The construction of six new buildings at a New York mental health campus involved plenty of scheduling and coordination challenges, but also successes thanks to superior sequencing.

Breaking it DOWN

BY MATTHEW HAAKSMA

CAMPUS DEVELOPMENTS are always a challenge—even more so when they involve a half-dozen new buildings in a relatively short time frame.

The Bronx Mental Health Redevelopment Project for the New York State Office of Mental Health (OMH) is a replacement project managed by DASNY (Dormitory Authority of the State of New York). The campus upgrade, which includes six new buildings totaling 436,410 sq. ft of space, is currently being constructed in the Bronx, N.Y. The projects used more than 3,780 tons of structural steel, over 500,000 sq. ft of composite and metal deck, more than 1,200 risers of stairs and building information modeling (BIM) coordination on a level far above what has ever been exercised on a project of this scale for the owner and all involved parties. The work is managed by Jacobs acting as overall program manager/construction manager and the LIRO Group as construction manager of one of the buildings. The first three buildings are partially being constructed where an OMH structure existed, while the last three are being built on land that was previously open space.

From the outside looking in, the project might seem commonplace. But looking past the nuts and bolts, the beams and columns, reveals a Seismic Category D design using multiple types of seismic force resisting systems (SFRS), uncommon structural steel exterior wall construction systems and structural steel gutter and roof systems. In fact, it was this type of uncommon project that prompted Orange County Ironworks, LLC (OCI) to expand beyond our historic experience with more traditional structures and miscellaneous metals to build our 70,000-sq.-ft fabrication facility, located an hour from the campus, in 2010.

Also uncommon was the look, feel and overall approach to the facility. The idea was to create an institutional facility that didn't feel institutional—one where the buildings and grounds themselves could play an active role in improving the mental and physical health of its patients. Increased daylighting, atypical geometry, bright colors and abundant green space all characterize the updated facility.

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Winter construction of one of the three residential buildings.

The owner sought Level of Development 500 for this BIM-driven project (the highest LOD identified by the AIA as it relates to field verification). This mandated tight fabrication and erection tolerances that would minimize as-built alterations to the structural steel model and prevent drafting budget overruns. It also necessitated bringing miscellaneous metals (such as stairs and guardrails) into the structural model, an atypical approach. Fortunately, this integration of miscellaneous and structural steel fabrication proved to be a cost-effective measure. As the fabricator, incorporating the stair framing into our structural design allowed us to factor it into the structural steel erection process, thereby virtually eliminating the need for temporary access provided by the GC for other trades soon to follow on-site.

Different Buildings, Different Challenges

The five-story, 180,000-sq.-ft Adult Behavioral Health Center (ABHC) was designed by STV, Inc., acting as both architect of record and structural engineer and was constructed by ARC. Using 1,415 tons of steel, it was the first of the six buildings to be constructed. The SFRS in this building was a buckling restrained brace frame (BRBF) system, which used a mixture of HSS10x6x¼, HSS10x8x¼ and HSS10x10x¼, all concrete-filled. A total of 172 buckling restrained braces (BRBs), using both V-type and inverted V-type braces, were installed. Incorporating such a large number of BRBs into a building in New York isn't exactly typical. But being constructed on the site of a previous swamp that was filled in with excess material from area construction projects over a period of decades—plus new New York State code requirements—caused the building to require a seismic design.

In an interesting twist to our typical workflow, the owner preselected the BRB supplier. Mixing a key structural component, which we were not directly supplying, into our initial fabrication and erection schedule added an uncommon and complex layer to our process. Constant and diligent coordination between OCI and Star Seismic, the BRB manufacturer, ensured that both fabrication and erection schedules could be met and maintained.

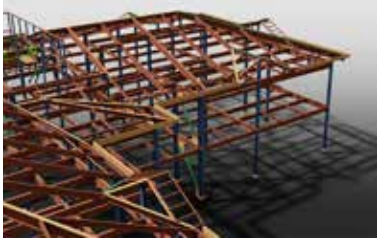
When it came to the exterior wall system, an uncommon approach was needed in order to maximize available square footage in the ABHC while also keeping within the seismic design requirements of the structure. Where limited exterior wall cavity space was available, structural galvanized HSS framing (HSS6×2×⅜) was used in lieu of more traditional light-gauge framing. This introduced an element that, while not classified as architecturally exposed structural steel (as it was buried inside the wall), still required the same tightness of AESS tolerances so as not to impact the finish trades that would follow a few months later.

The second new structure on the campus is the two-story, 48,580-sq.-ft Central Services Building/Central Utility Plant (CSB/CUP), which used 445 tons of structural steel. This building required yet another type of SFRS. Where the ABHC used a pre-engineered BRBF system, the SFRS for the CSB/CUP, as well as for the balance of the structures yet to be constructed, was OCI's to develop. Using a basis of design provided within the contract documents, OCI used a mix of concentric braced frames and special concentrically braced frames; one building even used special moment frames in the X direction

A rendering of the new buildings, all of which will be open by next year.

The three buildings of the Residential Village.

The Adult Behavioral Health Center (upper left), Central Services Building (center) and New York Children's Center (lower right).



Structural steel was used for roof framing.

BRBs abound in the Adult Behavioral Health Center.

Diagonal bracing in one of the residential buildings.

The Adult Behavioral Health Center was the first phase of the project and will open later this year.

Structural steel roof framing.

and special concentrically braced frames in the Y direction.

The third structure is the New York City Children's Center–Bronx Campus. The two-story structure used 995 tons of steel to frame 112,754 sq. ft of space. This design introduced new complexities through an elaborate hip and valley structural steel roof system. This required the inclusion of isometric details on the standard shop drawings to allow the fabricator and erector to visualize the final assembly, introducing a 3D aspect to a traditionally 2D environment. (BIM is a wonderful feature when it comes to coordination and having the ability to visualize things that otherwise might not be evident. However, the fabricator still needs to have a shop drawing in front of him/her to reference during the fabrication process.)

The last three buildings, the Residential Village, comprised 96,443 sq. ft of space and used 925 tons of steel. Each building is designated for a different level of readiness for patients to transition from the facility. While incorporating the same SFRS scheme used on the preceding two buildings, these three structures posed equally challenging elements of architectural and structural integration. As the structures are residential in nature, BIM was invaluable during the shop drawing review phase in accurately locating the dozens of MEP beam web penetrations required by low ceilings. This allowed for the penetration work to be factored in during fabrication and avoid the all-too-common problem of having to go back and deal with clashes in the field.

Tight Schedule, Large Scale

An overarching challenge was meeting an aggressive project schedule on such a large project with multiple buildings—and multiple design teams. In the prefabrication phase, the project team took a collaborative approach to the submittal/shop drawing process using electronic transfer/review of documents and weekly steel coordination meetings to expedite the process. In fabrication and construction, a tight schedule tends to be less of an issue on smaller projects where warehouse ordering is possible. But due to the schedule constraints—along with the logistics of structural steel fabrication on this scale—the need to order steel directly from the mill became evident right away. Thanks to the ability to stage large volumes of both raw and fabricated material at OCI's facility, along with the skillful manipulation of integrated fabrication software (FabTrol Systems and SDS/2), our staff was able to evaluate and fulfill the material purchasing process and oversee the complicated fabrication so as to minimize steel that would need to be scrapped as well as streamline the schedule.

Sequencing also played a large role in keeping the project on schedule. In order to meet site logistics, as well as allow building turnover in a way that was conducive to continued progress of other trades, the six buildings were broken down into more than 100 separate sequences of fabrication and erection. Breaking down one large challenge into multiple smaller challenges was, of course, logical, but it had other benefits as well. From a personnel standpoint, setting and meeting short-term goals can be highly motivating and rewarding and has been shown to result in a higher-quality product. This was certainly the case with the Bronx Mental Health project. Gabriel Steel Erectors and a cast of dedicated ironworkers were able to erect all six structures, including metal deck installation, under budget and 20% faster than the anticipated schedule using this sequencing concept.

All steelwork for the project is now finished, and the buildings are in various stages of completion. They will be opened in phases, and the entire facility is expected to open next year. ■

Owner
New York State Office of Mental Health

Owner's Representative
DASNY (Dormitory Authority of the State of New York)

General Contractors
ARC Electrical and Mechanical Contractors Corporation, Brooklyn, N.Y.
J. Kokolakis Contracting

Construction Managers
Jacobs
The LiRO Group

Architects
STV Incorporated
Spector Group
Architectural Resources

Structural Engineers
STV Incorporated
Ysrael A. Seinuk, P.C.
McLaren Engineering

Steel Team

Fabricator
Orange County Ironworks, LLC (AISC Member/AISC Certified Fabricator)

Erector
Gabriel Steel Erectors (AISC Member/AISC Advanced Certified Steel Erector)

Detailer
Kennebec Valley Detailers, LLC, Augusta, Maine (AISC Member)