LEFT
Federal, state and local incentives abound to install photovoltaic panels. New Jersey Transit elected to install these panels on one of their parking facilities to generate electricity to serve the energy demands of the facility as well as power electrical vehicle charging stations.
Photo courtesy Nexus Properties.

Virtually every product now has a "green" version, from light bulbs to automobiles. *Building design is no different.*

Incorporating sustainable strategies into the design of parking facilities

By Chris Gray, P.E., and Megan Leinart, LEED AP BD+C

The concept of sustainability has evolved significantly over the course of the past few decades. Virtually every product now has a "green" version, from light bulbs to automobiles. Building design is no different.

The architecture and engineering industry has made great strides in recent years, developing strategies and technologies centered on making our buildings more sustainable – increasing their useful life while improving the impact that they have on the environment. Today, building designers have a responsibility to consider every aspect of design, from the planning stages and site selection to more efficient uses of water, energy and materials.

The planning, design and construction practices we exercise today are critically important to the sustainable growth and development of our future communities. "Big picture" planning strategies must consider issues such as reduction of vehicle miles traveled (VMTs) and traffic congestion, as well as pedestrian convenience, to reduce carbon emissions and create attractive, high-value smart-growth developments. Meanwhile, our buildings must integrate energy and resource-efficient design and construction practices so that they can contribute positively – both environmentally and economically.

As the concept of sustainable building design has progressed over the past few years, we have seen the creation of a number of rating systems designed to provide guidance toward more sustainable buildings, while providing a format to rate buildings based on their level of achieved sustainability. In the United States today, the most prominent green building rating system is the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. Other systems, such as Green Globes, AIA 2030, and the recently developed Institute for Sustainable Infrastructure (formed by ASCE, ACEC and AWPA) are becoming more widespread and acknowledged. LEED continues to maintain the majority of this market share, and is the most recognized sustainability rating system in the United States. In recent years, many cities and institutions, including the federal government, have enacted requirements mandating certain levels of LEED certification for all of their buildings and projects.

RIGHT
Sustainability choices range from the big picture, such as locating near transit, to materials choices, such as pervious concrete.

One building type that has faced a lot of controversy in this arena is parking facilities. Parking is, by nature, a contentious topic in the "green" building realm as it provides accommodations for the use of single occupancy vehicles, which is otherwise typically discouraged. However, parking does and will continue to play a vital role in development. Automobile use and ownership continue to rise. While development can and should focus on creating communities that reduce the need for the single occupancy vehicle and increase adoption of alternative transportation, automobiles will continue to play a critical role in our transportation and lifestyle choices.

LEED certification and parking

Stand-alone parking facilities have never been considered candidates for LEED certification. Since they create an open-air environment that cannot be measured, they do not meet LEED's Indoor Environmental Quality (IEQ) Prerequisite 1: Minimum Indoor Air Quality Performance. In addition, stand-alone parking facilities also have difficulty meeting the requirements for water use reduction (minimum of 20 percent) and energy savings.

Per the minimum project requirements for LEED 2009, parking facilities with a footprint of mixed-use space could achieve LEED certification if they included 1,000 square feet of occupied, conditioned space and served at least one full time equivalent (FTE) employee per day. As of May 2011, the USGBC no longer permits parking facilities consideration in the LEED system.

The recent LEED interpretation ruling states the following:

- Parking garages may not pursue LEED certification. More specifically, buildings that dedicate more than 75 percent of floor area (including areas not covered, enclosed, or conditioned) to the parking and circulation of motor vehicles are ineligible for LEED.
- Parking garages may not be included in the gross floor area of the LEED project building. The definition of gross floor area in the glossary specifically disallows the inclusion of parking.
- Parking garages may be included within the LEED project boundary.
- If parking is within, connected to, or on the site of the LEED project building, it may (and sometimes, must) be included within the LEED project boundary.

This ruling limits how parking facilities can contribute to sustainability. But parking will continue to play an important role in most developments, particularly due to its close relationship with transportation. Regardless of the ability to achieve a LEED rating on their own, there are still many opportunities to implement strategies that promote the overall goals of sustainability, and even contribute points to the certification. The following are some of the most effective sustainable strategies related to parking and transportation.

Planning, location, and transportation

- Plan early to locate facilities near mass transit or in a dense mixed-use development.
- Reduce the amount of parking required, applying shared-use strategies.
- Provide preferred parking for carpools and vanpools.
- Provide priority parking for low-emitting and fuel-efficient vehicles.
- Provide recharging stations for electric vehicles.
- Provide car-sharing services using low-emitting and fuel-efficient vehicles.
- Provide shuttle systems to increase mobility and reduce individual automobile use.
- Include bicycle storage areas and conditioned shower and changing rooms.

Construction and building practices

- Document strategies that prevent construction activity pollution.
- Use regional materials to reduce transportation impacts.
- Develop and implement a waste management plan.
- Use salvaged, refurbished or reused materials to discourage use of virgin materials.
- Use materials with recycled content.
- Dedicate areas to the storage and collection of recyclable materials.

Water use and stormwater practices

- Install water-saving fixtures to reduce water use.
- Implement a rainwater recycling system.
- Carefully select native adapted plantings that do not require irrigation.
- Install pervious paving and other landscape strategies to increase infiltration.
- Install a green roof to increase pervious area and decrease roof temperatures.

LEFT
The Christopher Columbus Mixed-Use garage includes a number of sustainable design features, including a roof-top solar array and charging stations for electric vehicles. The facility will also promote walkability in this section of Atlantic City.

Lighting, energy use, and renewable energy

- Create a holistic energy model with software, to plan and design an energy efficient building.
- Commission building systems (electrical, solar, etc.) to ensure that they operate as designed, potentially identifying additional cost savings over time.
- Install renewable energy technologies, including photovoltaic panels, wind power, biofuels, co-generation, and hydrogen fuel cells.
- Reduce energy demand and use through the photocell receptors, timers, computerized controllers and/or dimmers.
- Install a "cool" roof to decrease roof temperatures and the heat island effect.
- Install energy-efficient electrical and mechanical systems.
- Retrofit existing garages with solar panels and energy efficient lighting systems.
- Screen facilities to limit the amount of light pollution spilling out of the structure onto surrounding areas.

Innovation

- Create an educational program based on the sustainable strategies in a facility.
- Institute green cleaning programs for interiors.
- Develop innovative strategies or apply technologies not yet considered by LEED and other systems.

Parking will continue to play an important role in the development of campuses and downtowns, providing the necessary infrastructure to support greater developments. As these facilities evolve, serving mixed-use and transit-oriented developments, opportunities to integrate sustainable technologies increase, in both number and complexity. Owners and designers continue to identify strategies to integrate sustainability into planning, design, and construction practices to improve their impact on the environment as a whole, while supporting the communities they serve.

Christopher Columbus Parking Garage

Atlantic City, N.J.

The Christopher Columbus garage in Atlantic City, N.J., incorporates significant sustainable design features. Designed for the Casino Reinvestment Development Authority (CRDA), the structure promotes the efficient use of land and walkability in the city's core.

Located on a previously disturbed site – a municipal parking lot – the garage will include 16,000 square feet of ground floor retail, as well as office space for parking services. This combination of uses in the footprint is a more effective use of land, preserving land that can otherwise be used for additional development or green space.

The mixed-use facility will help to enhance and extend pedestrian activity in this section of the city, while encouraging a more active and vibrant atmosphere along the street.

Additional sustainable design features include the integration of a rooftop solar array. The array is appropriately sized for a net-zero capacity, meaning the panels will generate as much power as is consumed by the facility's electric and mechanical systems.

Additionally, this cast-in-place, post-tensioned structure utilizes recycled content through the incorporation of fly ash into the cast-in-place mix design. The facility will include charging stations for electric vehicles, as well as energy efficient lighting throughout the garage portion and the retail space.

Canon Americas Headquarters Garage

Melville, N.Y.

The new Canon Americas Headquarters campus in Melville, N.Y., includes two new parking facilities. These garages have contributed points to the overall LEED certification of the campus as a whole, which is currently pursuing a minimum of LEED Silver, with the potential to achieve Gold. The garage includes electric vehicle charging stations, which will help the campus achieve the Sustainable Sites credit 4.3: Alternative Transportation – Low-Emitting and Fuel Efficient Vehicles.

Reflective roof surfaces contribute to the LEED certification process. All building roofs on the site will achieve a solar reflectance index (SRI) of at least 78. The Canon parking facilities utilized double tees, which met this SRI, helping the campus meet the Site Selection credit 7.2: Heat Island Effect – Roof.

In addition, the parking facilities incorporated a significant percentage of recycled content through the use of precast concrete. Precast concrete includes fly ash, which is a recycled material. The use of this material helped the project achieve LEED credit for Materials and Resources credit 4: Recycled Content.

Finally, the garages incorporated regional materials, meaning those materials extracted, recovered and manufactured within 500 miles of the project site. This helped to achieve LEED credit for Materials and Resources credit 5: Regional Materials.

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