Benefits of Early Steel Detailing

BY MATT TRAMMELL, P.E.

The ability to quickly reach decisions as construction documents are being developed streamlines hospital project.

WHEN OUR LADY OF LOURDES HOSPITAL in Lafayette, La., decided to build its new 378,000 sq.-ft, six-level replacement hospital and 16,000 sq.-ft central energy plant with a $211 million construction budget and overall construction schedule that would allow for only five months to erect 3,000 tons of structural steel, the design team knew that a significant challenge lay ahead. Brentwood, Tenn.-based TRC Worldwide Engineering, the structural engineer of record (SER), decided to meet this challenge head on by being proactive and actively participating in discussions in meeting the owner's proposed budget and construction schedule. Typically, a structural engineer can offer marginal assistance with the overall construction schedule and construction budget. However, when the structural engineer is also the structural steel detailer, this influence is significantly increased.

Early in the design process, the owner brought on board the joint venture of The Lemoine Company LLC and Brasfield & Gorrie LLC as the contractor. That step was crucial in efforts to meet the schedule and budget. Collaboration between contractor and the design team allowed the selection of not only the most cost effective structural system but also the structural system that could be constructed in the least amount of time.

The first system considered consisted of composite structural steel with reinforced concrete shear walls at the stair and elevator cores to minimize disruption of the floor plan with braced frames. However using that approach meant delaying steel erection by several months while the shear towers were constructed.

The second system to be considered was a total cast-in-place concrete structure that would allow for the columns and floor system to be constructed concurrently with the shear towers. That system would have resulted in delays by the design team because initial column grids and floor layouts were based on a structural steel system. Further, a concrete structure is significantly heavier than a structural steel system resulting in heavier, more expensive foundations.

The selected structural system consisted of composite structural steel framing with a 6¼-in. lightweight concrete floor

Opposite page: The contractor's plan to speed construction by using multiple cranes meant steel detailing and fabrication had to be completed quickly. Importing the 3D model from the design software into the detailing saved a great deal of time in this regard.

slab and concentrically braced frames. The architect agreed to the use of braced frames because of their economy relative to other lateral systems as well as the ability to maintain the construction schedule by using them.

Once the structural steel framing system was selected, TRC WW proposed to also develop the structural steel shop drawings for the steel fabricator concurrently with development of the structural construction documents, a process also known as Early Steel Detailing. To aid these efforts, the steel fabricator and steel erector were chosen by the contractor much earlier than usual in the construction process. The goal of such a proposal was to allow steel mill orders to be placed and shop drawings to be completed for certain erection sequences such that steel erection could begin immediately following the release of construction documents. At the time of the proposal, it was estimated that at least two months of construction time could be eliminated if the Early Steel Detailing process was implemented.

Once the design team and construction team agreed to Early Steel Detailing, the feedback obtained from the contractor, fabricator and erector with regard to sequencing and fabrication preferences became vital to the design team and steel detailer during development of documents. Construction documents were released by the design team on May 12, 2009, and steel erection began on June 8, 2009.

Structural steel shop drawings were prepared using SDS/2 using the engineering model prepared with RAM Structural System and imported directly into the detailing software. The steel detailers would not have been able to keep up with the aggressive erection schedule had it been necessary to recreate a detailing model from 2D drawings. Importing the engineering model initially took place in December 2008, three months before issuing the structural steel package and five months prior to the final construction document release package. This initial detailing model was used to develop an advanced bill of material to allow the contractor to schedule rolling dates for the heavy W14 columns, which had a longer lead time.

Importing the engineering model took place seamlessly several more times during the design process

Adopting an Early Steel Detailing process enabled creation of advanced bill of materials so the order could be placed for the heavier W14 columns, which had a longer lead time.

incorporating owner/architect requested design modifications that are inevitable in a project of this complexity. In this case it included the decision to construct an additional floor level that initially was planned to be constructed at a future date.

The steel erector planned to use three cranes to erect three sections of the structure simultaneously. To support the erector's aggressive schedule, the structural steel had to be detailed in time to be fabricated and transported to the job site. TRC WW structural engineers expedited that by in most cases reviewing and returning the shop drawing approval comments to the detailer prior to their being released for contractor/

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The architect's use of structural steel braced frames instead of concrete shear walls expedited the construction schedule.

architect approval. Thus the approved drawings could be released for construction as soon as the steel detailers had addressed comments from the contractor and architect.

In addition, during development of the steel shop drawings, no formal RFIs were issued by the detailer relating to clarifications in the structural contract documents. All discrepancies and detailer requested preferences not affecting construction or architectural requirements were handled internally at TRC WW without the time consuming process of preparing and documenting RFI responses.

Less than five months after erection began, the majority of the 3,000 tons of structural steel has been erected and construction of the structure is on schedule. Early Steel Detailing was vital in maintaining this schedule and its implementation was possible only through the tireless efforts and collaboration of both the design and construction teams. MSC

Owner
Our Lady of Lourdes Hospital in Lafayette, La.

Architect
The Estopinal Group-Jeffersonville, Ind./ HOK, St. Louis

Structural Engineer and Steel Detailer
TRC Worldwide Engineering, Inc., Brentwood, Tenn. (AISC Member)

General Contractor
The Lemoine Company LLC (Lafayette, La.)/Brasfield & Gorrie LLC (Birmingham, Ala.) Joint Venture

Steel Fabricator
Cives Steel Company, Rosedale, Miss. (AISC and SEAA Member)

Steel Erector
Bracken Construction-Jackson, Miss. (AISC and SEAA Member)

Software
SDS/2 and RAM Structural