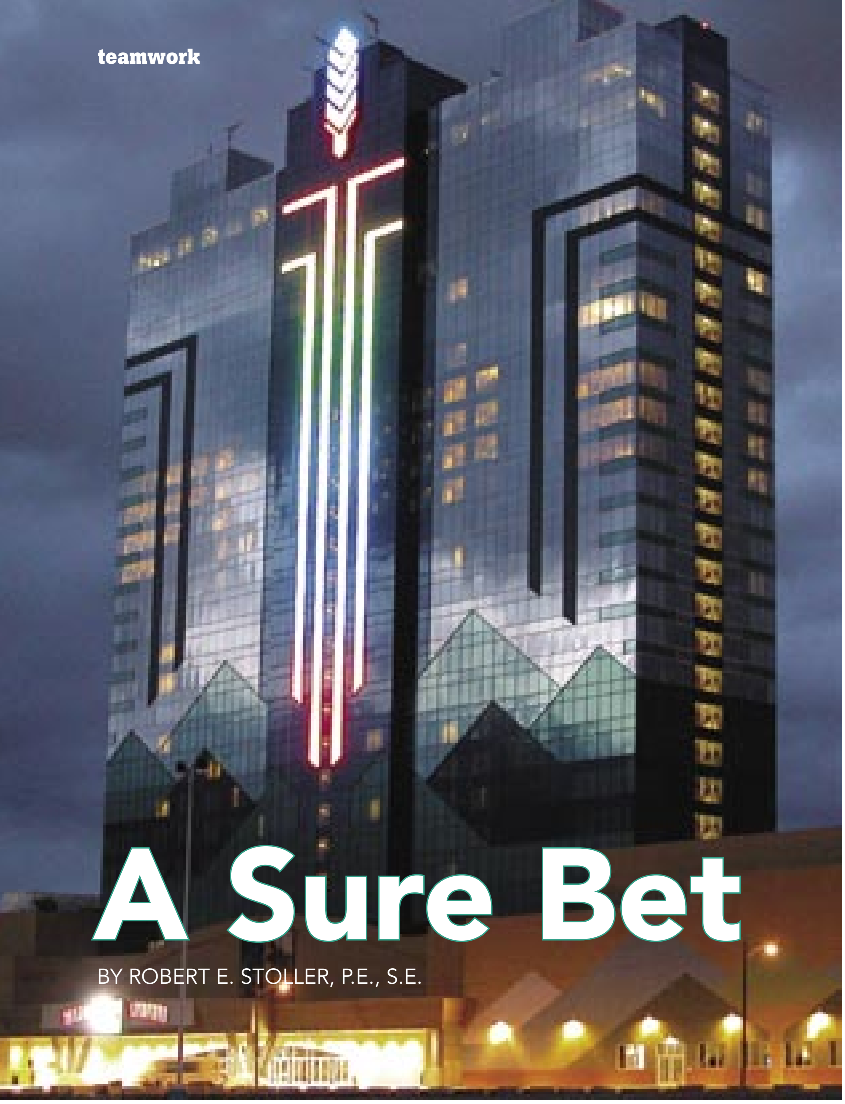

A Sure Bet

BY ROBERT E. STOLLER, P.E., S.E.

Design and construction team communication make this Niagara Falls casino complex a winner.

AN UNFORTUNATE FACT OF LIFE IS THAT SWIFTNESS AND ECONOMY ARE NOT ALWAYS BEDFELLOWS. When trying to achieve the two, cooperation and communication are key. The recently completed Seneca Niagara Hotel and Casino expansion in Niagara Falls, N.Y., is proof that even a conventionally bid project with an aggressive fast-track schedule can be built smoothly and economically.

Expedient Erection

The Seneca expansion is a 26-story, 700,000 sq. ft facility incorporating over 6,400 tons of structural steel. The first hotel tower bid package was issued in May 2004, and erection of the hotel tower steel, using imported jumbo shapes, began in August 2004. The tower was topped out in February 2005 and the facility opened December 30, 2005.

Early on, two tower cranes expedited erection. Typical steel framing and metal decking were completed at the rate of two floors per week. The steel was erected so quickly that it moved off the critical path and was out ahead of other trades. One tower crane was removed so that the balance of the project could catch up to the steel erection. If both cranes had remained, the actual topping out could have been accomplished as early as December 2004.

What made this project go so well? I asked participants to explain why they thought the project went smoothly, and share tips they picked up along the way.

Structural Design

With overall economy in mind, the structural engineering team at Wendel Duchscherer Architects and Engineers made some decisions to set the project on the right track and facilitate construction. Amongst their choices and conclusions:

- Prior to bidding, the construction manager placed an order for the 605 tons of jumbo steel shapes required for the lower level columns. These sections, up to W14×665, were not available domestically. They had a several month lead time and were ordered through Arcelor Steel in Luxembourg.
- The project was competitively bid to an invited group of qualified fabricators.
- The 26-story tower was the element on the critical path for steel delivery. It was bid separately from the balance of the project. The adjacent low rise spaces took longer to finalize both programmatically and architecturally. These were issued in two later steel packages negotiated as change orders with the successful bidder.
- Wendel Duchscherer was hired by the owner to spend a great deal of time on-site during construction. Field questions were handled immediately, allowing work could continue without interruption.
- It was specified that the steel fabricator must be AISC Certified for complex steel building structures.
- Connections were schematically detailed and loads provided on the drawings, but the fabricator was allowed to select connections suited to their shop practices.
- Floor framing and bracing alternatives were designed and evaluated for both economy and ease of erection.

- Perimeter steel beams and girders were connected directly to the exterior column flanges. This minimized the pour stop cantilever.
- Steel members were selected to maximize the use of similar shapes.
- Columns were designed in two-story lifts.
- Columns were sized such that column doubler plates and stiffeners were not necessary.

Establishing Flow

The result of the competitive bid proved fortunate. The project was awarded to Buffalo Structural Steel Construction Corporation, whose corporate office was located less than one mile from the Wendel Duchscherer structural office. Fabrication was in their Titusville, Pa., plant about 100 miles from the job site. Buffalo Structural Steel assembled an experienced team which included a detailer, Ram Drafting Ltd.; a connection engineer, Gary Violette, P.E.; and an erector, Contour Steel Company, an AISC Certified steel erector.

A kickoff meeting was immediately held where all parties met face-to-face and discussed issues critical to expediting the steel ordering, fabrication and erection. Procedures were established to speed the flow of information between parties.

Fabrication

Cooperation between project managers allowed the team to pursue the owner's aggressive schedule. According to Thomas Latona, President of Buffalo Structural Steel, $4.5 million of additions to the contract were added—including the low-rise buildings—within the original five-and-a-half month schedule. Other notes include:

Changing the Skyline

A SLEEK, STEEL-FRAMED STRUCTURE LIGHTS THE NIGHT SKY ALONG THE NIAGARA RIVER IN UPSTATE NEW YORK. At approximately 360 ft and showcasing a five-color glass façade and LED-lit features, the 604-room hotel is part of the expanded Seneca Niagara Hotel and Casino. The casino, which was opened in 2002 by the Seneca Nation of Indians, was constructed using the former Niagara Falls Convention Center, a 1971 Philip Johnson and John Burgee design. At the time, JCJ Architecture master-planned the designated 50-acre site of the casino to accommodate future hotels and parking facilities, with the vision to make this a first-class destination resort. A 2,500-car, five-story parking garage soon followed.

In late 2003, Wendel Duchscherer Architects and Engineers was retained to provide structural and civil engineering, and surveying services for a new luxury hotel and casino expansion. The project quickly grew from 11 stories to 26 stories, including a 35,000 sq. ft casino expansion and a 170 ft by 150 ft column-free special events center. In all, the total project contains over 700,000 sq. ft of new construction at a cost of $226 million.

A Rigorous Schedule

Due to the project's size, it was developed under an extremely fast-track schedule where design and construction were completed within a two-year time period. Alternate floor framing and lateral bracing systems were quickly developed and evaluated for overall economy and speed of erection. The schedule required building in all seasons, even the usually exterior-construction-stopping western New York winter. It was soon decided that only a steel-framed structure could meet the schedule's needs.

New York State adopted the new IBC 2000 Building Code in January 2003, making the Seneca one of the first high rise buildings and certainly the tallest in western New York to be designed under this much more stringent Code. Previously, the New York Code had no seismic design provisions.

The typical hotel floor framing system selected maximizes economy and minimizes the floor-to-floor height. It consists of composite steel beams at 14 ft 6 in. on center supporting 3-in.-deep composite metal deck and 3¼-in.-thick lightweight concrete. Typical floor beams are located within the hotel demising walls so that only the metal deck floor slab impacts the clear ceiling height within each room. This allows the typical hotel floor-to-floor height to be only 11 ft 4 in.

The typical floor plate is 75 ft wide by 257 ft long, and is three bays wide by nine bays long. Since the hotel tower is a tall, slender structure, the high aspect ratio required an innovative lateral bracing system. For the broad face direction, Wendel Duchscherer selected a braced frame system located within the demising walls of the hotel rooms. It consists of two-story-tall "super" diagonals within the blocks of rooms on either side of the floor plan. Adjacent bays had the bracing start on alternate odd- and even-numbered floors. This two-story diagonal system allows the placement of doors connecting adjoining rooms that were not impacted by structural braces. Vierendeel trusses span the hotel corridors at about every four floors to tie the two braced bays together and minimize overall building deflection.

In the narrow face direction, ordinary steel moment frames are located at the two interior column lines. The floor plate steps outward near the center of one long face of the building, precluding

Perimeter beams and girders were connected to the exterior flanges of perimeter columns to minimize the slab pour-stop cantilever.

- Shop drawings were hand-delivered between the structural engineer and the Buffalo Structural Steel office.
- Shop drawings were processed quickly according to a submittal schedule. Most submittals were turned around in one week or less.
- To meet the schedule, two tower cranes, two raising gangs, two detail crews, and two welding crews were used.
- In all, over 5,500 pieces were fabricated. Fit-up problems were encountered only in a handful of instances.
- The special events center had two 150-ft-long trusses supporting the main roof and two 73-ft-long secondary trusses. These were fully assembled in the shop to facilitate fit-up. They were shipped in 50-ft-long sections to the site and erected using two temporary support columns.
- Things went so smoothly that there were no back charges from the erector.

Detailing

According to those who worked on the project, almost every aspect of the Seneca project was bettered by this increase in communication and flow. "This was the best job we've worked on in 20 years. I cannot remember a steel building with this many pieces going through our office with so few questions or clarifications," said Ron Sawatsky of Ram Drafting. "The downside? We were not given an opportunity to delay the job!" Detailing highlights include:

- The engineering drawings were clear and all pertinent information was provided.
- Ram Drafting was allowed direct contact with the structural engineer. "We not only got answers instantly—virtually the same day—but were also thanked for our due diligence," said Sawatsky.
- Moment frames and columns were sized to eliminate stiffeners and doublers. This provided the best overall economy and greatly simplified both the connection detailing and erection.
- The detailers could look over the shoulder of the connection engineer to design economical connections without anyone's ego getting in the way. They would then submit the preliminary designs to the structural engineer and receive approval or comments within a 24-hour period.
- Shop drawing submittals were expedited through the detailer's office (upon receipt from the EOR) and into the shop, largely due to increased and speedy communication between the detailer and the EOR.

Connection Engineer

For connection engineer Gary Violette, the initial in-person meeting was invaluable. Talking directly to the EOR established the basics of what was needed for the project, and was highly recommended for the amount of time and trouble it saves. While all involved parties were qualified and committed to doing a good job, it was the open exchange that made the difference for Violette. "The team members all saw their roles as problem solvers," he said. "I was allowed open communication with the structural engineer, and became part of the design team."

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the use of perimeter moment frames. Using the seismic response modification coefficient R = 3 in both directions proved to be a very economical solution by negating the need for seismic detailing.

The Seneca Event Center is a 170 ft by 150 ft, multipurpose entertainment and meeting room. This space is column-free, with two 14-ft-deep trusses spanning the 150 ft dimension. Secondary trusses are framed perpendicular to these main trusses at midspan. These in turn support long span bar joists. Due to its multipurpose function, folding partitions and numerous 8,000 lb rigging loads are designed to be hung from the roof framing.

Moving Right Along

The building was completed on schedule. The structural component bid packages were all delivered on or before the dates requested. The innovative structural steel framing system of the tower saved several hundred tons of steel from the construction manager's original estimate.

The building process also implemented a complete program of Special Inspections outlined in the new building code. This was voluntarily done by the Seneca Nation of Indians (the hotel is built on sovereign nation land) to ensure quality construction. By not waiving Special Inspections, this project helped to establish this new process for the entire Western New York region.

— Robert E. Stoller

Owner
Seneca Gaming Corporation, Niagara Falls, N.Y.

Architect
JCJ Architecture, Hartford, Conn.

Structural Engineer
Wendel Duchscherer Architects & Engineers, Amherst, N.Y.

Engineering Software
RAM Structural System, StaadPro

Detailer
Ram Drafting, Ltd., St. Catharines, Ont. (NISD member)

Fabricator
Buffalo Structural Steel Construction Company, Amherst, N.Y. (AISC member)

Connection Engineer
Gary Violette, P.E., Windsor, Conn.

Erector
Contour Erection and Siding System, Eden, N.Y. (NEA member)