>$0.10</td>
<td>0.0%***</td>
</tr>
<tr>
<td>$/kWh²</td>
<td>$1.69</td>
<td>$2.30</td>
<td>26.5%</td>
<td>$1.69</td>
<td>26.5%</td>
</tr>
<tr>
<td>$/employee</td>
<td>$758.40</td>
<td>$661.91</td>
<td>–14.6%</td>
<td>$394.17</td>
<td>40.5%</td>
</tr>
<tr>
<td>Electricity cost</td>
<td>$43,544.89</td>
<td>$177,447.93</td>
<td>75.5%</td>
<td>$105,669.98</td>
<td>40.5%</td>
</tr>
</tbody>
</table>

* These savings do not reflect construction or upgrade costs, only the energy cost savings after construction or completion of upgrades.

**The headquarters building pays a discounted electricity rate because of the volume that it uses. The Commercial Building does not use enough electricity to qualify for the discounted rate.

**This suggests that the headquarters building would still use enough electricity after the installation of energy efficient technology to continue receiving the discounted electricity rate.

**Water/Sewer Comparisons — Yearly Totals**

<table>
<thead>
<tr>
<th>Building Analyses</th>
<th>Stellar Commercial Building</th>
<th>Stellar Headquarters Building ( Existing )</th>
<th>Percentage Savings: Commercial compared to headquarters*</th>
<th>Headquarters building with projected implementations of efficient technology similar to the Commercial Building</th>
<th>Percentage savings resulting from projected implementation of efficient technology in headquarters building*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons/ft²</td>
<td>2.29</td>
<td>8.16</td>
<td>72.0%</td>
<td>3.55</td>
<td>56.5%</td>
</tr>
<tr>
<td>Gallons/employee</td>
<td>1,022.14</td>
<td>2,344.30</td>
<td>56.4%</td>
<td>1,022.14</td>
<td>56.4%</td>
</tr>
<tr>
<td>Gallons</td>
<td>59,000.00</td>
<td>630,564.00</td>
<td>90.6%</td>
<td>274,019.70</td>
<td>56.5%</td>
</tr>
<tr>
<td>$/Gallon**</td>
<td>$0.03</td>
<td>$0.01</td>
<td>–214.1%</td>
<td>$0.01</td>
<td>0.0%***</td>
</tr>
<tr>
<td>$/ft²</td>
<td>$0.07</td>
<td>$0.08</td>
<td>12.0%</td>
<td>$0.03</td>
<td>56.5%</td>
</tr>
<tr>
<td>$/employee</td>
<td>$31.27</td>
<td>$22.78</td>
<td>–37.2%</td>
<td>$9.90</td>
<td>56.5%</td>
</tr>
<tr>
<td>Water/sewage cost</td>
<td>$1,795.18</td>
<td>$6,107.45</td>
<td>70.6%</td>
<td>$2,654.07</td>
<td>56.5%</td>
</tr>
</tbody>
</table>

* These savings do not reflect plumbing installation or upgrade costs, only the water cost savings after installation or completion of upgrades.

**The headquarters building pays a discounted water rate because of the volume that it uses. The Commercial Building does not use enough water to qualify for the discounted rate.

**This suggests that the headquarters building would still use enough water after the installation of efficient technology to continue receiving the discounted water rate.

**Motion sensors on faucets save valuable water resources and provide a sense of luxury. Conservation does not always mean sacrifice. The benefits are on multiple levels from water savings to germ control, and are recognized by end users and building owners alike.

**Interior Materials**

The interior finishes incorporate low-VOC content materials and high-recycled content materials into their design. Low-VOC materials not only improve indoor air quality, but also reduce demand on the HVAC system. Maintaining the same level of air quality with high-VOC
and urea-formaldehyde resin content materials greatly increases air change rates and energy draw on the HVAC system. This is especially true in the southeastern U.S. where tempering the outside air is a necessity the majority of the year.

Because they reflect natural light, use of lighter colors in common areas and in offices decreases the demand for artificial lighting. This is not a call to make office interiors look like sterile cleanroom environments. However, conscientious use of lighter colors in relation to the available natural light is an important factor to consider.

**Storm Water Treatment**

The easiest way to treat storm water in Florida is to use retention ponds, but this site is extremely compact and required an alternate solution. The project development team incorporated an underground exfiltration system to meet the requirements for storm water treatment.

Florida’s St. Johns River Water Management District (SJRWMD) had already instituted regulations for storm water quality equal to that of the LEED requirements for reduction of total suspended solids (TSS) by 80%. The engineer only had to enlarge the system slightly to handle the quantity of storm water to attain LEED credits, allowing the system to treat 7,812 ft³ of storm water at one time.

This system also has the added benefit of more readily promoting infiltration of water into the Florida aquifer. Placement of the storm water system underground allows use of the aboveground area for parking to augment the parking shared between the campus buildings.

**Applying Project Lessons**

The Commercial Building was Stellar’s first experience to design, construct and obtain LEED certification for a project incorporating Storm Water Treatment.
By comparing the performance of the Stellar Commercial Building (above) to the main headquarters building (right), Stellar can demonstrate the value of incorporating efficiency and sustainability into design and construction.

Owning and occupying a LEED Silver certified building and a “normal” building affords Stellar an opportunity to understand the benefits of sustainable design and construction measures. Stellar’s headquarters was built in 1985, with additions in 1990 and 2001, bringing the total size to 77,276 ft². The Commercial Building, at 25,806 ft², was completed in 2007.

Energy Per Square Foot Comparison
The headquarters building houses on average 268 employees and uses approximately 76,400 Btu/ft²/year. The LEED Silver Commercial Building houses around 60 employees and uses approximately 49,800 Btu/ft²/year. This represents approximately 35% energy cost savings per square foot.

Water Per Square Foot Comparison
The headquarters building’s water use rate is 8.16 gallons/ft²/year, while the new Commercial Building uses approximately 2.29 gallons/ft²/year annually. The headquarters building receives a discounted water rate because of the volume of water that it uses. The Commercial Building does not receive the discounted rate, so although it uses 72% less water the cost difference of only $0.01/ft² is not a staggering savings.

Energy Per Occupant Comparison
When comparing the energy cost per occupant, we have closer numbers primarily because the Commercial Building was built to allow for expanded growth and houses fewer employees. The headquarters building uses approximately 1,850,000 Btu/employee per year, while the Commercial Building uses around 1,028,000 Btu/employee per year. The difference is only about 8%.

Water Per Occupant Comparison
At headquarters, the annual number of gallons used per employee is 2,352, while it is 1,028 at the Commercial Building. This is 57% decrease in usage, but amazingly costs $8.49 more per person. The building received three LEED credits for water use reduction and innovative design. The LEED credits recognized the building design, which was predicted to use 50% less water than the baseline model, but after the first year the building used more than 73% less water than the baseline model.

By comparing these two buildings, which are used for the same business purposes, we can demonstrate the value of incorporating efficiency and sustainability into design and construction. We suspect that the majority of energy and water savings in the Commercial Building have come from energy-saving features applied to lighting, effective zoning and efficiency of the HVAC system, the evolving technology in the last 20 years in glazing, water-conserving plumbing fixtures and the emphasis placed on better performing buildings that brings small opportunities.

Even though they are similar building types and have similar occupancies, we must break down the comparison to per square foot and per occupant.

Energy savings in the Commercial Building have come from energy-saving features applied to lighting, effective zoning and efficiency of the HVAC system, the evolving technology in the last 20 years in glazing, water-conserving plumbing fixtures and the emphasis placed on better performing buildings that brings small opportunities for energy savings to light.

 Even though they are similar building types and have similar occupancies, we must break down the comparison to per square foot and per occupant.

When comparing the energy cost per occupant, we have closer numbers primarily because the Commercial Building was built to allow for expanded growth and houses fewer employees. The headquarters building uses approximately 1,850,000 Btu/employee per year, while the Commercial Building uses around 1,028,000 Btu/employee per year. The difference is only about 8%.

Even though they are similar building types and have similar occupancies, we must break down the comparison to per square foot and per occupant.

Even though they are similar building types and have similar occupancies, we must break down the comparison to per square foot and per occupant.

Efficient technology. The firm will use this experience to meet the increasing demand for environmentally friendly buildings.

For instance, the firm did not install submeters in the Commercial Building, but has realized that they would be helpful to obtain energy savings data. Stellar will consider adding submeters to the building in the future and will recommend that clients install submeters.

“Next, you need to calculate pro forma budgets based on energy savings, cost of design and construction. Once this data is compiled, our management team will analyze and decide upon best management practices for our entire campus,” she said.

“We anticipate early efforts will include updating energy management control systems, lighting, HVAC, reducing heat island effect and reducing water usage in the existing Stellar buildings,” Korman said.

By comparing the performance of the Stellar Commercial Building (above) to the main headquarters building (right), Stellar can demonstrate the value of incorporating efficiency and sustainability into design and construction.

ABOuT The AuTHor
Aaron Schreiber, LEED AP, is an interior designer at Stellar. He is a member of the American Society of Interior Designers and is a licensed interior designer in the state of Florida.

LESsONs LEARNED
Documentation Much of the cost of LEED certification lies in the commissioning and documentation process. Because it’s an expensive process, teaming with knowledgeable architects, engineers and subcontractors who are either LEED accredited or are willing to learn documentation requirements is essential to avoid missed credits.

Commissioning Teaming with a commissioning agent at the beginning of the design phase is crucial to project success. Maintaining constant communication throughout the project greatly facilitates seamless performance of key tasks during the final stages of construction, commissioning and certification.

Considering Costs of Sustainable Technology While installation of waterless urinals resulted in water savings, the expense of maintaining the urinals nearly negated the cost savings from reduced water use. Design and construction firms need to look out for clients as well as for the environment. If a client’s goal is cost savings, waterless urinals may not be best. The technology may improve in the future, making them a better benefit to building owners.

About the Author
Aaron Schreiber, LEED AP, is an interior designer at Stellar. He is a member of the American Society of Interior Designers and is a licensed interior designer in the state of Florida.