

# A New Future for Mental Health Care

BY SAM RANGASWAMY, S.E., P.E., PH.D., AND ANTHONY EHLERS, JR.



Using SidePlate FRAME cuts the number of moment connections required, maximizes design versatility and yields significant cost savings for landmark public works project.

**LAST FALL**, when ground was broken for construction of the new Eastern State Hospital in Lexington, Ky., two milestones were reached. The first was the creation of a modern, state-of-the-art mental health facility designed to replace a dilapidated, 185-year-old hospital that was ridden with controversy. The second was the incorporation of the SidePlate FRAME steel frame connection system, which offered strength and design versatility as well as savings for this competitively bid public works project.

Originally established in 1817, Fayette Hospital is the second-oldest psychiatric facility in the U.S. With an initial capacity to house 920 patients, the facility population had increased to nearly 2,000 by 1945. Later renamed Eastern State Hospital, the facility fell into severe disrepair, and remaining patients were relocated from the outdated facility to other care centers.

Under the leadership of the Bluegrass Regional Mental Health-Mental Retardation Board Inc., which previously had taken over facility management and day-to-day operations,

stakeholders were able to secure state funds to build a new, modern facility. Through a unique agreement with the Bluegrass Community and Technical College, Eastern State Hospital was relocated to the Coldstream Research Campus, while the college relocated to the existing site of the original hospital facilities.

When it came time to make critical decisions regarding the new facility, stakeholders agreed that a project being developed to meet future needs should incorporate materials and architectural standards designed for the future as well. The architectural plans called for a state-of-the-art, 300,000-sq.-ft main hospital consisting of three independent residential pods, each of which connects with a common, three-story connector building. Two of the pods are three stories high, while the third is four stories high.

The next question: should the building be made of concrete or steel? While reinforced concrete moment resisting frames are popular in nearby Louisville, steel was selected as the more practical and cost-effective building frame material of choice in Lexington. Two primary factors dictated this choice. The first was the complex geometry of the structure. Concrete would

- ◀ Partial view of the steel structure.
- ▶ Steel frame using SidePlate connections.

have significantly escalated building costs when compared with the versatility of steel. The second was time. Selecting a steel frame ensured the structure could be enclosed before winter, allowing interior work, such as drywall, HVAC ducting, plumbing and electrical, to continue even when the weather didn't cooperate.

The original architectural plans for the spine building and three separate units called for moment-resisting conventional steel frames, but required a staggering 359 beam-to-column moment connections. To stay within the project budget, the structural engineer investigated several ways to limit the extent of field welding required and thus reduce the costs associated with having so many moment connections.

Bracing systems were considered, but quickly eliminated because they would interfere with the operational and functional requirements. Then the team turned to the SidePlate FRAME system, which was a more economical option because of its strength and simplicity. Best of all, because of its stiffer moment connections coupled with improvements in the overall lateral frame layout of the building, SidePlate required only 199 moment connections, which translated into a 45% reduction when compared with conventional steel frames. This ensured fewer erection hours, field welding and field labor—all of which translated into an estimated savings of approximately \$300,000 when compared to the original design.

While initially viewed as a steel frame system created only for earthquake, bomb blast and progressive collapse design applications, SidePlate FRAME is rapidly becoming recognized by engineers, steel fabricators and general contractors in lower seismic zones as a cost-saver in wind-controlled regions as well. Today it is the only steel moment frame system that uses all fillet-welded construction, with all welds deposited in the horizontal welding position 2F, in lieu of complete joint penetration (CJP) groove welds, which can be costly and require ultrasonic (UT) inspection.

The decision to use SidePlate on the project was unanimous, but there was one more hurdle. Because Eastern State Hospital is a state-owned building, open bidding is a requirement. Fortunately, SidePlate is a proven technology design—not a sole-sourced manufactured item. That means it can be competitively bid by any and all steel fabricators, just like any other steel component in a project's design documents.

For the new Eastern State Hospital project, the SidePlate FRAME system offered several significant benefits, including:

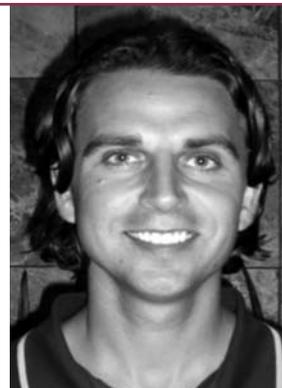
Sam Rangaswamy, S.E., P.E., Ph.D., is principal-in-charge of Rangaswamy & Associates, Inc., a planning, engineering and management consultancy service based in Louisville, Ky., which also maintains an office in India. He has more than 40 years of structural engineering experience in design, surveying and analysis in the public and private sectors. Anthony Ehlers, Jr., has been a project manager and structural engineer for Rangaswamy & Associates since 2003.



photos by Rangaswamy & Associates, Inc.



▲ Beam end of the connection.





photos by Rangaswamy & Associates, Inc.

- ▲ Assembled SidePlate connection.
- ◀ Column end of the connection.

- 0.5 psf of net steel savings, or 75 tons of steel
- Competitive shop labor (due to smaller fillet welds and a 27% reduction in the required number of moment connections)
- Reduced field labor (due to use of four fillet welds in the horizontal position in lieu of more costly CJP groove welds where beam flanges attach to column flanges)
- Shorter construction schedule
- Elimination of all ultrasonic nondestructive testing costs

Additionally, the engineers at SidePlate served as expert resources who worked side-by-side with the team during the design phase, including providing information on lateral frame size optimization and detailing, as well as other detailed calculations. The engineers also reviewed all welding procedures and quality control efforts, as well as steel shop drawings relating to the lateral load resisting system.

The new Eastern State Hospital is seeking Leadership in Energy and Environmental Design (LEED) certification, so the use of SidePlate also will help achieve this by using less steel, eliminating waste and decreasing construction time.

When construction is complete in 2013, the new Eastern State Hospital will transform how the state cares for individuals with mental health needs. It also marks a successful collaboration among several nonprofit, educational and public entities, opening the doors to not only new opportunities for patients and their families, but for economic development as well. **MSC**

**Architect**

Arrasmith, Judd, Rapp, Chovan, Inc., Louisville, Ky.

**Associate Architect**

SmithGroup, Inc., Ann Arbor, Mich.

**Structural Engineer**

Rangaswamy and Associates, Inc., Louisville, Ky.

**Construction Manager**

D.W. Wilburn, Lexington, Ky.

**Steel Team**

**Fabricator**

Steel Service Corporation, Jackson, Miss. (AISC Member)

**Steel Erector**

J&B Steel Erectors, Hamilton, Ohio (AISC Member)

Midwest Steel, Inc., Detroit (AISC Member)