

Colorado

# CONSTRUCTION & Design

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## Craig Hospital Expansion Faces Huge Challenges

## RMMI 2013 Masterworks in Masonry Awards

## Urban Perspectives: Emerging Trends in Denver

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## 20 **Craig Hospital Expansion Faces Huge Challenges**

How collaboration among architects, contractors and end users is solving issues at a major expansion of the country's premier neurological rehabilitation hospital.

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## On the Cover

It's just a hole in the ground now, but 250 Columbine is one of several new projects in Cherry Creek.

Cover photo courtesy of PCL Construction.

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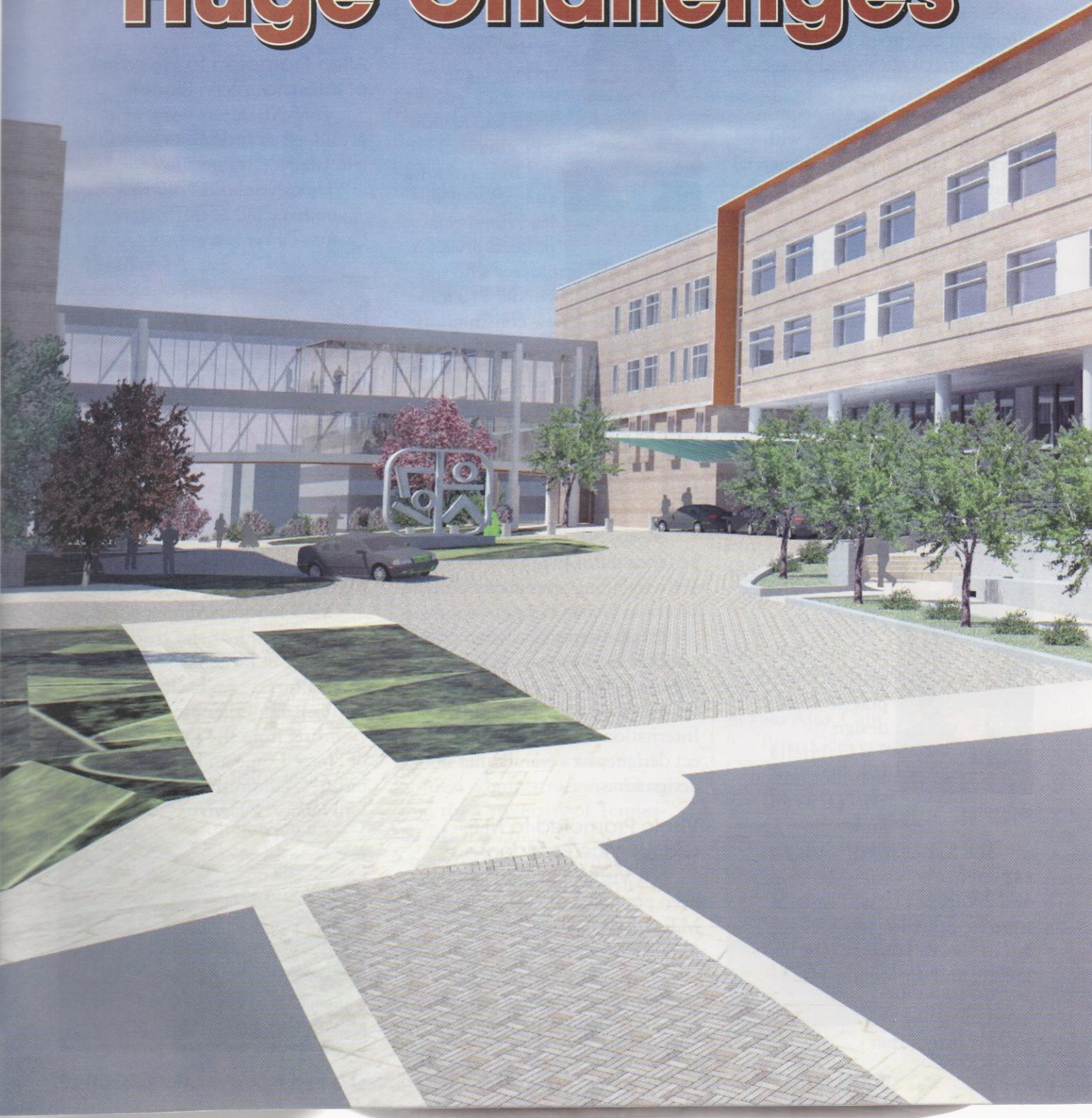
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Due to an editing error in the Inside AGC Colorado 2013 Annual Magazine, the silver winner was identified incorrectly in one of categories of the ACE Awards section.

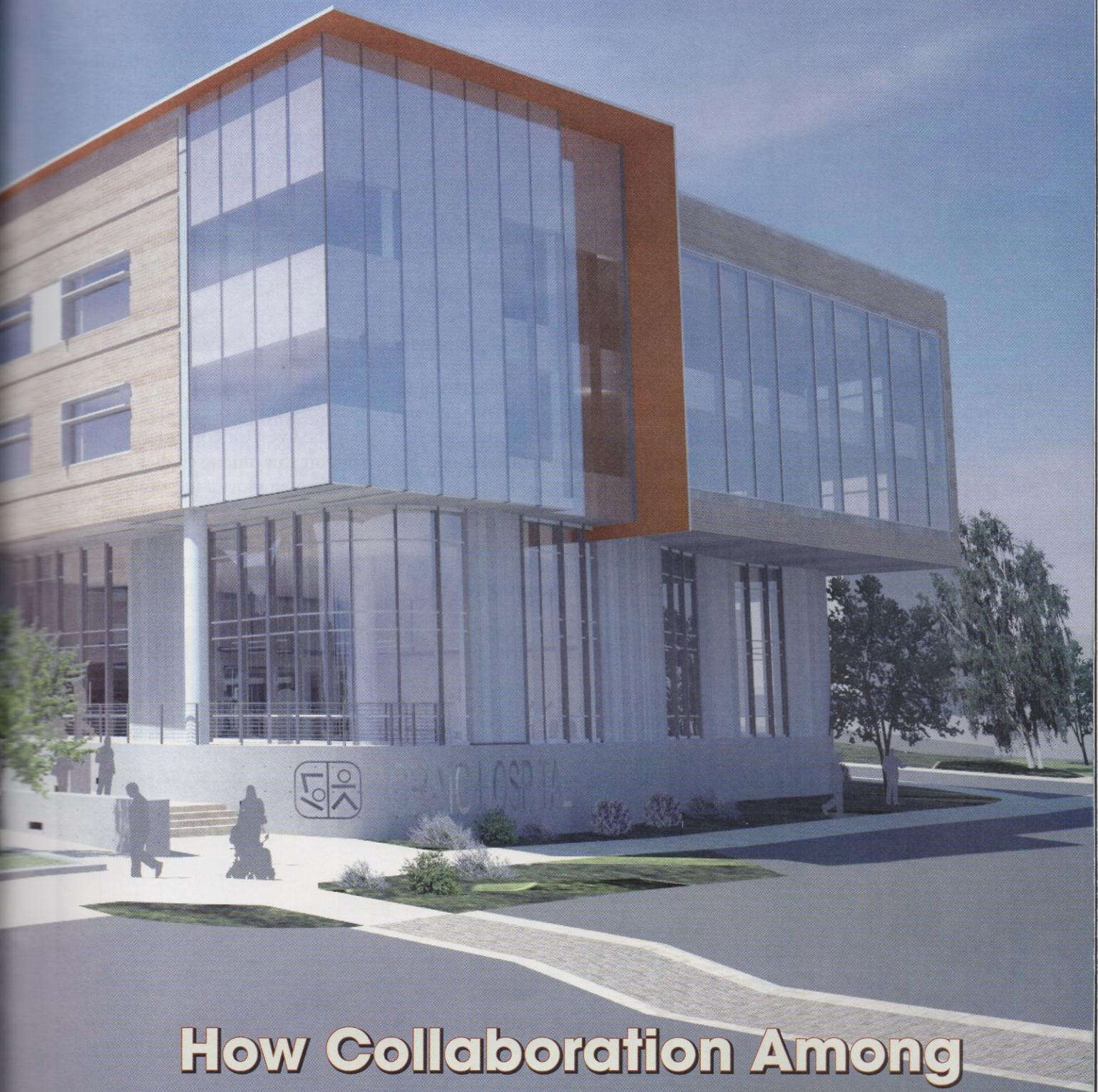
In the Best Building Project: Over \$10 Million/Subcontractor, RK Mechanical is the Silver Award winner for its work on Castle Rock Adventist Hospital, owned by Centura Health. The project and owner were incorrectly identified as NREL Energy Systems Integration Facility, owned by the National Renewable Energy Laboratory.

Colorado Construction & Design apologizes for the error.

# Craig Hospital Expansion Faces Huge Challenges



Rendering of the new cul-de-sac main entrance to Craig Hospital.  
(Rendering courtesy of RTA Architects/SmithGroupJJR.)



## **How Collaboration Among Architects, Contractors and End Users is Solving Issues**

**R**TA Architects, serving as architect of record, partnered with design architect SmithGroupJJR, Phoenix, on Craig Hospital's \$90 million expansion and renovation – a 60-month project in a challenging health care environment.

GE Johnson Construction and MGA Structural Engineers were selected for a collaborative effort that would resolve an extremely complex problem: How to build a new facility on top of and inside an operating brain and spinal cord injury rehabilitation hospital – without losing beds or disrupting patients?

The answer, according to Randy Thorne, AIA, RTA's principal in charge, was to pull in experts from all disciplines and break the enormous project into 22 pieces.

"The planning process took a full year that began with a week of full immersion at Craig by the architectural team," Thorne said.

Working in an integrated project approach with GE John-

son and MGA, the team co-located to the Craig Hospital campus during concept and pre-schematic design to build the project plan, design and budget.

From a design perspective, brain and spinal cord rehabilitation presents unique challenges. RTA consulted with the nation's top-designed brain and spinal cord hospitals to learn about the needs of this narrow segment of the population.

The RTA/SmithGroupJJR team found that even though simple fixes for patients in wheelchairs can be designed, Craig's rehabilitation staff feels it's almost pandering to provide amenities that patients won't find in the real world.

Once they leave Craig Hospital, graduates have to cope with round door knobs, bathrooms that aren't the right size and configuration for their wheelchairs, curbs, thresholds and the like.

"All of these aspects of reality are present in our design for the new Craig Hospital facility,"

Thorne said.

GE Johnson is the general contractor on the project. The expansion includes a vertical addition to the existing 135,034 sq. ft. west building, as well as a four-level horizontal addition totaling 94,000 sq. ft.

This expansion will provide 52 new private inpatient rooms, a two-story rehabilitation center, two therapy gyms and two rehabilitation swimming pools.

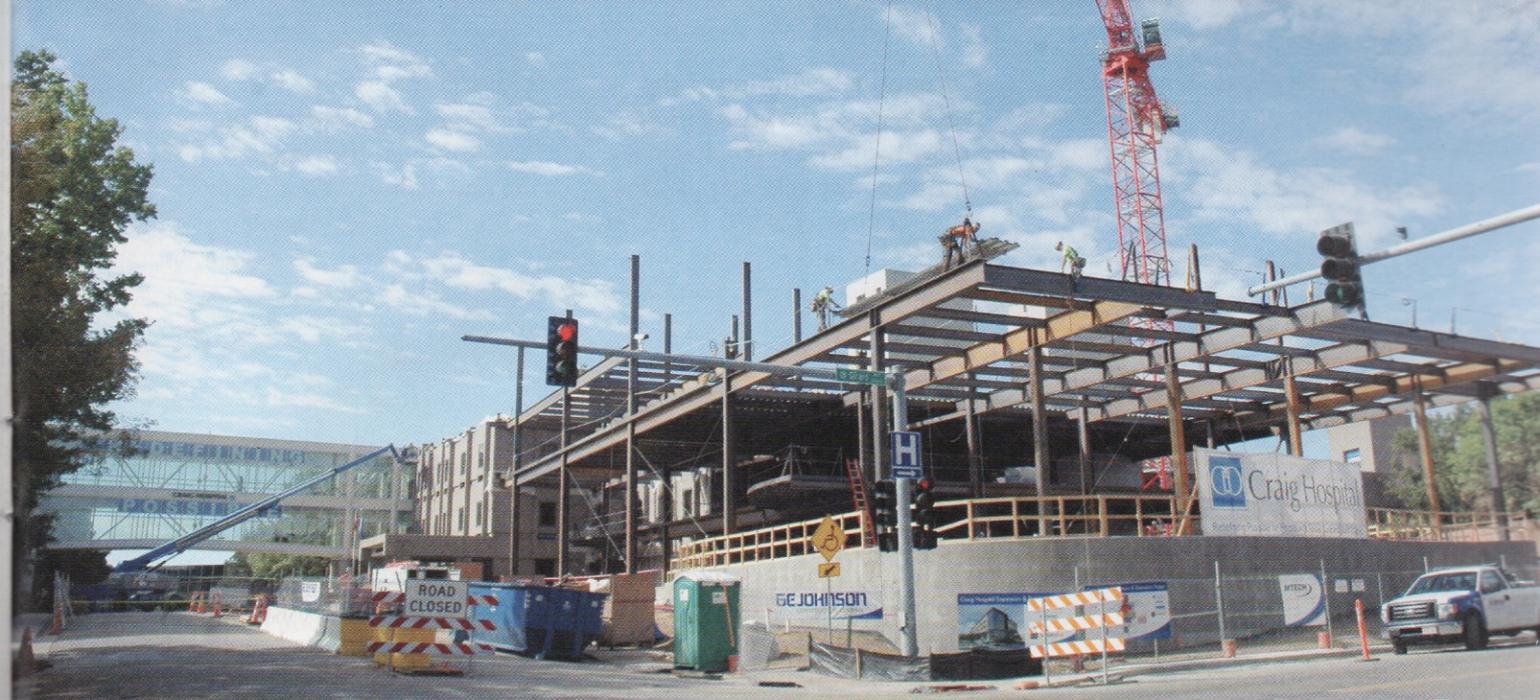
State-of-the-art patient control technology will allow patients with traumatic brain or spinal cord injuries to use eye and motion controls to operate nearly every element of their suite.

The hospital will maintain 100 percent patient occupancy throughout the five-year construction. To support this unique challenge, GE Johnson employs a full time, on-site hospital liaison to monitor potential impacts on staff or patients.

Five major phases are planned, with an additional seven sub-



Rendering of a patient room in the Craig Hospital expansion. (Rendering courtesy of RTA Architects/SmithGroupJJR.)



Framing on the new expansion to Craig Hospital. (Photo courtesy of GE Johnson Construction.)

phases to allow construction of the superstructure and interior renovations within the occupied hospital. The integrated plan shows 12 phases of construction.

Using a dedicated nine-person systems integration group and

health care preconstruction team, GE Johnson developed a target design and cost model that achieved the desired program while marrying the extraordinarily complex phasing challenges.

Justin Cooper, vice president

of GE Johnson, said the team developed a phasing strategy that maintains full occupancy throughout construction while assuring noisy or disruptive activities are minimized and separated from the patient care environment.

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“Our priority from day one was to challenge the traditional processes for phasing an occupied hospital project,” Cooper said.

A few examples include eliminating the typical drilled floor connections from the new structure into the existing structure, supporting the existing steel structure with exterior scaffold towers to allow for connections to take place outside the building instead of inside of patient rooms and building a new elevator core in phases to maintain hospital exit pathways and operation until the new addition is complete.

As the existing hospital had no available swing space, the team devised a plan to renovate an adjacent property to create a flex space to accommodate phased renovations within the hospital.

GE Johnson also ensured that the phasing plan guaranteed that while a floor area is under construction, the area directly below that floor would not be occupied.

This level of coordination is vital with patients with extreme sensitivities to noise, vibration and light. Key to the effort was team culture and communication, Cooper said.

From the beginning of the design process, the entire project team worked in a single location within the hospital campus. Designers, engineers, contractors, mechanical specialists, nurses, facility managers and others collaborated to build the plan.

“Our team recognized that communication is crucial on this project – specifically, with each Craig patient and team member,” Cooper said.

As the typical Craig patient’s stay is more than three months, GE Johnson built a comprehensive project website to provide up-to-date information, interactive tools, project renderings and a calendar system that communicates a variety of workshops, new construction activities to watch and when noisy activities will occur on each day.

MGA Structural Engineers encountered a number of challenges on the project. The original three-story building was built in 1969, with a major three-story addition added to the west side of the original building in 1982.

The planned new expansion consisted of adding one story to both the original building and the new addition. A major four-story

addition was designed for the north side of the original building.

Although the original building and addition were theoretically designed for multiple additional stories, they were designed at a time when seismic loads were considerably less than those applied under the 2012 I.B.C.

To address that, MGA added micro-piers and additional concrete to create additional tensile capacity for uplift resistance due to seismic and wind load forces.

The original building and the addition had 12 ft. floor heights. As the infrastructure for hospitals has evolved, this limited floor-to-floor height creates challenges in fitting all of the equipment under or within the structure, said Michael Gaines, president of MGA.

To support upgraded MEP systems, 750,000 lbs. of mechanical equipment was placed on the roof at the fourth stories, further aggravating the seismic loading.

“Floor plan space was at a premium, so adding lateral load resisting bracing was not an option,” Gaines said.

“A concentrically braced steel frame was added into the north addition to reduce the amount of seismic force taken in the existing buildings.”

Paul Reu, RTA Architects’ project manager, feels the permanent closing of Clarkson Street was one of the most rewarding aspects of the first phase of the project.

“The closing of Clarkson Street was a significant milestone accomplished through numerous meetings with city agencies, including traffic, engineering, zoning, planning, city council, neighborhood groups and the mayor of Englewood,” Reu said.

Clarkson Street was closed off to allow the facilities on both sides of the street to function better together. But closing the throughway was not without its structural challenges.



Three-dimensional BIM rendering of a fourth floor patient room showing rough-ins and structural supports. (Rendering courtesy of GE Johnson Construction.)



Another view of the 94,000 sq. ft. expansion to Craig Hospital in Englewood. (Photo courtesy of GE Johnson Construction.)



The roof is complete, as is interior framing and MEP on the fourth floor. (Photo courtesy of GE Johnson Construction.)

The third and fourth floors of the north addition cantilevered 20 ft. above and beyond the lower levels facing Grand Avenue. The facade of brick veneer required careful design and detailing to limit deflection for the support of these cantilevered stories.

A 24 ft. cantilevered canopy structure was also required to create the architectural interest of the main entry. The geometry of the interface of the north addition, the east main entry and the existing original building created a need for large transfer beams, up to W30x191.

As is typical of many health care renovation/retrofit/addition projects, Craig Hospital had to remain fully operational without disturbing patients during construction, said MGA's Gaines.

The phasing of the construction required creating enhanced lateral force resisting connections to the existing building, particularly to elevator and stair cores, without disrupting the operations. Vertical connections of new columns to existing had to maintain water tightness to the occupied spaces below.

"As was to be expected, some of the existing columns were not in the exact location as shown in as-built drawings, requiring field adjustments," he said.

Buried utilities presented challenges with installing the deep-

drilled pier foundation system, also requiring field modifications.

Fast-tracking of the construction schedule required structural design to be completed much in advance of the remainder of the building design.

"Fast tracking the schedule makes coordinating the structure even more complex, particularly with chases and mechanical equipment supports, along with architectural detailing," Gaines said.

Budget concerns are always a consideration on any project. During the structural design process, economies were studied to achieve the optimum design without sacrificing safety or serviceability.

Large 36 ft. structural bays were used in the addition to achieve some economy and work with patient room layouts.

The project team – RTA Architects, SmithGroupJJR, GE Johnson Construction and MGA Structural Engineers – are highly responsive to Craig's patient needs, said Mike Fordyce, Craig Hospital's president and CEO.

"The deep collaboration going on here is remarkable – to the point of GE Johnson appointing one of its superintendents to be the staff-patient liaison," Fordyce said.

The patient liaison is on call around the clock for three years to ensure no activity will impact patient comfort. Shutting down

drilling for three hours to accommodate one patient's need to nap and be relocated to a quieter room is one example of the level of commitment to the Craig philosophy of patient-centered care, Fordyce said.

"For us, it's the 'dream team' we needed to carry out such an important community project."

The expansion is expected to be completed in late 2016.

## Craig Hospital Expansion

### Owner:

Craig Hospital, Englewood

### Architect Of Record:

RTA Architects, Colorado Springs

### Associate Architect:

SmithgroupJJR, Phoenix

### Project Manager:

Hammes Co., Englewood

### General Contractor:

Ge Johnson Construction  
Greenwood Village

### Structural Engineer:

MGA Structural Engineers  
Colorado Springs

### Civil Engineer:

Anderson & Hastings, Lakewood

### Mechanical/Electrical:

SBEC, Lakewood