

Project Sunburst: Mohegan Sun Expansion

Overview

Construction of Project Sunburst, the \$1 billion, 4.9-million-square-foot expansion of the Mohegan Sun in Uncasville, Connecticut, was managed by Perini Building Company, Inc., using fast track methodologies wherein design packages developed by the architects (Kohn Pedersen Fox Associates) and interior designers (Rockwell Group (Casino) and Hirsh Bedner Associates (Hotel)) were prepared as construction progressed over a 20-month construction schedule. Perini was awarded the project in December 1998 for a lump sum price developed from conceptual drawings. By March 1999, Perini was on site, managing critical elements of the site development work. During the preconstruction phase, Perini worked closely with Trading Cove Associates, the project developer, and the project designers to maximize efficiencies on every component of the construction program to compress as many activities as possible into the shortest periods of time.

The individual components of Project Sunburst – the 10,000-seat multi-purpose arena; 115,000-square-foot Casino of the Sky; three-level Wombi Rock; the world's largest planetarium dome; two-level, 135,000-square-foot retail and dining pavilion; a 60-foot-high by 150-foot-wide waterfall (Taughannick Falls), and 34-story, 1,200-room luxury hotel – were significant projects in their own right.

Architectural Theming

The complexity of the work was compounded exponentially by extensive architectural “theming” of the facility that reflected the traditions and culture of the owner, the Mohegan Tribe, and created energetic interior spaces (see attached photos). Many of the theming elements such as Wombi Rock; the 187-foot-diameter, 1,100 aluminum-paneled planetarium dome; and freestanding sculptural trees and glass-beaded canopies were long lead, labor-intensive items, requiring months of preparation and production. Perini recommended to Trading Cove Associates that several specialty contractors be given responsibility for individual themed elements (divided into \$5 - \$6 million packages, some design/build), guaranteeing more focused attention to quality and achieving delivery dates.

Existing Operations

Work on the Phase II expansion could not disrupt operations of the existing, 1.4-million-square-foot gaming and entertainment facility (see Site Plan) whose continued success was essential in generating the revenue stream required to support the financing of Project Sunburst.

Infrastructure & Site Development

A significant effort was undertaken during the early site development stages of the project to route necessary mechanical/electrical/plumbing (MEP) lines from the Central Plant, located on the opposite side of the existing Casino of the Earth, to the construction site.

Construction Sequencing

In order to achieve the greatest efficiency, the Phase II expansion was built from the center of the “podium” (Casino of the Sky and Wombi Rock) towards the ring road along the perimeter of the project site. Parking garages were built to replace surface parking. The construction sequencing (see below, *Managing the Project Team*) began with excavation of 850,000 cubic yards of material, the construction of footings and foundations for the arena and podium areas, and erection of steel for the arena (see attached photos). With the arena topped off and closed-in by September 2000, the construction team’s focus was on completion of the interior of the arena and erection of steel for the base building. In all, the new facility required 148,600 cubic yards of concrete, enough to build a 514-mile sidewalk from the Mohegan Sun to Pittsburgh. The hotel tower would be the last major component on the critical path, topped off on June 8, 2001. Despite trades stacking and joint occupancy of the structure, subcontractors worked cooperatively to achieve the schedule.

Construction Staging

Entrances to the existing facility were reconfigured and a four-level, post-tensioned concrete parking structure (2,500-car, self-park Riverview Garage) was built to replace surface parking areas that fell within the new building footprint and to generate additional laydown area for construction staging. Under a separate design-build package, proposed by Perini to expedite construction, a second 2,700-car pre-cast parking garage with an employee center and public services, such as emergency medical services and fire and police departments, was constructed.

Location of the Arena

Construction of the 10,000-seat arena adjacent to the new Riverview Garage and the existing facility, was an early focus of the project team. The contractor needed to get the roof on the arena as quickly as possible and to back out of the arena area to complete work on the podium. The arena features a 400-foot clear span. The construction team minimized the use of secondary and tertiary bracing members by carefully selecting member sizes. The material costs were higher, but the scheme reduced the cost of fabrication and the duration required to erect the steel (80 days).

Building a mountain within a building: Wombi Rock

At the center of the new facility is Wombi Rock (meaning “white rock” in Mohegan language), a 3-story crystalline structure, 60 feet in diameter and 65 feet tall, comprised of 22,000 square feet of polished onyx and marble.

The Raymond Group of Orange, California was brought in to build Wombi Rock. Perini and Raymond had worked together on several high-end theming projects and confidence was high that Raymond could identify a method of fabricating the 4,300 unique geometric onyx and glass facets that make up the structure and coordinate the global effort to meet delivery dates.

Raymond’s engineering department used three-dimensional programs to develop the structural frame in conjunction with the translucent stone panels that formed the finished structure. Raymond also generated over 10,000 shop drawings to stone, steel, decking and glass fabricators.

The onyx for Wombi Rock was mined in the Middle East and fabricated by Santucci of Carrara, Italy. Santucci brought in Taltos S.p.A. to laminate the onyx slabs to safety glass in 8-foot by 4-foot panels, which were cut to size by Santucci. It appeared as if the schedule for Wombi Rock was secure.

In December 2001, Taltos' factory, north of Torino, Italy, was destroyed by a flood. Production of the laminated stone product was disrupted and meeting the construction schedule appeared to be in jeopardy. The entire project team – Mohegan Tribe, Trading Cove Associates, Perini, Raymond and Santucci – pooled their resources to get the destroyed factory back up and running and to begin delivering the laminated stone product on site. The last piece of stone was affixed to the frame of Wombi Rock on September 25, 2001, the opening day of the new casino.

Pool and Spa Redesign

The 20,000-square-foot, world-class spa at Mohegan Sun and enclosed 10,000-square-foot swimming pool is located on a level above kitchens and restaurants in the facility. Last minute design changes required Perini to operate cranes on the spa level deck slab. Shoring the deck to adequately support the weight of the crane and its loads was impossible. An innovative solution had to be devised to allow for operations to continue. Structural steel grills were designed, fabricated, and laid upon the deck structure, bearing atop the columns so that the loads exerted on the deck would instead be transferred to the columns. Using these grills with mats, cranes were able to walk out to the work area without impacting the integrity of the structure.

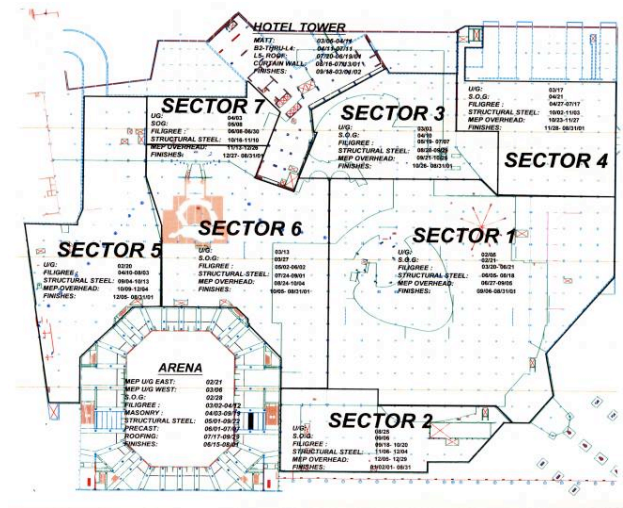
Project Management

Perini has been ranked as the nation’s top builder of hospitality and gaming facilities by Engineering News-Record for the past two years and brings a wealth of experience as a general contractor who self-performs much of its contract work and as a construction manager skilled in large construction programs. Perini also has extensive design-build

experience. This versatility enabled the Company as CM on Project Sunburst to develop and evaluate value engineering proposals (several design-build) and assess the qualifications and capabilities of major subcontractors that could support the aggressive, fast track schedule. In addition, Perini provided preconstruction, technical, and master plan services programmed to meet the needs of Phase II. Perini's goal was to control construction costs, anticipate challenges and offer solutions aligned with the Mohegan Tribe's interests and objectives.

To manage the construction effort, Perini assigned Harry Coldreck, then-Vice President of Perini and skilled manager of large construction programs, to serve as Project Executive. Perini brought together 75 individuals, many of whom were seasoned veterans of the Company's work on similar projects in the U.S. The management team also included many young recruits who brought energy, enthusiasm and creativity to their roles.

The simultaneous execution of three separate project components, the arena, podium (Casino of the Sky and Wombi Rock), and hotel, required Perini to organize its staff to manage each of the major areas from procurement through construction. Prior to groundbreaking, project managers were dedicated to each of the three areas and multiple baseline schedules were established for each component. Each had its own timeline for structure through enclosure and its own finish schedule. Because of its size, the podium was subdivided into seven "sectors" with specific construction milestones assigned to each.



Perini worked closely with each of the major subcontractors (see attached list) to execute the construction program. The project team relied on the experience of the construction team – many of whom were AGC of Connecticut members -- to exchange ideas with the design teams to propose alternative means, methods and materials as appropriate. For example, theming elements drove the critical path for much of the project. Glass beaded tensile canopies specified by the designers were hand-strung in India. Alternative, less expensive methods were proposed (such as pressing multi-colored beads between two sheets of corrugated glass to achieve a beaded appearance), but the Owner was intent upon attaining the highest quality products available, true to the designer's vision and the customer's expectations. Using full-size CAD drawings laid upon the floor of the fabrication room in India, workers strung the beads as per the specification of the Rockwell Group, the interior designer of the gaming and retail areas.

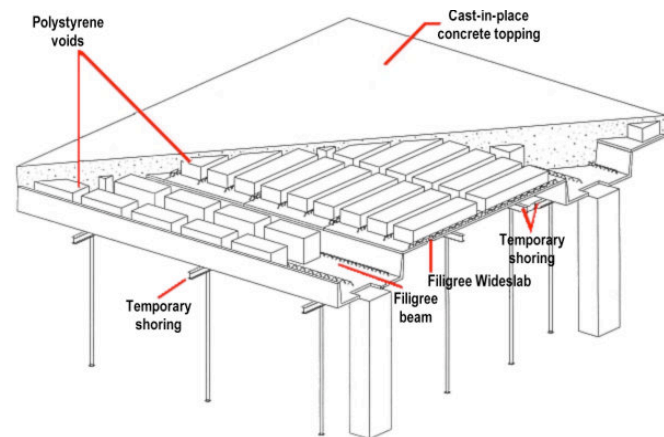
A formal partnering process was not implemented on this project, the construction team met regularly with the developer and architect(s) and weekly with the Mohegan Tribal

Council to discuss concerns and resolve issues quickly (see attached Letters of Commendation, Mohegan Tribal Council and Trading Cove Associates).

Innovation in construction techniques or materials

To maximize efficiency, Perini sought methods and materials that would be typical and require repetitive operations. The shoring, formwork, and stripping of conventional deck forming systems for example, would not support Perini’s aggressive schedule. The use of the “Filigree” hybrid forming system – prefabricated reinforced concrete beam and wide slab panels that replace traditional formwork and become an integral part of the finished deck -- resulted in a 25% savings in schedule duration for the podium structure (Casino of the Sky, Wombi Rock, and retail area). The panels, used as forms, became a monolithic unit with the balance of the reinforcing steel and the upper, poured-in-place concrete layer of the deck slab. Perini placed styrofoam on the wide slab panels before the concrete was poured, creating a waffle slab, which is a faster and less expensive construction process. When temporary shoring was moved as construction of the deck slab progressed, the smooth underside of the filigree panel became the finished ceiling of the two parking levels below the podium.

Use of the filigree system cut labor and consumable materials costs and enabled Perini to build enough deck to support an early start in steel erection and an early start to M/E/P work on the lower levels.



Innovative technology employed on the project

Project Sunburst team members shared and accessed documents through web-based software, BlueLine Online, reducing expenses associated with paperwork, postage, printing, and travel; increasing document security and tracking; reducing delays in communication; and improving productivity. Perini utilized Primavera scheduling software and Meridian Project Systems’ Prolog for document management (also, see “Filigree System” and “Wombi Rock” above).

Excellence in client service

“We relied on Perini to provide us with the wealth of their experience to assist us in the assured decision-making process required by a project of this magnitude.”

Len Wolman, Managing Partner, Trading Cove Associates

Perini brought experienced resources to work on the Phase II expansion of the Mohegan Sun. The Company drew on its relationships with specialty subcontractors to execute difficult and problematic themed elements of the facility. The Company utilized its own in-house resources with hands-on experience in hospitality and gaming construction, assigning many of its best building specialists to this project. Construction managers, area supervisors, engineers and general superintendents were brought to Connecticut from throughout the United States to apply their talents to meet the Owner's expectations.

The owner expected the highest quality at a reasonable cost, delivered on time, according to schedule. The Casino of the Sky was opened on September 25, 2001 and the Hotel was opened under a phased occupancy plan and completed in June 2002.

Our contribution to the community

As leader of the construction team, Perini encouraged subcontractors, vendors and individuals to contribute to local community services and local causes that improved the quality of life on the Mohegan Reservation or in the surrounding region (see attached list). It is important to note that the greatest contribution to the community may have been the opportunities afforded to experienced and fledgling Native American-owned businesses that qualified under the Mohegan Tribe Equal Rights Ordinance (TERO) program to participate on this impressive project. Under the TERO program, qualified Native American subcontractors (from any tribe, not just members of the Mohegan Tribe) were provided with bid package materials and offered equal footing in the competitive process. Several small firms forged strategic alliances with larger and more established subcontractors or specialty contracting firms, extending their capacity and work experience. Native American-owned firms represented various building trades and disciplines including finish woodwork, landscaping, painting, tile, ironwork, electrical, and concrete supply.

The success of the construction process at Project Sunburst garnered a great deal of attention from the local and national press (including *ENR* and *New York Construction News*). Ground breakings, topping off ceremonies (Arena and Hotel) and dedications were crowded with television and newspaper reporters and attended by notable figures such as CT Governor John Rowland and former president, Bill Clinton. It is important to note that the Mohegan Sun's public relations department was extremely helpful, enabling contractors to communicate the positive results of Project Sunburst.