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RAISING THE (WORLD’S LARGEST RETRACTABLE) ROOF
THE PROJECT

On September 30, 2011, the newly revitalized BC Place officially reopened, less than a year-and-a-half after it was closed for a complete renovation. The ambitious project began immediately after BC Place closed in April of 2010, shortly after serving as Olympic Stadium during the Vancouver 2010 Olympic and Paralympic Winter Games.

Today, the roof is the largest cable-supported, fully retractable fabric roof in the world, at more than four hectares (10 acres). The design allows for the fabric roof to retract into the center node of the roof opening and be hidden above a suspended, four-sided electronic video board.

“Although the new roof has been the focus of attention for many people, anyone coming in here now will understand that the revitalization was much more than that,” says David Podmore, chair of BC Pavilion Corporation (PavCo), which owns and operates BC Place. “This is a complete makeover, starting with the roof, and working its way right through the building.”
THE CONTRACT

“PCL worked in close collaboration with the PavCo team providing effective preconstruction services,” Podmore says, “helping to ensure that the drawings and design were not only constructible but within previously approved budgets.”

PCL worked with PavCo and their design team early, planning and pricing the work. They searched the world to find the best suppliers and subcontractors with the specialized expertise required to complete the project.

In November 2009, after six months of preconstruction, PCL and PavCo signed a fixed-price contract.
GLOBAL PROCUREMENT

The next step was procurement. With only five months’ lead time to bring 18,000 tons of steel and many other custom-made products to the site from other parts of the world, the schedule was tight. Two full-time staff members were dedicated to working directly with international suppliers to check on quality control and ensure timely shipments. To ensure the new roof mechanism would work correctly on opening day, the design was tested at a facility in Washington State before installation. “PCL’s execution was second-to-none in getting equipment and materials onsite and not interrupting work in progress,” says Podmore. “Such organization is indispensable in a project of this size and complexity.”
ENGINEERING FEAT

BC Place was technically a very complex design, engineering, and construction program with many logistical constraints, including heavy construction operations in a congested urban location. Consequently, many adjustments had to be made to accommodate some pretty large components. Each of the thirty-six 14-story, 240-ton masts was shipped in pieces and assembled onsite. They were then lifted into position by a 1000-ton Mammoet RK-8500 crawler crane so large it was brought in on 85 semi-trailer trucks. See www.PCL.com for more information.

COLLABORATION

A project of this magnitude and complexity could not be completed without a collaborative approach that encompassed every member of the project team. “I’m very proud of the positive working relationship that was established on the project,” Podmore said, “and I know that the many men and women who built this facility will remember this project as a highlight of their careers.”

PHOTO: WORKERS BENEATH A SPIDER'S WEB OF CABLES
PROJECT BACKGROUND

CPS Energy is the energy provider for San Antonio, Texas, and is the largest municipal energy provider in the US.

Joint venture partners Kiewit Power Engineers and PCL Industrial Construction Co. (Atlanta) designed and installed a Selective Catalytic Reduction system (SCR) on CPS Energy’s existing 446-megawatt, coal-fired JT Deely Unit II at Calaveras Power Station in San Antonio.

CONSERVING THE STRUCTURE

Rather than demolish all of the existing steel, the team added modified support steel to increase its load capacity. This lessened the risks of hitting underground obstructions that normally exist in older plants. “If we had drilled into a circulating water line,” said Bill Gates, director, Engineering and Technical Services, CPS Energy, “we could have been shut down for weeks, at enormous cost to our business and our customers.”
Another challenge was to erect the new structure at a height of 80 to 185 feet above grade, in the middle of an existing operating unit. An 850-ton crane would optimally sit 180 feet from the work. But this would mean lifting objects directly over the coal conveyor which, if damaged, would shut down the plant and leave part of San Antonio without power. A smaller crane, closer to the center of the work, would affect no existing critical plant equipment, but would force the SCR and steel to be stick built in place, at elevated heights.

The solution was to have the ductwork assembled at a San Antonio shop and transported to the plant. This took the work to an environmentally controlled location and reduced safety risks. “It is part of PCL’s excellent safety culture, for any safety incident, to do prompt root-cause analysis and determine corrective action,” said Gates. “We were very pleased with the attention to safety, which resulted in a TRIR* of less than 1.”

*TOTAL RECORDABLE INCIDENT RATE

Photographs: Opposite — Workers at, and atop, the site. Above — All lifts were individually engineered and documented

“PCL’s quality control process was very open; in fact, we learned a lot from them,” says Lisa Hufstetler, project manager with CPS Energy. “Transparency in this area reflects a general willingness to share information, which really helped operations in the field.”

BUILDING AT HEIGHT

HOW IT WAS DONE
“I do not know how the teamwork could have been any better,” said Gates. “Everyone at PCL was open-minded and seriously considered other people’s ideas. Every important decision was the product of collective wisdom.”

Kiewit Engineering’s design of the new steel structure was a large part of the ultimate success of this project, because the team was able to cut costs and risk by not having to demolish all of the existing steel, but used it to build on top of.

CPS Energy worked daily on a hand-in-hand basis with the joint venture partners. “Planning was superb,” continued Gates. “The way the work stayed ahead of the schedule, in challenging circumstances and at elevation in the midst of a working coal-fired plant, inspires confidence in all involved.”

GROUND-LEVEL MODULARIZATION MEANT THAT FEWER, LARGER ENGINEERED LIFTS WERE DONE OVER THE CONVEYOR, AND SPACE WAS FREED FOR OTHER CRAFTS.
THE SOLUTION SAVED ON TIME AND MANPOWER WHILE CREATING A SAFER WORK ENVIRONMENT.
FOSTERING A CLEANER COAST FOR SAN DIEGO

LOCATION: SAN DIEGO, CA
“AMERICA’S FINEST CITY”

Named “America’s Finest City” for its beauty and ideal climate, San Diego is known as a popular tourist destination, particularly for its miles of sandy beaches. However, many people don’t realize the constant maintenance required to keep the ocean water lining the 70 miles of beaches pristine. With San Diego and Mexico sharing an international border, the need for water entering the ocean to be treated and clean is vital.

THE CHALLENGES

Sewage flowing from Tijuana into the US-Tijuana river valley and ultimately the nearby ocean has caused contamination of the water since the early 1900s. To address this growing environmental concern, the International Boundary & Water Commission (IBWC), a joint effort of the US and Mexico, created the South Bay International Wastewater Treatment plant.
Constructed in the 1990s, the original plant provided only primary treatment. To meet current Environmental Protection Agency (EPA) regulations, PCL was contracted to build the secondary treatment facility. The plant treats 25 million gallons per day (mgd) with expansion capability up to 100 mgd. The civil site work PCL did included deep dynamic compaction and construction of two large cast-in-place concrete tanks, the Activated Sludge Tank (AST), and the Secondary Sedimentation Tank (SST). PCL self-performed a vast majority of the work, which included all facets of the cast-in-place concrete, installation of embedded miscellaneous metals, process and yard piping, and process equipment installation.

OPEN COMMUNICATION

When the PCL team began mobilizing onsite, they discovered that underground utilities
had created a need for shoring on the AST structure. Through the use of virtual construction, the project team determined that by minimally moving the AST structure ten feet south and five feet east, the excavation could be sloped, thus eliminating the need for shoring. The IBWC agreed to move the structure, which resulted in time and cost savings on the project. This early and open communication led to a strong partnership throughout the remainder of the project between PCL and the IBWC. “PCL was proactive and forward-thinking about issues they saw, and quick to respond,” said Steve Smullen, area manager for IBWC.

THE RESULTS

As unique design challenges developed, PCL was able to provide the IBWC with solutions by using virtual construction tools. This commitment to collaborative workflows ensured few design overruns. “PCL’s whole philosophy just makes it so easy to work with them,” said Smullen.

The expansion was completed two months ahead of schedule, allowing the IBWC to meet their vision of providing acceptable water quality essential to the region and to maintain the quality of the beaches.
THE PCL FAMILY OF COMPANIES IS A GROUP OF INDEPENDENT CONSTRUCTION COMPANIES WHICH CARRY OUT DIVERSE OPERATIONS IN THE CIVIL INFRASTRUCTURE, HEAVY INDUSTRIAL, AND BUILDINGS MARKETS.