

Building **Better**

Joele Fowler, P.E., S.E.



EDI speeds up the steel design and construction for the Baptist West Hospital in Knoxville, TN.

In just a few decades, the structural engineering profession has progressed from portal frames and moment distribution by hand and slide rule, to three-dimensional, finite-element modeling programs that can map out and solve the entire geometrical, loading and stiffness matrices for almost any size and shape of building. The Baptist West Hospital in Knoxville, TN, is an example of how the capabilities of the RAM Structural System can be interfaced with SDS/2 detailing software using CIS/2 technology to streamline design, detailing, fabrication and erection on a fast-track hospital project.

Carpenter Wright Engineers, P.L.L.C. was the structural engineer of record for this project. The 350,000-sq.-ft Baptist West Hospital comprises a

three-story women's hospital, a three-story surgery center appended to a five-story patient wing, and a four-story medical office building. The design process was divided into phases for each area of the building, and the overall project schedule was approximately 21 months.

Several portions of the building had to be designed with future expansion in mind, so Carpenter Wright designed in accordance with the IBC 2000 Building Code even though 1999 SBC governed. One future floor for the women's hospital was added during the design phase.

PROJECT DELIVERY

The project was set up as a Construction Manager at Risk, and the selection of subcontractors ran

CIS/2 SPEEDS PROJECT DELIVERY

concurrent with the design phase. Design began in August 2001 and drill rigs hit the ground a month later in September. With a 120-day turn-around time on the caissons and grade beams for Phase I—The Women’s Hospital, the contractor had to set columns by the last week in January 2002. The structural steel and slab had to be in place so the brickwork and dry-in process could begin. Meeting the structural steel design, detailing and fabrication schedule would determine if the whole project schedule would be met.

During the selection process for the structural steel fabricator, general contractor Johnson & Galyon inquired if Carpenter Wright would be receptive to sharing files to facilitate a CIS/2 electronic data interchange between the engineer’s RAM Structural System software and the fabricator’s SDS/2 detailing software. Carpenter Wright responded affirmatively, provided that certain rules and agreements would be in place.

ELECTRONIC EXCHANGE

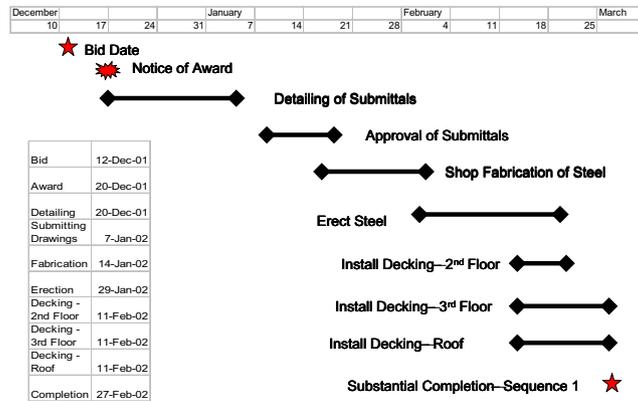
Carpenter Wright had worked with fabricator AISC-member Superior Steel on several successful fast-track projects. Upon completing the Phase I model and file-transfer paperwork, Carpenter Wright e-mailed the files to Superior Steel. Superior converted and imported the file. Fifteen-hundred tons of structural steel building was now visible in three dimensions. In a matter of 10 minutes, Superior went from knowing only the name and location of the project to being able to view a detailed sheet showing the beam size, fabricated length and punched-hole locations of specific beams. There was still work to be done on modeling edge conditions, cladding support details, and other miscellaneous framing details that were not incorporated into the RAM Steel design package; but less than three weeks from design completion, Carpenter Wright received a structural-steel shop-drawing package

The use of the CIS/2 electronic data interchange format to transfer structural information from the engineer to the detailer helped speed the fabrication of steel for Baptist West Hospital—and the completion of the entire project

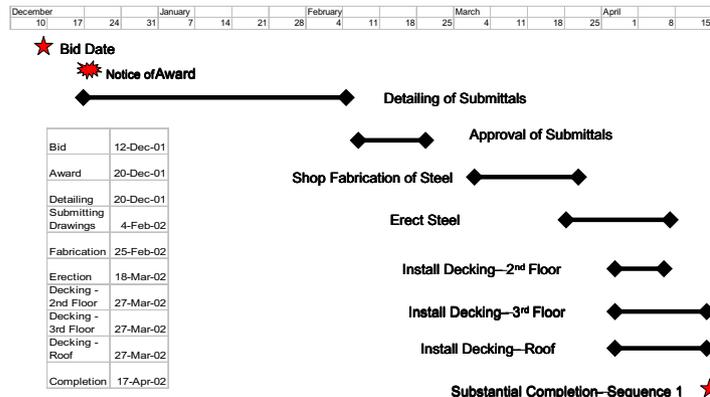
CIS/2 saved time for fabricator Superior Steel on the shop-drawing production side. Superior Steel was able to download structural information from Carpenter Wright using CIS/2, and could quickly get to work on shop drawings. Instead of the typical six-or seven-week time period that it might take for fabricators to submit shop drawings on a project of this magnitude, Superior Steel was able to send checked shop drawings for the first 500-ton sequence of the project only two and a half weeks after being awarded the project. Careful pre-scheduling allowed Carpenter Wright to shorten their normal two-week shop-drawing review process down to one week. This initial head start pushed fabrication and erection forward, and was essential for successful fast-track project completion.

As shown below, if Baptist West had not shared the electronic model through CIS/2 data interchange, it is unlikely that erection would have begun before mid-March, 2002; but using EDI and a teamwork approach, erection kicked off at the end of January, saving about seven weeks. For more information on EDI and CIS/2, visit www.aisc.org/cis2.

ACTUAL SCHEDULE



TRADITIONAL SCHEDULE





Steel erection kicked off at the end of January 2002, saving seven weeks in the overall construction schedule.



By January 2003, the project was approaching completion.

for the women's hospital. The remaining phases followed with similar results.

MUTUAL TRUST

There were certain ground rules in place so that Carpenter Wright could comfortably share RAM files with the fabricator. The terms are similar to those used when a fabricator shares electronic drawing files to aid in shop-drawing production. Essentially, these files are provided as aids; all dimensional confirmation and coordination is the responsibility of the steel fabricator, and ultimately the hard-copy drawings govern.

Trust was a big component for the success of this project. Carpenter Wright worked to develop a cordial relationship with Superior Steel. Communication, project organization and the ability of the owner and architects to make timely decisions were essential to produce a project of this scale on a fast-track schedule.

There are benefits to be realized by using file transfer interface programs in the shop-drawing preparation phase. In order to become established as a normal mode of operation, file transfer interface programs must assure engineers that providing files will not increase liability and exposure if there is a problem with the model. As long as the proper checks are in place and each party understands what is expected from the other, any potential added risk can be eliminated. ★

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ARCHITECT

Barber & McMurry Inc., Knoxville, TN

STRUCTURAL ENGINEER

Carter Wright Engineers, P.L.L.C., Knoxville, TN

GENERAL CONTRACTOR

Johnson & Galyon, Knoxville, TN

DETAILER, FABRICATOR AND ERECTOR

Superior Steel Inc., Knoxville, TN, (AISC member)

ENGINEERING SOFTWARE

RAM Structural System

DETAILING SOFTWARE

SDS/2

Meeting the structural steel design, detailing and fabrication schedule would determine if the whole project schedule would be met.