

The exterior façade of Magnify Credit Union in Lakeland, Fla., mixes glass, brick and cement stucco, balancing the connotations of security and transparency.

Opposite Daylighting is controlled by exterior shading devices and interior ceiling “clouds.”



SUBURBAN SOLUTION

Credit unions are in a unique position to reach out to the community. But they tend to be places where customers conduct their business, then leave. At a new branch of Magnify Credit Union in Lakeland, Fla., customers buy ice cream, attend wine tastings and gardening workshops in a multi-purpose community room. An outdoor pavilion and plaza provides a public space for events that can develop an identity over time.

BY TIM HOEFT, ASSOCIATE AIA

Building off Magnify Credit Union's history as a community-oriented business, the branch was built on a previously developed site. The new building is designed to wrap around an existing Bruster's ice cream shop, which is a neighborhood favorite. Only minor cosmetic changes to the shop were necessary to make two buildings that work well with each other and serve the community.

“The project is a direct investment for our members,” says John Santarpia, president/CEO of Magnify Credit Union. “Not only do our members benefit, but the community sees that we are doing something for the environment and for them. Our goal is to educate the community and at the same time simplify banking.”

Design Intent

The past few decades of creating sprawling suburbs have made people long for a sense of community. Projects that combine mixed-use with sustainable strategies help fulfill the need for physical and psychological proximity among people and places.

The new branch helps redefine the model of sustainable design for small commercial buildings in a typical American suburb. This project focuses on developing sustainable strategies that are integrally tied to social, economic and ecologic issues in its immediate Central Florida neighborhood.

Energy conservation and efficiency were key criteria that guided all design decisions. With a goal to

design the state's first net zero energy commercial building, every detail was significant. The roof's holistic design combines passive cooling and renewable energy systems. Building materials selection was critical to provide a building envelope that balanced the benefits of natural daylight with the challenge of maintaining interior thermal comfort.

In Florida, it is vital to closely evaluate water conservation strategies. Combining the benefits of a dual-cistern rainwater harvesting system with low-flow fixtures, microirrigation and native landscaping reduced potable water consumption projections by 88% over the LEED baseline case for the entire project.

Community Design

On the municipal fringe, this primarily residential area has cultivated several nodes of local commerce that provide many everyday services. Bicycle racks and brick paved plazas encourage a walkable community and welcome visitors from the nearby elementary school. These local families and patrons strongly support the existing ice cream shop, an established local favorite that anchors the chosen location for the project.

The new building was built around two sides of the existing ice cream shop, which was included when the credit union purchased the site. The credit union later sold the franchise, and leased the building to the new owner. Keeping the shop increases the area's development density

BUILDING AT A GLANCE

Name	Magnify Credit Union, South Lakeland Branch
Location	Lakeland, Fla., 30 miles east of Tampa, Fla.
Owner	Magnify Credit Union
Principal Use	Financial/Banking
Includes	Open plan concept lobby and teller area, teleconference meeting rooms, community room, drive-through tellers
Employees/Occupants	6
Occupancy	100%
Gross Square Footage	4,151
Distinctions/Awards	LEED Gold NC-v2.2, 2009; ENERGY STAR certified, 2011; Sustainable Buildings Industry Council Beyond Green High Performance Building Award, Second Place, 2010
Total Cost	\$2,378,937
State Solar Energy Rebate (credit)	\$52,000
Cost Per Square Foot	\$560
Substantial Completion/Occupancy	August 2009

All photos are by Straughn Trout Architects, LLC.



The new façade around the existing ice cream shop creates a collective sense of place between the new building and the adjacent outdoor plaza.

while minimizing changes to infrastructure and local traffic patterns. A traffic study proved each business's peak hours of operation were antonymic to the other.

The credit union is open until 6 p.m. during the weekdays and Saturday mornings, and the ice cream shop thrives in the evenings and on weekends. These schedules enable an efficient way to share the existing parking lot, which includes

preferred electric car parking spaces. The schedule also eliminated the need for additional turn-lanes into the property.

The outdoor plaza is a privately developed public space, which is a rare commodity in a suburban setting. The transparent building envelope creates a community-friendly relationship between the bank branch and its surroundings. In the evenings when the building is typically unoccupied, low-voltage color-changing LED lights extend the vitality embodied in the building.

Bioclimatic Design

Located 55 miles inland from the Gulf Coast and 85 miles from the Atlantic ocean, the project is at the peninsular state's midpoint. The resulting environmental condition pairs tropical heat and humidity without the relief of coastal breezes. The primary architectural challenge of Central Florida is to provide protection from solar heat gain.

At the new branch, large overhangs, including the drive-through canopy that extends more than 50 ft off of the south façade, shield 99% of all glazing from the mid-day sun. Additional sun-shades, awnings, and interior clouds filter the direct light and mitigate glare.

The majority of the west façade receives its solar protection from the existing ice cream shop that was preserved on the site. The remaining west and southwest façades are minimally glazed and enclose core functions.



Above The super high-efficiency insulated low-e glass pairs minimal solar heat gain with optimal visible light transmittance. Below The project takes advantage of the existing storm water pond (next to parking lot) and uses the adjacent utility easement on the site by creating a brick-paved plaza that connects it to the outdoor pavilion.

Daylighting

The two primary building elevations that face the adjacent roadways use an abundant amount of glazing that allows natural daylight to permeate the façade into all primary interior public spaces. Eighty-three percent of all regularly occupied spaces are daylit throughout business hours.

Large overhangs, exterior sun-shades, and interior suspended "clouds" diffuse the natural daylight that enters through the window walls and clerestory. The super high-efficiency insulated low-e glass

pairs minimal solar heat gain with optimal visible light transmittance.

The interior lighting system includes digital controls and photo sensors that automatically dim the fluorescent and compact fluorescent fixtures when natural daylight sufficiently illuminates a space.

The South Lakeland branch doesn't have traditional teller windows or cubicles, and only has a few private offices. Instead, electronic cash recyclers (a combination ATM, safe and teller's cash drawer) and tablets allow for an open floor plan, which maximizes daylighting and views.

Natural Ventilation

Financial institutions require limited openings in the exterior envelope, so operable windows were not used in this project. Additionally, the local climate precludes natural ventilation in most cases because of the high heat and humidity levels.

Water Conservation

In recent years, many development projects in this region have been halted because public utilities could not provide the required potable water supply. This project did not need to request additional

ENERGY AT A GLANCE

Annual Energy Use Intensity (Site)	74.69 kBtu/ft ²
Electricity	40.59 kBtu/ft ²
Renewable Energy (Solar PV)	34.1 kBtu/ft ²
Annual Source Energy	170 kBtu/ft ²
Annual Energy Cost Index (ECI)	\$1.18/ft ²
Annual On-Site Solar Energy Exported	34.07 kBtu/ft ²
Annual Net Energy Use Intensity	6.52 kBtu/ft ²
Savings vs. Standard 90.1-2004 Design Building	40.74%
ENERGY STAR Rating	83
Heating Degree Days	505
Cooling Degree Days	3,903

WATER AT A GLANCE

Annual Potable Water Use	9,000 gallons or 2 gallons/ft ² -yr
Precipitation managed on site	100%
Annual Harvested Rainwater Use	17,753 gallons (rainwater use is not metered; based on LEED estimate)
Percent of total water provided by harvested rainwater	66%

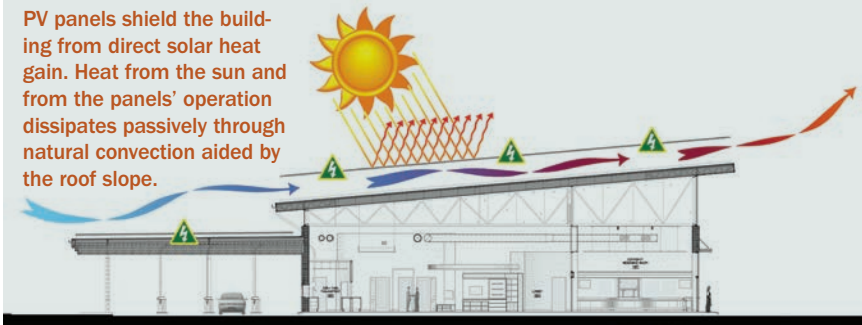
potable water service because the existing property provided two previously dedicated potable water supply lines: one for the ice cream shop and another for irrigation.

The irrigation line was rededicated to the new credit union building during construction. The project's rainwater harvesting systems provide more than enough water to sustain the microirrigation system. The site's "Florida friendly" vegetation requires 51% less water than a conventional design.



DOUBLE ROOF DIAGRAM

PV panels shield the building from direct solar heat gain. Heat from the sun and from the panels' operation dissipates passively through natural convection aided by the roof slope.





BUILDING ENVELOPE

Roof

Type Thermoplastic polyolefin (TPO) single-ply membrane
Overall R-value R-20
Reflectivity 0.79

Walls

Type Concrete masonry unit (foam filled) with stucco or face brick
Overall R-value R-25
Glazing percentage 35.4%

Windows

Low-e glass, 1 in. insulated
U-value 0.26
Solar Heat Gain Coefficient (SHGC) 0.27
Visual Transmittance 64%

Location

Latitude 28°N
Orientation Not applicable; L-shaped footprint

A financial institution requires only a little water. Low-flow water fixtures, including faucets and water closets, reduce water by 45% when compared to conventional fixture design.

Envelope and HVAC

Locating the new building within inches of the existing ice cream shop was an energy-saving feature. The cohesive design also passively reduces energy required for both structures' cooling loads by reducing the total amount of exterior walls that are subject to the Central Florida climate; therefore, each building is more efficient than if they were designed to be stand-alone structures.

Two DX central station air-handling units are located in the

mechanical mezzanine. Each AHU is provided with two condensing units located on grade, and includes dual circuit interlaced DX cooling coils. This provides the system with staging compressors during periods of non-peak demand. The system also includes a programmable thermostat. Outside air is ducted directly into the return side of each air handler.

Increased wall and roof insulation, state-of-the-art insulated glass, large overhangs and sun shades, solar reflective roofing material, double-roof design for passive cooling, high efficiency HVAC system design and equipment, and a daylight harvesting fluorescent and compact fluorescent lighting system reduce the building's energy demand 36% below average requirements of similar commercial structures.

Photovoltaics

In addition to the existing ice cream shop, the previously developed site had a 100 ft utility right-of-way for overhead high tension power lines that occupy the triangular site's southwest hypotenuse. However,

this right-of-way area is ideal in that it secures long-term solar access for the 309 photovoltaic (PV) panels located above the south oriented solar reflective roof membrane.

The "photovoltaic blanket" is significantly elevated above the solar reflective roof membrane. This creates a double roof that dissipates direct solar heat gain as well as the operating heat of the PV modules through natural convection between the two roof layers.

The branch's 58 kW roof-mounted PV array is designed to produce 85,717 kWh per year, roughly 101% of the building's estimated energy requirements. This project was designed to qualify the branch as a source, site, and emissions (carbon) net zero energy building, as defined by the U.S. Department of Energy.

Above The stainless steel downspout near the main entry directs rainwater to underground cistern tanks that supply water for irrigation and flushing.

Below The open plan design creates a place for a variety of evening and weekend community events, including Wii tennis tournaments and couponing classes.



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Rapid Start Cooling

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Materials & Construction

By preserving the existing ice cream shop structure, 100% of its building materials were diverted from disposal in landfills. By renovating this previously developed site, materials used for site

infrastructure and surface parking were also retained.

Construction waste was sorted in separate dumpsters, and more than 94% was recycled. Collection bins in multiple locations within the branch make recycling convenient for all occupants.

Sixteen percent of materials (by cost) were extracted and manufactured within a 500-mile radius of the project, reducing the need for excessive transportation fuel. In addition, many of the interior finish materials were selected based on their high recycled content, including carpet systems, porcelain tile flooring, recycled glass wall tiles, rubber flooring with shredded and cleaned tire rubber, recycled aluminum mill work panels, and countertops of recycled paper that include inlays of bamboo, recycled credit cards and recycled currency.

The building team chose low-emitting materials including adhesives, sealants, paints, wood stains, carpet systems and composite wood

KEY SUSTAINABLE FEATURES

Water Conservation Rainwater harvesting for toilet flushing and irrigation; low-flow fixtures; "Florida-friendly" native landscape design

Recycled Materials Ninety-four percent of construction waste recycled; recycled paper countertops and shower enclosure; recycled aluminum millwork panels; recycled-tire rubber flooring; porcelain tiles with 40% pre-consumer recycled content

Daylighting Extensive façade and clerestory glazing; high-performance insulated solar control low-e glass; digital dimming controls on CFL and fluorescent fixtures; 62% of total building area is daylight

Other Major Sustainable Features 58 kW "photovoltaic blanket" (roof-mounted PV system creating a double roof condition for passive solar cooling); open plan concept (unusual for financial institutions); electric car charging stations; low-VOC paint, carpet, adhesives and sealants; sealed cleaning chemical storage under negative pressure



Above Interior finish materials include recycled paper counter tops with inlaid bamboo and recycled credit card details. **Left** Accessible and flexible "teller transaction pods" eliminate the impersonal physical barriers typically found in other financial institutions.

systems to reduce or eliminate volatile organic compound (VOC) off-gassing.

Long Life, Flexibility

Without teller counters and offices typical in other branches, the open floor plan provides flexibility and



Left Areas available for landscaping on the site are limited, but not eliminated. Micro-irrigation and a xeriscaping design reduce demand for irrigation.

Below The façade's transparency displays the interior functions of its users during the day. In the evenings when the building is typically unoccupied, low-voltage color-changing LED lights extend the concept of activity and vitality embodied in the facility.

This space also provides configuration flexibility for future technologies. The mezzanine has a dedicated exterior access point for when large equipment needs to be removed or replaced. Organized and integrated design and installation of all building systems enhances future operations and management (O&M) and serviceability.

Evaluating Benefits

The building provides both quantitative and qualitative benefits in respect to all eight of the U.S. National Institute of Building Sciences' Whole Building Design Objectives (<http://tinyurl.com/designobjectives>), which include cost effectiveness, functionality, historic preservation and sustainability.

Benefits include lower operating costs, reduced maintenance, improved durability, enhanced safety and security, maximum functionality and accessibility, and excellent indoor environmental and experiential qualities. The

reduces the potential for remodeling throughout the life of the building (50 years). The community room and outdoor pavilion/plaza are regularly available during the week for meetings as well as after-hours events. These public spaces have multiple configurations to support various uses.

An open mechanical mezzanine provides ample space for building

systems and technologies including communications and IT infrastructure, HVAC equipment, rainwater harvesting equipment, and on-site renewable energy equipment and monitors. Locating this equipment on the mezzanine also reduces the impact of noise on building occupants and creates a more efficient use of the grade level floor area for daily occupant operations.





Top Receptacles for recycling are prominently located at the main entrance to the credit union. The bins are in multiple locations within the branch making recycling convenient for all occupants.

Middle Electronic teller cash recyclers increase employee productivity and security by eliminating the traditional cash drawer transactions and creating more opportunities for one-on-one interactions.

Bottom The continuous roof curbs create 10 in. of air space between the PV panels and the roof membrane. This creates natural convection that dissipates heat.

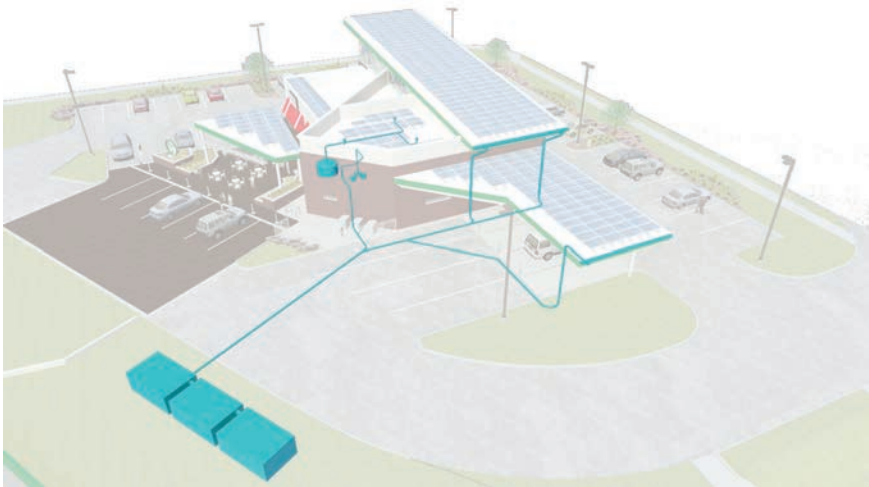
building's ability to operate with reduced reliance on the municipal utilities has significantly increased the project's property value.

A touch-screen kiosk in the community room displays live building

data for water and energy, identifies the green features of the project, and provides explanatory animations.

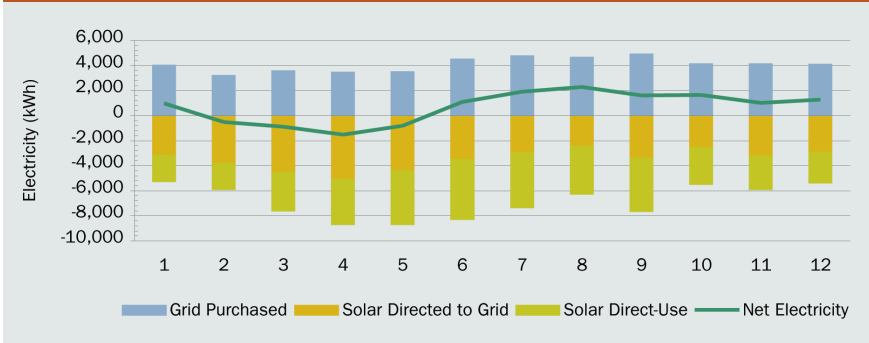
A third-party commissioning authority (CxA) provided a complete analysis of building systems and

CISTERN



Rainwater is harvested from all building roof areas. A series of cistern tanks and filters provide more than double the water required for flushing and irrigation.

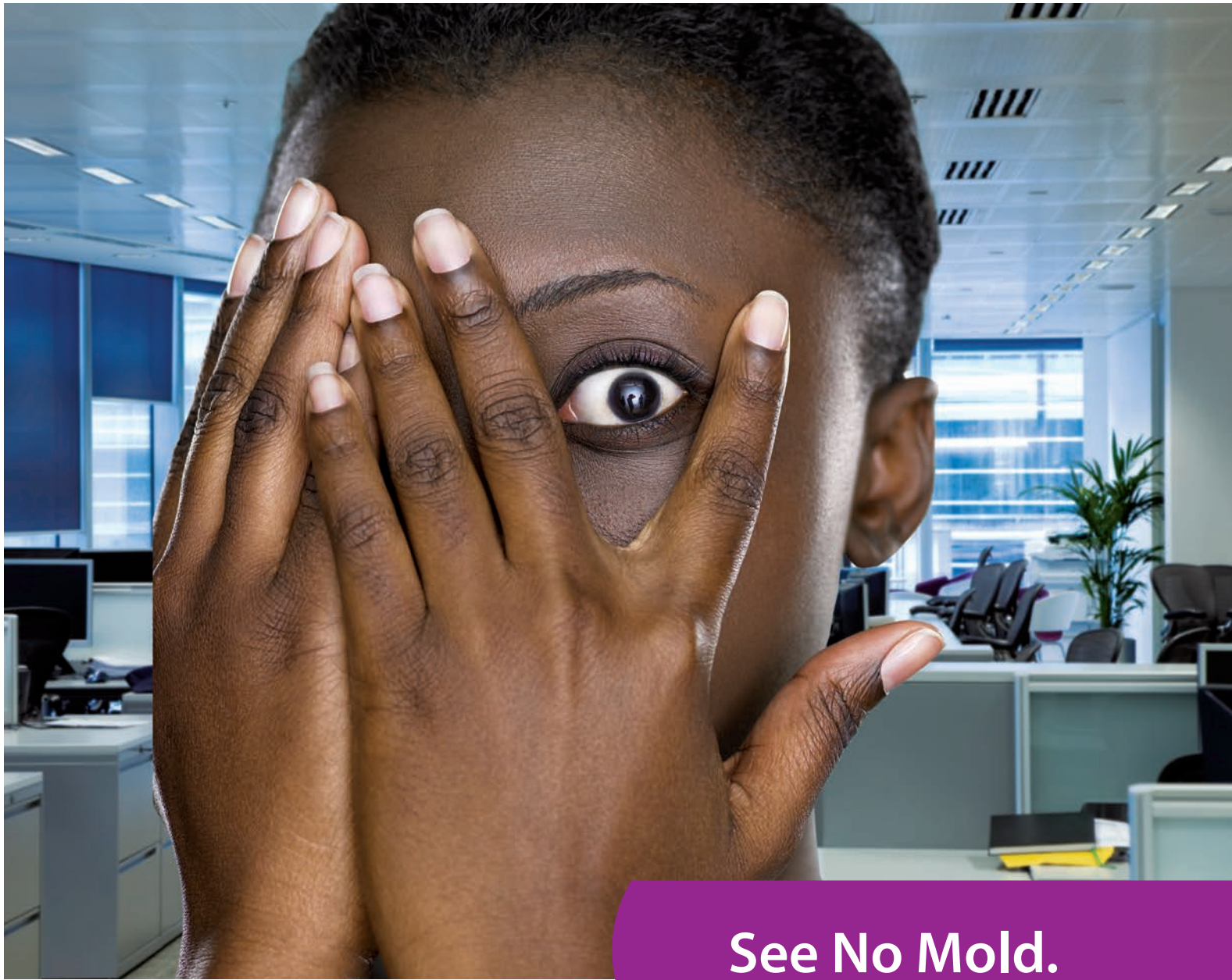
2011 MONTHLY NET ENERGY



2011 ENERGY, WATER USE

	Estimated	2011	Difference
PV Energy Collected (kWh)	85,717	82,930	96.70%
Building Energy Used (kWh)	84,900	90,867	107.00%
Potable Water Use (gallons)	4,657	9,000	193.30%

After-hours community events not accounted for in the energy model have caused the building's energy use to exceed initial estimates. Exterior water use to clean up "ice cream catastrophes" and for community fundraising events such as car washes caused water use to exceed estimates. An additional hose bib has recently been provided that uses water from the irrigation cistern.

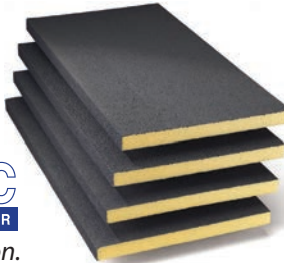


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Above Architects and solar energy contractors work to integrate the on-site PV array with the building's design. After-hours community events held at the credit union have increased energy use beyond initial estimates. A new PV trellis that includes additional and relocated PV panels is expected to produce enough additional energy to exceed the building's demand.

Right The mechanical mezzanine provides space for systems and equipment including HVAC equipment, electrical panels, photovoltaic inverters, rainwater harvesting filters and storage, telecom/data infrastructure, and daylighting controls.



LESSONS LEARNED

Energy modeling and fixture flow estimates cannot predict occupancy-related variables. Energy modeling software has evolved to include extremely specific conditions. The result is that designers can essentially test a proposed building solution before construction begins. However, designers must consider that the building might be used in different ways than first thought.

For instance, members of the team had previously worked with the client on other banking facilities. As a result, they felt comfortable with how and when the building would be used, and with who would use it. However, once this new branch was complete, it was used as the marketing centerpiece for the client's rebranded institution.

After-hours community events have increased the building's energy use beyond the team's initial estimates. Still, estimates were within 8% of actual use. This accuracy is most likely accredited to the small scale of the project and effective communication between the design team and the users.

Water use was also higher than anticipated because there was no way to estimate exterior nonirrigation water use. For instance, water from a hose bib is used regularly to clean the brick plaza of "ice cream catastrophes."

Another exterior water use is directly related to hosting community fundraising events such as car washes. Responding to this need, an additional hose bib has been provided that uses water from the irrigation cistern.

With photovoltaics, every little bit counts. Given the client's design goal of a net zero energy building, the design team worked to maximize the roof area available for mounting PV panels.

Unfortunately, some panels were originally located in partial shade for small portions of the day or during June and July at solar noon. A construction phase addition of another parking lot light (required for ATM safety) casts a shadow on another section of panels. As a result of the partial shade some panels are producing less electricity than other panels.

To correct this documented inefficiency, a new, sloped PV trellis is being constructed over the existing flat mezzanine roof. This trellis will provide additional area for a combination of new and relocated existing panels, increasing the total on-site energy production by an additional 15%.

The original maintenance program for the panels involved cleaning them semi-annually. Air pollution from heavy truck traffic on an adjacent county road prompted cleaning the panels monthly.

Daylight harvesting can be challenging with CFL fixtures. The project's primary lobby and client interaction spaces are designed with a digital daylight harvesting system that controls dimming ballasts in suspended compact fluorescent (CFL) fixtures. After the system was installed and inspected by the design engineers and the manufacturer's representatives, the lights experienced unexpected flickering issues.

After hypothesizing about waveforms, high frequency harmonics, electromagnetic fields and excited ions, proposed modifications included everything from adjusting the length and diameter of the wires, grounding all fixtures collectively through a net of ground wires, and installing Faraday shields around the bulbs and/or the wiring. Luckily, before any significant changes were made, testing the fixtures with lamps by alternate manufacturers solved the problem.

verified the quality of construction and system installation (HVAC, PV, rainwater harvesting). After one year of occupation, the CxA also provided a facility performance evaluation to the owner and the architect to confirm that the building is operating as designed and to document lessons learned.

Project Economics

As a credit union (not a bank), the client is a not-for-profit member-owned organization that exists to further community development while promoting thrift, providing credit at competitive rates, and providing other financial services to its members. In efforts to advance their organizational mission, the client self-financed the project in its entirety.

The owner was recently awarded approximately \$52,000 through a State of Florida rebate program for solar energy systems. These funds are being used to offset original construction costs as well as maintenance on the photovoltaic system.

Life-cycle cost analysis (LCCA) was used extensively throughout the design and construction process to maximize net savings when comparing initial construction costs with long-term operating costs as well as qualitative benefits to building occupants.

Through a combination of energy modeling and cost analysis, it was estimated that the initial cost of the "photovoltaic blanket" would equal the energy cost savings after approximately 15 years (assuming energy costs remained constant). The roof panels' manufacturer's warranty is 25 years.



Top A panoramic photograph of the site before construction shows the existing ice cream shop surrounded by a sea of asphalt parking spaces.

Above To ensure compatibility and maximization of all design features and project components, members of the building team (owners, architects, engineers, construction managers, and materials and systems specialists) collaborated during regular on-site meetings.

Therefore, total net savings on energy alone is a minimum of 67% of energy cost over the 25-year period. Additional qualitative benefits include reduced dependence on the municipal electric company (which could be down for extended time periods in a hurricane-prone Florida environment).

Estimated energy costs savings for the daylight harvesting system was far greater than the system first costs. As a banking institution, the facility's hours of operation are during daylight hours almost entirely year-round. Therefore the daylighting system provides benefits almost 100% of the time the building is occupied.

Conclusion

From the project's inception, stakeholders were involved and committed to every design decision. It remained of utmost importance that this building meet expectations of

functionality and sustainability and become a learning tool for both the immediate community and local construction trades.

Face-to-face meetings promoted an accurate exchange of ideas and facilitated clarity of understanding that resulted in a successful project even though it differed from most of the team members' general commercial design and construction experience. ●

ABOUT THE AUTHOR

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