Sustainability and Precast/Prestressed Concrete

The PCI Sustainability Council has been creating case studies on projects to showcase the many ways in which precast, prestressed concrete can contribute to more sustainable structures. In this issue of the *PCI Journal*, we highlight six structures in six different market segments. Although not all of the structures attained some level of LEED certification, all possess sustainable attributes. Projects range from the Missoula Federal Credit Union, which used a 100%-fly-ash concrete, to a bridge that includes a significant amount of green space.

All case studies are also published on the PCI website at www.pci.org/cms/index.cfm/sustainability/case_studies. To submit information on your recent green building project, contact Brad Nesset at bnesset@thermomass.com, or for more information on PCI's Sustainability Council, please contact Emily Lorenz at elorenz@pci.org.

Sustainability Case Studies

PRECAST CONCRETE & LEED

INTENSIVE MANAGEMENT UNIT, MONROE CORRECTIONAL COMPLEX– IMU/SEG

Project Type:	Correctional
Location:	Monroe, Wash.
Owner/Developer:	Washington State Department of Corrections, Olympia, Wash.
Architect/Engineeer:	INTEGRUS Architecture, Spokane and Seattle, Wash.
Contractor:	Absher Construction Co., Puyallup, Wash.
Precaster:	EnCon Washington, Puyallup

OVERVIEW

The 140,000 ft^2 IMU/SEG project, which scored 37 points on the USGBC LEED-NC rating system, consists of an Intensive Management Unit (IMU) and Segregation Management Unit (SMU). This new facility, constructed at a cost of $277 per ft^2, houses inmates classified as Intensive Management Status (IMS) and inmates classified as Segregation Management Status (SMS).

Two housing wings on both levels of each building have 32 single-occupancy cells, and one housing wing on both levels of each building has 36 single-occupancy cells (four cells for handicapped use), resulting in a total of 100 single-occupancy maximum-security cells for each building. Each wing is located around a control room for optimum visibility. Each housing wing consists of a main level and mezzanine level, with two showers on each level. The wings are divided in half to provide a total of 12 individual pods of 8 cells, or 9 cells where accessible cells are provided. Each pod, including those on the mezzanine, has a dedicated entry door for inmate movement and delivery of services. The administrative-services wing provides support to the housing wings with correctional-staff offices and break rooms, inmate visiting, counseling rooms, hearing rooms, storage space, food services and linen storage, and holding and isolation cells.

Because of the extreme security concerns, the structure consists of precast concrete exterior sandwich walls. All cells, as well as bunks, tables, and stolls within them, are are constructed of precast concrete.

(cont…)

25 PERCENT
amount of baseline energy-use reduction due to precast concrete panel design

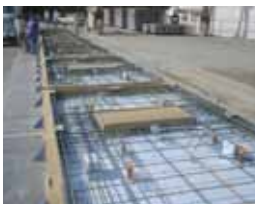
58 PERCENT
reduction in potable water consumption

60 MILES
distance from precast concrete manufacturing facility to the jobsite

PRECAST CONCRETE & LEED

Exterior, IMU/SEG

Interior, IMU/SEG



Precast concrete sandwich wall panels

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The facility accommodates a maximum of 20 employees working in the building and houses a maximum of 200 inmates. Employees are encouraged to take the bus or ride bicycles to work, and all inmates either walk or are bussed to the facility. Van pools are also implemented on the campus for the purpose of ride sharing and other transportation alternatives. During the design phase, design teams worked with the campus to eliminate some existing parking stalls.

The design team also worked with mechanical and electrical engineers to implement better energy-saving strategies by increasing the ***R***-value of the insulated precast sandwich wall panels, installing efficient HVAC control systems, introducing rainwater collection systems, and hiring a commissioning agent to monitor the system's accuracy and efficiency.

While the project was designed and specified to achieve a LEED silver rating, it actually achieved a gold rating. The project contract and documents include the elements of the project and materials that have a high recycled content or were manufactured in nearby neighborhoods. A sign-off letter system was also established in the contract documents to ensure that the awarded contract submitted correct information, recycled-content ratios, and distances from the manufacturers, in order to precede the work.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials & Resources:

Precast concrete systems were incorporated that use a high fraction of local materials, including aggregates, steel, cement, and fly ash, in the concrete. The precast concrete fabricator's plant was less than 60 miles from the jobsite and panels were sized to allow for maximum stacking and a minimum amount of trucking.

The specific goal was to incorporate a minimum of 50% recycled materials, based on material cost. Approximately 97% of construction waste was diverted for repurposing and more than 99% of construction waste and debris was recycled. Additionally, more than 60% of construction materials were harvested or manufactured locally, including the precast concrete wall panels.

Energy & Atmosphere:

A thermally efficient precast sandwich wall panel shell was utilized. The precast concrete panels were designed to exceed the baseline model energy code by at least 25%, and use 27% less energy than comparable noncertified buildings.

Sustainable Sites:

The facility has on-site retention and treatment of stormwater. Precast concrete retention tanks were used as the collector basin.

Water Efficiency:

Rainwater collection is used by toilets in inmate areas. This feature contributes to a 54% reduction in water consumption and a 58% reduction in potable water consumption as opposed to a comparable facility.

Indoor Environmental Quality:

The precast concrete components produce no dust or airborne contaminants during construction or service because the precast concrete elements are fabricated and cured off-site. With the precast concrete components incorporated and the facility constructed, it offers natural lighting for more than 75% of the occupied space.

PRECAST CONCRETE & SUSTAINABILITY

915 WALNUT PARKING STRUCTURE

Project Type:	Parking Structure
Location:	Kansas City, Mo.
Owner:	Simbol Commercial, Kansas City
Architect:	Stott & Associates Architects PC, Ames, Iowa
Engineer:	**FDG Inc., Arvada, Colo.**
Contractor:	The Weitz Co., Overland Park, Kans.
Precaster:	IPC Inc., Des Moines, Iowa

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OVERVIEW

The 915 Walnut Street Parking Structure is sandwiched between two older buildings in downtown Kansas City. The 106,000 ft^2 structure provides 325 parking spaces for the adjacent condominiums. The owner's goal was to create a highly sustainable design and a green presence that would attract attention to the project. To that end, the parking structure features a dramatic rooftop garden. The garden serves as a key selling point for the condominiums. It provides residents with a safe, fun, and beautiful area to have picnics, walk their pets, or just enjoy the outdoors. The 16,000 ft^2 green rooftop area has also created a great deal of interest within the community, being used for public tours, weddings, receptions, and other special events.

The all-precast concrete structure was originally designed as cast-in-place, but none of the design variations being considered could meet the budget or schedule requirements. "This project is an excellent example of the benefits a total-precast concrete solution can provide," explains Michael Stott, principal of Stott & Associates Architects PC. "By switching to an all-precast solution, the cost was reduced by approximately 25%, and the challenging schedule met."

Site conditions were also a challenge. The site was sandwiched between two existing older buildings in a congested downtown area, and the structure was built within 2 in. to 3 in. of those buildings, which were not square. Precast concrete components produced off-site in a controlled environment ensured that precise tolerances would be met. Finished components delivered to the site reduced site impact and construction time.

16,000 FT^2
area of rooftop garden

100 PERCENT
of the parking spaces were covered

25 PERCENT
cost reduction

PRECAST CONCRETE & SUSTAINABILITY

Construction was possible from only one side of the 915 Walnut Street Parking Structure in downtown Kansas City, Mo.
Courtesy of Dirk McClure of IPC Inc.

This section drawing shows the greater number of modified precast concrete double-tees used to support the increased loading of the rooftop garden.
Courtesy of Stott & Associates Architects PC.

A 16,000 ft² rooftop garden, the largest elevated garden in Kansas City, Mo., graces the top of the seven-level 915 Walnut Street Parking Structure.
Courtesy of Simbol Commercial.

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The crown jewel of the facility is its rooftop garden. Additional loading was calculated and provided by IPC, the precaster, to ensure that components would support the added soil and plants and the added load as the trees and landscaping mature. Eight inch double-tees were used to meet this need. The project also called for precast concrete columns, ledge beams, stairs, spandrels, wall panels, and shear walls.

The owner was extremely pleased with the finished product, and the rooftop garden has become an icon in the city. The local chapter of the U.S. Green Building Council has prominently featured this project on its website. The project was also a cowinner in the 2007 PCI Design Awards in the category of Best Sustainable Design.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials & Resources:

All of the precast concrete components were produced locally. Nearly all of the products used to manufacture the components were extracted within a 500 mi radius of the jobsite.

Recycled materials were used in the concrete, including fly ash and recycled steel for the reinforcing bars, strand, embed plates, and connection plates.

Energy & Atmosphere:

All of the parking spaces are covered and approximately 50% of the roof structure consists of vegetation, reducing the heat-island effect.

Sustainable Sites:

The project is in an urban area sandwiched between two older, historic buildings.

Water Efficiency:

Storm water runoff volumes are reduced by absorbing rain into the rooftop garden soil.

Innovation & Design Process:

The rooftop garden is an innovative feature that provides a high-profile green presence for the project and the city.

PRECAST CONCRETE & SUSTAINABILITY

POPULOUS HEADQUARTERS

Project Type:	Office
Location:	Kansas City, Mo.
Owner/Developer:	Opus Northwest, Kansas City
Architect:	Populous, Kansas City
Contractor:	Opus Northwest, Kansas City
Precaster:	IPC Inc., Des Moines, Iowa

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OVERVIEW

The team at Populous (formerly HOK Sport Venue Event), has designed some of the most distinctive sports facilities around the world, including many projects in the United States such as Kohl Center at the University of Wisconsin, Reliant Stadium in Houston, Tex., PNC Park in Pittsburgh, Pa., Oriole Park at Camden Yards in Baltimore, Md., and the new Dallas Cowboys Stadium. These structures have all utilized precast concrete elements in the form of risers, beams, columns, stairs, and wall panels. For the design of its 225,000 ft^2 headquarters in Kansas City, Mo., it comes as no surprise that Populous opted for a total-precast concrete structure.

The project consists of 105,000 ft^2 of office and retail space as well as a parking structure with 400 spaces below grade. The project has several unique features, including an all-glass exterior facade. The total-precast concrete structural system, including columns, beams, hollow-core, stairs, double-tees, and wall panels, was left exposed and can be seen clearly through the 12-ft-tall glass windows. To match the 4-ft-wide window panes, 8-ft-wide precast, prestressed concrete double-tees were utilized so that each double-tee stem lined up at 4 ft on center.

The double-tee stems were left exposed to accentuate the structural aspects of the product. "Sleek, contemporary lines and layering were the driving forces behind the building's design," explains Jon Knight, design principal. "We wanted to create a modern building that sat lightly on its site amid a sea of 100-plus-year-old brick warehouse buildings."

Although not registered with USGBC, this project was built with sustainable features and was recognized in 2007 as Best Office Building in the PCI Design Awards competition. Many project attributes would contribute toward the LEED program as noted in the following.

100 PERCENT
of the parking spaces were covered

8 FOOT WIDE
double-tees align with window mullions

100 PERCENT
of the precast concrete was manufactured within 500 miles of the jobsite

PRECAST CONCRETE & SUSTAINABILITY

HOK's designers implemented sustainable features into the building to maintain the firm's corporate policy of energy conservation and environmental consciousness.

Courtesy of Aaron Dougherty.

The precast concrete frame and many of the connections are intentionally visible through the glass.

Courtesy of Aaron Dougherty.

Columns are left exposed on the interior in order to reinforce the honesty of the materials.

Courtesy of Aaron Dougherty.

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PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials & Resources:

Recycled Content Recycled materials used in this project included: fly ash, man-made sand, reinforcing bars, strand, and embed plates. Fly ash made up a portion of the cementitious materials. In addition to the fly ash, steel products greatly contributed to the recycled content.

Local/Regional Materials 100% of the precast concrete used in the project was manufactured in two plants, both within 500 miles of the jobsite; the Des Moines, Iowa, plant is 200 miles from the jobsite and the West Burlington, Iowa, plant is 300 miles from the jobsite. Additionally, almost all the overall precast concrete components were extracted regionally, within a 500-mile radius of the jobsite. This includes use of local aggregates and nearby cement and fly-ash sources.

Energy & Atmosphere:

While no formal energy-performance testing has been done on the building at the time of this case study, the thermal-mass benefits of an all-precast concrete solution (even un-insulated) are extensive and well documented. The use of precast concrete helps optimize a building's overall energy performance.

Sustainable Sites:

Heat Island Effect – Roof With the exception of the site's perimeter street parking, 100% of the parking spaces are underground or covered by the structure, reducing the heat-island effect in its urban location.

Indoor Environmental Quality:

Construction IAQ Management Plan During Construction The exposed use of precast concrete components and the elimination of more-traditional drywall-based materials with higher volatile organic compounds positively influence the indoor environmental quality. Additionally, the fact that the precast concrete components produce no dust or airborne contaminants during construction or service, influences this credit.

PRECAST CONCRETE & SUSTAINABILITY

FIFTH STREET PEDESTRIAN PLAZA BRIDGE

Project Type:	Bridge
Location:	Atlanta, Ga.
Owner/Developer:	Georgia Department of Transportation
Architect:	Smallwood, Reynolds, Stewart, Stewart & Associates of Atlanta
Engineer:	ARCADIS U.S. Inc., Atlanta
Contractor:	Sunbelt Structures, Inc., Tucker, Ga.
Precaster:	Standard Concrete Products of Atlanta (beams)

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OVERVIEW

Georgia Institute of Technology (Georgia Tech) is located in the heart of Atlanta, Ga. Green space is at a premium on many urban campuses such as Georgia Tech. So when the university expanded its campus and built a new Technology Square on the other side of a major interstate, it took the opportunity to connect its campuses with more than just a bridge. Today, the Fifth Street Pedestrian Plaza Bridge provides an inviting lawn and park-like setting that students gravitate toward and enjoy. The bridge has become a gathering place for movies, tailgating prior to sporting events, and many other campus-approved activities.

The Fifth Street Pedestrian Plaza Bridge is a two-span bridge with a 48-ft-wide roadway. The total width of the bridge is 223.25 ft. More than half of this expanse is green space. Pedestrian walkways, planters, and benches are provided on each side of the bridge. The south side has a white, tubular trellis built over a campus trolley stop. The north side has sloped walkways with dark-red concrete pavers that provide pedestrian access to the lawn and landscaped areas. Landscaping is arranged in multitiered plantings. Nine-foot-high planter walls at the outer perimeter minimize road noise from the high-speed traffic moving under the bridge and screen activity on the bridge that may cause a distraction to motorists.

50 PERCENT
of the bridge deck is green space

9 FOOT HIGH
planter walls minimize road noise and screen activity on the bridge

10 MONTHS
from concept to contract

PRECAST CONCRETE & SUSTAINABILITY

Georgia Institute of Technology is responsible for maintaining the landscaping on the Fifth Street Pedestrian Plaza Bridge in Atlanta, Ga.
Courtesy of ARCADIS: John Bullock Photos.

A typical bridge project for the Georgia Department of Transportation (GDOT) takes between five and six years from concept to contract. This process was reduced to just 10 months by awarding the bridge as a design-build project. ARCADIS U.S. Inc. served as the project designer for the roadway, drainage, and structural designs. Hayward Baker Inc. designed the east abutment. The contractor, Sunbelt Structures & Associates, was responsible for construction of the entire project.

The design-build team, which included architect Smallwood, Reynolds, Stewart, Stewart, looked for the most economical structure for the project. The final design used 74-in-deep prestressed, precast concrete bulb-tee beams, and precast concrete deck slabs, walls, and planter boxes. Standard Concrete Products in Atlanta supplied the bulb-tees, which are a modified version of a standard AASHTO 72 in. bulb-tee beam.

This photo of the Fifth Street Pedestrian Plaza Bridge depicts daily campus hustle and bustle.
Courtesy of Georgia Institute of Technology.

Filled with trees, plants, and soil, the planters and walls were considered as composite dead load. To reduce density, GDOT specified a special lightweight organic soil. ARCADIS was concerned that the deep planter sections would distribute a greater percentage of the composite dead load to the beams under the landscaping, instead of being evenly distributed on the beams. To counter this, beams beneath the landscaping were spaced at closer intervals than those of the other bridge girders.

The bridge spans 15 lanes of traffic and has become a signature feature of the campus. Jim Aitken of ARCADIS remarked, "At bridge level, it is difficult to tell that the Fifth Street Pedestrian Bridge is a bridge at all. It closely resembles a small park with wide sidewalks, grassy lawns, shrubbery, benches, trees, and a trellis that provides shade from the intense sun that beats down on Atlanta." Consistent with its original goals, it provides an attractive and welcoming passage between Georgia Tech's two campuses.

Connecting the main and technology campuses of Georgia Tech, the Fifth Street Pedestrian Plaza Bridge resembles a small park and provides valuable green space for the campus.
Courtesy of ARCADIS: John Bullock Photos.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials & Resources:

Products were sourced and produced locally by Standard Concrete Products of Atlanta. A high percentage of local and recycled materials was used to construct the bulb-tee beams and walls.

Sustainable Sites:

By adding valuable green space, the urban heat-island effect was reduced, minimizing the impact on the microclimate and human and wildlife habitat.

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PRECAST CONCRETE & LEED

MISSOULA FEDERAL CREDIT UNION – RUSSELL STREET BRANCH

Project Type:	Office
Location:	Missoula, Mont.
Owner/Developer:	Missoula Federal Credit Union, Missoula
Architect:	MacArthur, Means & Wells, Missoula
Contractor:	Gordon Construction, Missoula
Precaster:	Missoula Concrete Construction, Missoula

OVERVIEW

When Missoula Federal Credit Union (MFCU) set out to build a new branch office, they encouraged MacArthur, Means & Wells Architects (MMW) to design the most environmentally responsible building possible. MFCU wanted a building that would reflect their commitment to social, environmental, and economic improvements for its members and for the community.

With those goals in mind, MMW quickly went to work analyzing the project site as well as building products and systems. The site selected was not virgin land (it was previously a lumber mill) and was located in the middle of town surrounded by existing services, reducing travel distance to the branch. MMW recommended systems and products that used local trade expertise, supported the local economy, and exhibited good environmental stewardship. Products and systems were evaluated and selected that would minimize the building's embodied energy, including energy used during delivery to the project site, as well as future energy consumption and resource use.

The building pioneered the use of concrete incorporating 100% fly ash (an industrial waste product) and recycled glass, with no portland cement. The mixture was developed by the Western Transportation Institute, which is affiliated with Montana State University in Bozeman, Mont. This is believed to be the first building in the world that does not use portland cement in its concrete. Because Missoula does not have a glass recycling program, the concrete helped create a use for glass that may have otherwise ended up in the landfill. Two citywide glass drives were held to provide glass for the concrete. The mixture was used throughout the building—site-cast concrete included footings, foundation walls, and floor slabs. Precast concrete elements included exterior cladding (wall panels, coping, and headers), interior components (column surrounds, coping, and roof beams), and site elements (site sign, coping for site walls).

In addition to the fly-ash-and-glass concrete, the design team specified other locally sourced and recycled materials throughout the project. Just outside of Missoula, two river dams were removed shortly before construction began. Logs recovered during the clean up were milled and used for the interior wood casing, trim, and light framing. Regionally available exterior cladding made from recycled paper and wall and floor tile made from recycled glass were specified as well.

0 PERCENT

portland cement used in the concrete

45 PERCENT

reduction in potable water use

93 PERCENT

of construction waste was diverted from landfills

PRECAST CONCRETE & LEED

Over 55% of the total building materials, by value, have been extracted, processed, and manufactured within 500 miles of the site. Also, 93% of construction waste was diverted from landfills and over 40% of the total material content, by value, is recycled.

The result is the first LEED-NC v2.2 platinum building in Montana. The project has helped spur interest in functional, innovative, green building design in Montana that supports the local economy. "This building is our mission statement come to life. The technology we are utilizing creates efficiencies in serving our members and the opportunity to educate our community about the green aspects of the project. We have become the green financial institution in our market, and we're proud to carry that moniker," says Joni Walker, senior vice president at MFCU.

Concrete for the precast wall panels contained no portland cement.

The precast concrete site sign used no portland cement in the mixture.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Sustainable Sites:

Built on a former lumber mill site, in an urban area, the project is located with a ½ mi radius of 14 community services and one residential district. Included on the site are; priority parking spaces for alternative-fuel and carpool vehicles, a bicycle storage facility to serve 15% of all building users, and shower facilities to serve 5.8% of building occupants.

The project has provided open space exceeding 96.5% of local zoning requirements. About 63% of the nonroof impervious surfaces are either shaded with trees or paved with highly reflective material (concrete) to reduce the heat-island effect of traditional asphalt. Precast cladding panels were manufactured off-site and quickly erected, minimizing site disturbance and construction waste. No potable water is used for site irrigation. Exterior light fixtures minimize light pollution.

Materials & Resources:

Precast concrete was made from materials harvested, extracted, and manufactured within 500 miles of the site. The concrete used fly ash and recycled glass with no portland cement. Precast panels were produced off-site, eliminating construction waste. Recycled glass was also used for pipe bedding, fine grading, landscaping, tiles, and countertops.

Precast concrete panels and rain-screen construction were used for the exterior of the building, resulting in a high-performing envelope with little thermal bridging. Materials that had high recycled content, were manufactured regionally, or were composed of rapidly renewable materials were specified throughout the project.

Energy & Atmosphere:

On-site photovoltaic energy offsets 12.8% of the building's energy cost. Structural insulated panels for the roof and walls, along with concrete's inherent thermal mass, result in fewer temperature fluctuations and help reduce HVAC loads. Energy-efficient windows, daylighting in occupied spaces, and interior and exterior light shelves minimize thermal gain and bounce light into the interior, and a HVAC system with demand-control ventilation was designed closes outside air dampers when space are not occupied. The project's mechanical and electrical strategies result in a performance rating of 50.8% using the ASHRAE 90.1-2004 Appendix G methodology.

Water Efficiency:

The first gray-water collection and distribution system approved in Missoula provides water for irrigation near the building. Native and drought water plants that require no permanent irrigation system are installed around the site perimeter. Installation of dual-flush toilets and low-flow lavatories, showers, and the kitchen sink will reduce potable-water use by 45.5%.

Indoor Environmental Quality:

Precast concrete contains no volatile organic compounds and is recognized by LEED as a mold-resistant material. Low-emitting adhesives and sealants, paints, carpet systems, composite wood, and agrifiber products were specified throughout the project. Lighting and HVAC systems were designed to allow users to have control over their specific workspaces. Over 75% of regularly occupied spaces are lit with daylight and over 90% of regularly occupied spaces have views.

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PRECAST CONCRETE & LEED

UNIVERSITY OF NORTH FLORIDA SOCIAL SCIENCES BUILDING

Project Type:	Educational
Location:	Jacksonville, Fla.
Owner/Developer:	University of North Florida, Jacksonville
Architect/Engineer:	Smith-McCrary Architects Inc., Jacksonville Beach, Fla.
Contractor:	Elkins Constructors, Jacksonville
Precaster:	Gate Precast Co., Monroeville, Ala.

OVERVIEW

The new Social Sciences Building on the campus of the University of North Florida (UNF) was the first LEED-registered building in Jacksonville, Fla. The school is set in a nature preserve, and administrators wanted to not only create an environmentally friendly project but ensure it blended with its green surroundings.

The $13.3 million, three-story project features 70,589 ft^2 of space, housing offices for faculty, staff, and administration, as well as conference rooms, lounges, and study areas. The centerpieces of the building are five regular and two theater-style classrooms and three teaching laboratories, all equipped with smart technology and wireless communication systems. The building features a variety of environmentally friendly features, including waterless urinals, an emphasis on natural light, energy-efficient heating and mechanical systems, and an irrigation system that uses recycled water.

Initially, designers planned to construct the building using a structural system of brick on steel studs. But after an in-depth series of studies, designers were convinced to convert the exterior wall panels to a precast concrete insulated sandwich wall-panel system. This design provides an increased ***R***-value, eliminates thermal breaks, and enhances energy efficiency.

To add interest to the exterior of the building, the sandwich walls were made with colored, sand-blasted concrete as well as intricate formliners and thin brick. The formliners, which were peeled off after the panels were stripped from the forms, were made with 100% postindustrial recycled content. Also, by using ½-in.-deep thin brick as opposed to 3-$^5/_8$-in.-thick full-bed-depth brick, fewer raw materials were used, brick firing costs were reduced, and more brick was able to fit on a flatbed truck, resulting in fewer trucks on the road and less fuel consumption.

School administrators were so pleased with the outcome that they intend to follow similar construction methods and specifications on future buildings to meet LEED standards. "It won't be the last such project at the university," says John A. Delaney, UNF president. "We're going to do the rest of our buildings in this same fashion," he told reporters at a news conference. "It's a healthy place for UNF students to learn and faculty and staff to work."

20 PERCENT
less energy to operate

30 PERCENT
more efficient than model energy code

$28,210
in annual energy savings

PRECAST CONCRETE & LEED

Exterior architectural finishes included thin brick and light-colored sand-blasted concrete.

The precast insulated sandwich wall-panel system saved energy by increasing the *R*-value and eliminating thermal breaks.

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PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials & Resources:

Building Reuse The Social Sciences Building was built to be a 100-year-plus facility, with exterior precast wall panels designed to extend the life cycle of the facility and withstand even the most extreme Florida climatic conditions. In addition, the wall panels reduced the amount of waste and the overall environmental impact to construct the facility.

Construction Waste Management The system's individual components are 100% recyclable. Scrap materials were taken to a polystyrene recycling center and recycled into other products, diverting them from landfills. In addition, the precaster diverted construction waste during production, crushing the 143 ft^2 of waste concrete in the plant and turning it into road fill.

Recycled Content To reduce the impact from processing virgin materials, the integral insulation system utilized Styrofoam-brand XPS (extruded polystyrene) insulation that contained up to 40% postindustrial recycled content. The reinforcing steel, welded-wire reinforcement, steel connections, and cementitious materials used in casting the panels also featured recycled content. To further increase the recycled content, gray cement that included silica fume and fly ash was used for the interior concrete layer. Gray cement was only used as the interior layer so that the final color of exposed concrete was not affected.

Local/Regional Materials Manufacturing the precast concrete panels at the local precasting plant reduced the environmental impacts of transportation. Because panels embedded with thin brick use less material, more units can be included in each delivery. Approximately 65% of all materials used in the building were manufactured within 500 miles of the site.

Energy & Atmosphere:

The precast concrete wall system used an integral sandwich insulation system that provides an ***R***-value of 24, which is greater than what could be expected by the material alone. The building utilizes 20% less energy than the baseline requirements of ASHRAE 90.1 and is 30% more efficient than required by code. These features resulted in $28,210 in annual energy savings.

Sustainable Sites:

Site Development – Protect or Restore Habitat The panels were erected with crawler cranes, which were kept within 30 ft of the project perimeter.

Heat Island Effect – Non-Roof The panels' light color raises the building's albedo, which is the amount of solar radiation the material reflects rather than absorbs. The precaster used a high-quality white-cement concrete in the faces of the wall panels to enhance their albedo. The result was 47.39% of the area qualifying for a high albedo rating.

Water Efficiency:

The building is estimated to use 2,882,000 gal of total potable water per year and 2,281,000 gal of outdoor potable water per year. The landscape irrigation system was designed to collect the campus reclaimed-water irrigation system for a savings of $15,526 per year. Waterless urinals, 1.2-gallon-per-flush toilets, and sensor faucets were installed. Each waterless urinal was designed to save 40,000 gallons of water per year, providing an estimated savings of 601,000 total gallons per year. This resulted in 31% water savings compared with the baseline design.

Indoor Environmental Quality:

Construction IAQ Management Plan During Construction Precast concrete panels are cast and cured off-site. This eliminates any dust or airborne contaminants from drying or curing of compounds during the construction phase, improving air quality at the construction site. With the precast concrete components incorporated and the facility constructed, it offers natural lighting for more than 75% of the occupied space.

Thermal Comfort The precast concrete panels utilize continuous integral insulation to effectively manage moisture and maintain a constant, even internal temperature.