Right: View of Broward County Regional Library showing roof and floor steel during construction.

Middle: Interior view of the first floor of the Broward County Regional Library.

Bottom right: Interior view of the lobby of Broward Community College satellite campus building.

Bottm left: Exterior view of the front entrance of Broward Community College satellite campus building.

A NEW DIMENSION to Design-Build

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Interior view of the first floor of the Broward County Regional Library.

Design-build has become increasingly popular with public and private clients, creating an ever-expanding group of design-build providers. The Haskell Company (THC), located in Jacksonville, FL, has added a unique in-house capability, a Steel Fabrication Section, to enhance their capabilities in design-build projects.

The advantage of having an in-house steel fabricator, compared to traditional arrangements between contractors and steel fabricators, is the mutual knowledge shared through joint technical training, collegial luncheons and engineers' visits to the steel shop. In addition, knowing the scope of each other's work and having a better understanding of each individual's capabilities and workload makes Haskell's integrated system a truly efficient one. The integrated team is also able to share problems, solve them quickly and communicate this information so the team can learn from each experience.

There are also cooperative strategies of finding the best solutions and synergizing design, fabrication and erection needs. Quick turnaround is achievable in evaluating costs of alternative concepts, which results in faster decisions for the client and an earlier project start. By having control over a critical subcontractor (the steel fabricator in this case) and being able to work out the delivery of structural steel to the job, THC could optimize the project schedule.

Another advantage is that material availability can be checked with a phone call, and mill orders can be made if it fits the project schedule. The work can also be subdivided into the best delivery packages that suit the construction schedule without penalizing anyone for partial deliveries or being charged for storage. In most cases, steel is fabricated to ship almost immediately, so there is very little need to store the finished product. This joint sharing of responsibility and knowledge continues to lead to cooperative efforts in solving problems. There is no wasted energy in placing blame; instead the energy is used to find solutions that are best for the client and also the company.

How We Do It

One way Haskell achieves this synergistic arrangement is through data sharing. The entire company is linked by one network, where sharing of information happens with a push of a key on a keyboard. The most current design drawings are downloaded to steel detailers to use as a base in the detailing. In addition, preferred details have already been collegially worked out between the engineers and detailers, which minimizes requests for information (RFIs) and change requests during project work.

Many elements such as stairs, tilt-up embeds, column anchor bolts, column base and cap plates have been standardized; therefore, shop drawing approval is not required. These items have been pre-designed, detailed, submitted and approved in advance, so there is no need to keep submitting them. This greatly increases the speed of the process. Having an in-house fabrication shop also provides construction project managers more accurate and timely cost data on a project,always helpful in making sure a project gets off to a good start. The engineers also have access to any spare inventory of steel and can help minimize waste.

A significant component to the efficiency of steel fabrication is the shop drawing process at Haskell. It is not a typical industry standard of processing shop drawings; all bases of a "normal" process are covered more efficiently and, consequently, faster.

Project Example

An excellent example of this cooperative effort is the construction of City of Pembroke Pines' Academic Village in Broward County, FL. Haskell Ed ucation Services (HES), an educational development organization offering turnkey services for all aspects of charter school development, provided turnkey services for the Academic Village, beginning with site evaluation and culminating with design, construction and educational management. The Academic Village includes an innovative charter high school, consisting of five buildings for a total of 1,464 students. There are three 11,700-sq. ft. classroom buildings, an 8,600-sq. ft. administration building and a 44,000-sq. ft. multipurpose building. Also included on the site is a 78,000-sq. ft. Broward County Regional Library, a 12,700-sq. ft. satellite campus building for Broward Community College, a joint-use community recreational facilities and a 19-acre environmental park. This 72-acre campus was constructed in only 14 months.

Exterior view of the grand front entrance of the Broward County Regional Library.

One reason a project of this magnitude was completed on time was because the detailing, approval and delivery of the structural steel was closely planned and phased to meet the scheduled dates for constructing each building. To accomplish this, it was necessary to separate the project into phases, and each phase was further subdivided into packages for permitting, procurement of materials, production of shop drawings and delivery of the steel.

Phase one consisted of the administration building and the three high school classroom buildings. The first package for phase one included foundations, which were submitted to the Florida Department of Education for their review and approval. The second package included the structural steel, joists, trusses and decking. This package was issued to Haskell's fabrication shop to produce shop drawings and forward drawings to the bar joist subcontractor to begin their shop drawing process. The third package focused on tilt-up panels and reinforcing, and the final package included panel embed placing drawings and provided the steel shop with the correct number and type of embeds to fabricate.

Phase two's submittal was for the multipurpose building, which included areas for art, music, a gymnasium, food court, kitchen and mechanical plant. Phase three featured the community college classroom building. Phase four's submittal was for the regional library, and phase five included the site structures, which featured covered walkways and other miscellaneous structures located throughout the site. These phases were broken into packages the same way phase one was handled.

Once the foundations were submitted to Florida Department of Education for approval, the structural steel drawings were transmitted to steel detailers who used the latest structural drawings by downloading them from the company network. Shop drawings were then produced on computer and submitted electronically to a shop drawing coordinator at Haskell's home office. The coordinator printed one hard copy for the engineer and architect to review. The engineer marked up this copy with any comments or

changes and returned the drawings to the coordinator. The coordinator then scanned the drawings and distributed them to all secondary parties, such as project managers, subcontractors and also to the detailer for making corrections. Detailers can then make the corrections using a split screen to show marks and original details simultaneously. Final, corrected drawings are issued to the shop and put into fabrication.

A normal amount of time to transmit shop drawings from the subcontractor to the engineer is about five days, but processing the shop drawings by computer reduces this time to one day or even less if necessary. The normal four weeks for complete shop drawing review and return can be reduced to just days with this in-house capability, which certainly aids a very tight schedule required for a large complex project like the Academic Village.

The administration building is an 8,600-sq. ft., one-story structure with load bearing tilt-up exterior walls and a 4-in-12 sloping roof. The hips and valleys of the roof are created with wide flange beams supporting joists. The roof structure is covered with 1 1/2" wide rib roof deck to provide a type four, unprotected structure with sprinklers.

The four, two-story classroom buildings feature exterior load bearing tilt-up panels with a 5" composite floor system and light gauge metal trusses supported on beams in the center of the building and panels around the exterior. The trusses support the 1 1/2" wide rib roof deck.

Horizontal bracing, with wind beams supporting the exterior panels, was provided to create a horizontal truss in the plane of the top of the wall. This horizontal truss was designed to transfer the wind loads from the panels and trusses to the end walls of the building, thus acting as shear walls. It was decided not to use the roof deck as a diaphragm because of the complex connections and timing that would involve different trades. Therefore, the steel erector can finish a building, and another subcontractor can install the trusses and decking without having to deal with specialized connections that are required. This arrangement speeds up the building's construction and frees the steel erector to move on to the next building to maintain an accelerated schedule.

The regional library is a two-story, 78,000-sq. ft. structure with load bearing tilt-up panels supporting the 5" composite slab as the second floor. Joists and joist girders frame the roof and support the 1 1/2" wide rib roof deck with a roof slope of 1/4" per foot.

The multipurpose building is a 44,000-sq. ft., single-story building. The walls are load bearing tilt-up panels that support the joist and joist girders. Long span joists were used to clear span the 87' long gym and food court area. Again, 1 1/2" wide rib roof deck was used over the joists.

The project was constructed with 570 tons of steel provided by Haskell's steel fabrication shop, with Socar, Inc. providing 200 tons of joists and joist girders. Marlyn Steel Decks, Inc. provided 2,200 squares of floor and roof deck. Southeastern Structural Detailers performed detailing services. The total project cost was $45.6 million.

The integrated team approach with in-house steel fabrication capabilities has served the company well for many years. Haskell has plans to broaden the steel shop's capabilities and the interactivity of these already cooperative entities. These plans include: more direct interaction between engineers and detailers, in some cases reducing the extent of construction drawings; directly producing shop drawings, similar to the delivery model used by pre-cast concrete suppliers; more interactive software between engineers and detailers and future steel shop expansion.

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