Turner Construction Company was the Construction Manager at Risk for Learned Engineering Expansion Phase 2 (LEEP2), which includes two new buildings for The University of Kansas School of Engineering. The new buildings – one on the Main Campus and the other on the West Campus – are part of KU’s ongoing efforts to produce high quality engineers to meet industry demand and boost the state and national economy.

Funding for LEEP2 was provided by the Kansas Department of Commerce through the University Engineering Expansion Act of 2011, as well as donor gifts through the KU Endowment, the KU Center for Research, and other university funds.

**PROJECT TEAM**

The Turner team included Scott Hoisington, Project Executive; Josh Jones, Project Manager; Brian Curtain, General Superintendent; Brian Schmidt, Assistant Superintendent; Karen Hogan, Lead Engineer; Erin Elder, Assistant Engineer; Matt Johnson, Field Engineer; Jacob Connor, Safety Manager; and Michelle Ashline, Project Administrator. Kyle Weller was Lead Superintendent and De’Jon Slaughter was Field Engineer for the West Campus facility.

The Design Team was lead by Treanor Architects as the Prime Architect and Project Team Leader in association with Burns & McDonnell, which was the Lead Architect for the West Campus facility.

The client, KU School of Engineering, is now the operator and occupant of the buildings. The Turner team included Tim Reynolds, Principal in Charge; Dale Glenn, Design Principal; David Livingood, Project Management Principal; Jerome Ratzlaff, Project Architect; Jennifer Kulseth, Laboratory Planner & Designer; and Bill Graham, Construction Administrator. Burns & McDonnell’s team was lead by Neal Angrisano, Project Executive; Amy Slattery, Project Manager; and Michael Coats, Project Architect.

The Design Team was lead by Treanor Architects as the Prime Architect and Project Team Leader in association with Burns & McDonnell, which was the Architect of Record for the West Campus and provided structural engineering for both sites. Treanor’s team included Tim Reynolds, Principal in Charge; Dale Glenn, Design Principal; David Livingood, Project Management Principal; Jerome Ratzlaff, Project Architect; Jennifer Kulseth, Laboratory Planner & Designer; and Bill Graham, Construction Administrator. Burns & McDonnell’s team was lead by Neal Angrisano, Project Executive; Amy Slattery, Project Manager; and Michael Coats, Project Architect.

The client, KU School of Engineering, is now the operator and occupant of the buildings. Jim Modig, University Architect and Director, KU Office of Design & Construction Management (DCM), and Leigh Myers, Project Manager, DCM, led KU’s Programming Committee for the project.

Turner also hired numerous student interns through KU’s engineering program, enabling the students to complement their academic studies.
**KU Engineering Expansion**
*(continued from page 2)*

with real-world experience.

**MAIN CAMPUS BUILDING**

The Main Campus building at 1536 West 15th Street contains 135,749 square feet. It includes six active learning classrooms, research and instructional laboratories, core facilities, student success spaces throughout the facility, and administrative areas over three floors, as well as a Central Plant on the roof-level penthouse. The Main Campus facility was constructed using BIM (Building Information Modeling) by Turner and its subcontractors. “We used a single model. The subcontractors would pull their different sections out, update them, populate them, and then insert them back into the model. We would do the overlays and clash reports and have active working sessions where we could change things live on the screen to ensure that everything worked as it should,” said Josh Jones. Extensive MEP coordination was done on both sites. On the design side, BIM was used by the architectural and structural teams, while the MEP engineers used AutoCAD®.

The building has a concrete structural frame with heavy gauge stud and sheeting infill. The façade has silver metal panels and blonde brick masonry that matches the surrounding engineering facilities. The exterior envelope employs a high performance polyurethane foam spray application which provides insulation and acts as a water and air barrier. Glazing is used extensively to create a light-filled interior.

Light wells on the west and south ends of the building allow natural light from the rooftop skylights to reach all the way to the ground level, which is 7-1/2 feet below the basement of Learned Hall to the north.

The penthouse is located above the classrooms and teaching labs and was built to accommodate future expansion and build-out on the east side. The east half of the building consists primarily of space for classrooms, collaboration, student outreach, and career services. Many of the classrooms have glass fronts which create a more open learning environment. The collaborative spaces have white board paint on the walls so students can write on them with dry-erase markers. The west side is devoted mainly to research. Several labs have standard fit-outs for future expansion as KU attracts new researchers.

The new Main Campus building now fills in the open space north of M2SEC and south of Learned Hall, and also connects to Spahr Engineering Library on the north and east. The columns between Spahr Library’s Jay Break (a small café area which was moved from the east end of Spahr to the west end and expanded) and the new building’s main lobby atrium were part of the old south exterior wall of Spahr Library.

The floor plates are 16 feet structure-to-structure and marry up perfectly to the M2SEC building, stated Josh. (Phase 1, the Measurement, Materials and Sustainable Environment Center, is a 47,000 square foot structure that was formally dedicated in 2012 and is south of the new Main Campus building.)

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**Subcontractor Members of The Builders’ Association Who Worked on LEEP2**

- Allied Construction Services, Inc.
- The Bratton Corporation
- Building Keepers, Inc.
- Capital Electric Construction Company, Inc.
- Chamberlin Contracting, Inc.
- Coreslab Structures (Missouri) Inc.
- Doherty Steel, Inc.
- E&K of Kansas City, Inc.
- Environmental Mechanical Contractors, Inc.
- FDC Contract, a John A. Marshall Company
- Foley Company
- Hayes Drilling, Inc.
- Interior Surface Enterprises, LLC
- Jackson Painting Company, Inc.
- Jayhawk Fire Sprinkler Co., Inc.
- Johnson Controls, Inc.
- Leavcon II, Inc.
- Loveall Custom Sheet Metal
- Midland Wrecking
- P1 Group, Inc.
- George J. Shaw Construction Co.
- SimplexGrinnell
- Total Interiors, Inc.
- Trio Masonry, Inc.
- United Rentals

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**ACTIVE LEARNING CLASSROOM**

The new Main Campus facility includes six state-of-the-art active learning classrooms. The 160-seat active learning classroom shown above is on the second floor. Each of the six classrooms was carefully designed to facilitate active learning and team-based approaches to student learning. The tables include multi-media hookups for student laptops and other electronic devices; an ELMO projector for student teams to share their work; a microphone for student voice projection; and an LCD screen that can be used to either view the same content as projected throughout the room or project content from a student laptop/device at the table.
KU Engineering Expansion
(continued from page 3)

The floor plates of Spahr Engineering Library (which is to the north and east) and Learned Hall are about 3-1/2 feet above the first floor of the Main Campus building.

“Not only were we tying into an existing corner of Spahr, but we were also tying in through an egress route and stairwell into Learned Hall and making sure the corridor connections were straight and even,” said Josh.

LEEP2 involved the renovation of over 10,000 square feet of space in Spahr Engineering Library and removal of portions of its west and south walls so that the library flows seamlessly into the new Main Campus facility.

“One of the design team’s goals was to maintain the feel of the M2SEC facility in the research spaces, including high open corridor ceilings, so in almost every one of the corridors we maintained a 10-foot height for the MEP systems including the processed chilled water, the hot water supply, the lab water and the ducts,” added Josh.

“We delayed the temporary closing of Spahr Library until December 2014 to work around class schedules, and did all our tie-ins to the existing structures as quickly as possible to minimize the impact to the university,” he continued. Turner took care to minimize construction-related vibrations that might impact ongoing research in M2SEC. They also maintained fire exits and coordinated corridors and exit paths into the existing buildings.

The Main Campus building’s sustainable features include a white TPO roof, a rainwater collection system that provides grey water for flushing toilets and urinals, and low-maintenance landscaping that requires minimal watering.

WEST CAMPUS BUILDING

The 27,000 square foot Structural Testing and Student Projects Facility on the West Campus at 2107 Becker Drive is a single-story, high bay facility. The front of the building is enclosed by glass and contains 3,000 square feet of student fabrication and shop space. The area is used by Engineering student groups including the KU Jayhawk Motorsports Formula SAE Racing Team, KU EcoHawks, KU Steel Bridge Team, and KU Jayhawk Heavy Lift Design Team.

The high bay steel structure is directly behind the fabrication and shop space and is dedicated to structural engineering research. Ribbon windows add visual interest to the large facade. The spacious bay encloses a 40-foot high strong wall, two 20-ton cranes, and a 6,800 square foot strong floor for research, testing, and development of large structural systems including concrete piers and steel girders. The strong floor can accommodate over 100,000 pounds of vertical force at any of the approximately 650 tie-down locations. The setup allows for full-scale tests to be performed using loads that simulate real-world conditions.

STAYING UNDER BUDGET

As Construction Manager at Risk, Turner guaranteed the project’s total cost and completion date, and held the contracts with the subcontractors.

During preconstruction, estimates on the structural portion of the Main Campus building came in higher than expected. Turner Vice President of Preconstruction Lee McSparran and his team compared the structural plans against similar projects the company had built, and discovered that the structural parameters were based on higher seismic requirements than necessary. This discovery resulted in nearly $1 million in savings, which KU used to add scope to the project, stated Josh. He also noted that as part of the guaranteed maximum price (GMP), Turner had a contingency of around 2% of the total contract budget.

“As we reached certain milestones, we were able to release the contingency back to the owners to spend on different items. For example, we were originally going to use tile flooring for the lobby atrium, but we were able to install terrazzo, one of their wish list items, instead,” he commented. The total project cost for both buildings was $80 million, and the total construction volume for both buildings was $66.7 million.

PROJECT TIMELINE

Turner was awarded the LEEP2 project in March 2012. The official groundbreaking for the Main Campus building was on October 26, 2012.

The original design of the Main Campus building had a high bay component on the west side. “Once the Engineering Department determined the size and scale of the strong wall and the strong floor they wanted to build, they decided to expand to the West Campus,” said Josh. “As we proceeded through preconstruction, our role evolved to include the West Campus project as well.”

LEEP2 had seven GMPS. The first GMP was for relocation of utilities at the Main Campus and was issued in July 2012 while design was under way. The second GMP was for the initial utility work at the West Campus and was issued in spring 2013. The remaining GMPS were as follows: site egress and improvements for the Main Campus; foundations for the West Campus; foundations for the Main Campus; the MEP and core & shell package for the West Campus; and the MEP, core & shell, and interiors package for the Main Campus.

Josh described how Turner was able to stay in front of the schedule. “The Architect would design the various phases and present drawings to KU’s Office of Design & Construction Management for approval. Once the design was approved and finalized, it would be submitted for permit. Rather than wait for design approvals on all phases, we were able to proceed with each phase as its respective design was approved.”

Turner reached a peak of 160 workers from September to December of 2014. “This was right after we finished enclosing the Main Campus structure and ramping up work on its MEP systems and interiors,” said Josh.

Turner finished the West Campus building 30 days ahead of schedule. They completed the Main Campus building two weeks ahead of deadline.

Throughout the course of this project, Turner Construction showed superior communication skills and diligence. It was an honor to experience the company’s tireless effort of leadership and facilitation involving every entity throughout the course of the project. Through the company’s excellence in project management, project deadlines were fulfilled prior to expectations for both projects, while facing the inevitable unforeseen circumstances of any project.

Through our department’s experience with Turner Construction Company, it was clearly evident that client satisfaction is the company’s first priority.

– Craig A. Calixte, Building Complex Manager, The University of Kansas School of Engineering

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schedule and were able to accelerate the move-in date almost six weeks ahead of schedule at the latter facility.

Certificates of substantial completion were issued by KU for the West Campus building on August 27, 2014, and for the Main Campus building on June 15, 2015.

**JOB SITE SAFETY**

Between the two projects (the Main Campus facility and the West Campus facility), there were over 500,000 hours worked without a significant lost-time injury. The project trades were diligent in following project safety policies, and the clean, well-organized project site promoted a safety culture that was embraced by the entire workforce. In order to work onsite, workers were also required to be compliant under the CISAP program.

“We set up a very strong perimeter fence system at the Main Campus building and provided a lot of signage to redirect student traffic. We ended up painting warning signs on the sidewalks along 15th Street because students occasionally look down at their phones while they’re walking,” said Josh.

The staging area was located in the courtyard bounded by the new Main Campus building, Spahr, and Eaton. “We had to be careful not to overload the staging area because of the underground utilities. We also had to work around all the existing infrastructure that was in place, including gas lines, data lines, electrical lines, and duct bank lines that run up and down 15th Street,” said Josh. Turner stationed its office trailers southeast of the new Main Campus building's radius wall. As the interior of the building came together, they removed the office trailers and moved into the building to allow for completion of site work and landscaping.

“One of the biggest challenges was keeping occupants in the surrounding buildings happy and informed as we were putting in foundations and piers and building this massive structure in their midst. Noise restrictions were a major issue. We had restrictions on working hours because of our proximity to the residential neighbors on the northwest,” he added.

The Main Campus building extends west to the area formerly occupied by Burt Hall, which was built in 1961 and demolished by the Turner team in August 2013. The building housed a small nuclear reactor used by engineering, radiation and biophysics faculty for research and training. The reactor ceased operations in 1985 and the site was cleaned to Nuclear Regulatory Commission standards in 1992.

“The demolition of Burt Hall helped us immensely in terms of providing another access point to the construction site,” stated Josh.

**ARCHITECTURAL PRESERVATION**

In addition to the separate demolition package for Burt Hall, the project included selected demolition of portions of the existing facades of Learned Hall and Spahr Library. The selected demolition involved the preservation of architectural elements such as the brick columns where Spahr Library flows into the new space on the first and second floors. Some of Learned Hall’s stone façade was preserved as well as the old barrel vault roof structures on its west end.

“We clipped the concrete eyebrows which protruded about six feet from the barrel vaults and were part of Learned’s structural roof deck. We had to saw cut through 6-inch concrete without compromising the structural and water integrity of the rest of the building,” said Josh.

**CENTRAL PLANT**

The new Central Plant has 2,000 tons of chilling capacity with two large 1,000-ton chillers and two large cooling towers. It has room for an additional 1,000-ton chiller and another cooling tower. In addition to the Main Campus building, the Central Plant now provides chilled water to M2SEC and Spahr Library. The new Central Plant was built to accommodate future expansion loops to serve Learned Hall, Eaton Hall, and Green Hall, which houses the School of Law.

When M2SEC was completed, the north face was left unfinished in anticipation of future expansion. Turner removed its old air-cooled chiller during Phase 2. They modified and reused M2SEC’s tower crane foundation for the main campus facility’s tower crane.

Turner and the MEP subcontractors prefabricated vertical ducts and piping components to fit within the rated shaft enclosures and utilized the tower crane to hoist them into the new building’s structural openings. The chase shafts were built in-place and spanned from structural deck to structural deck. Sections of some of the corrider were prefabricated as well.

“Working with KU, the School of Engineering, and the Architect, getting input from the researchers and graduate assistants, rolling with all the different tweaks, changes, and modifications, and then finally having everyone be happy with the results speaks volumes as to how the team approached this project,” said Josh. “There was solid camaraderie and a really cohesive working environment throughout. The focus was always, ‘Let’s just find a way to do it.’ “

In July 2015, Turner began construction on the new Earth, Energy and Environmental Center (EEEC) project east of LEEP2 (and adjacent to Lindley Hall) for the KU College of Liberal Arts & Sciences. Plans for EEEC call for two towers totaling 145,000 square feet and rising from a connected base. The south tower will be a concrete structure with a dedicated Central Plant and planned elements that include a terra cotta rain screen. The north building will be a steel structure on a concrete foundation.