Shop-applied intumescent fireproofing cuts schedule and speeds erection.

Fire Protection to Go

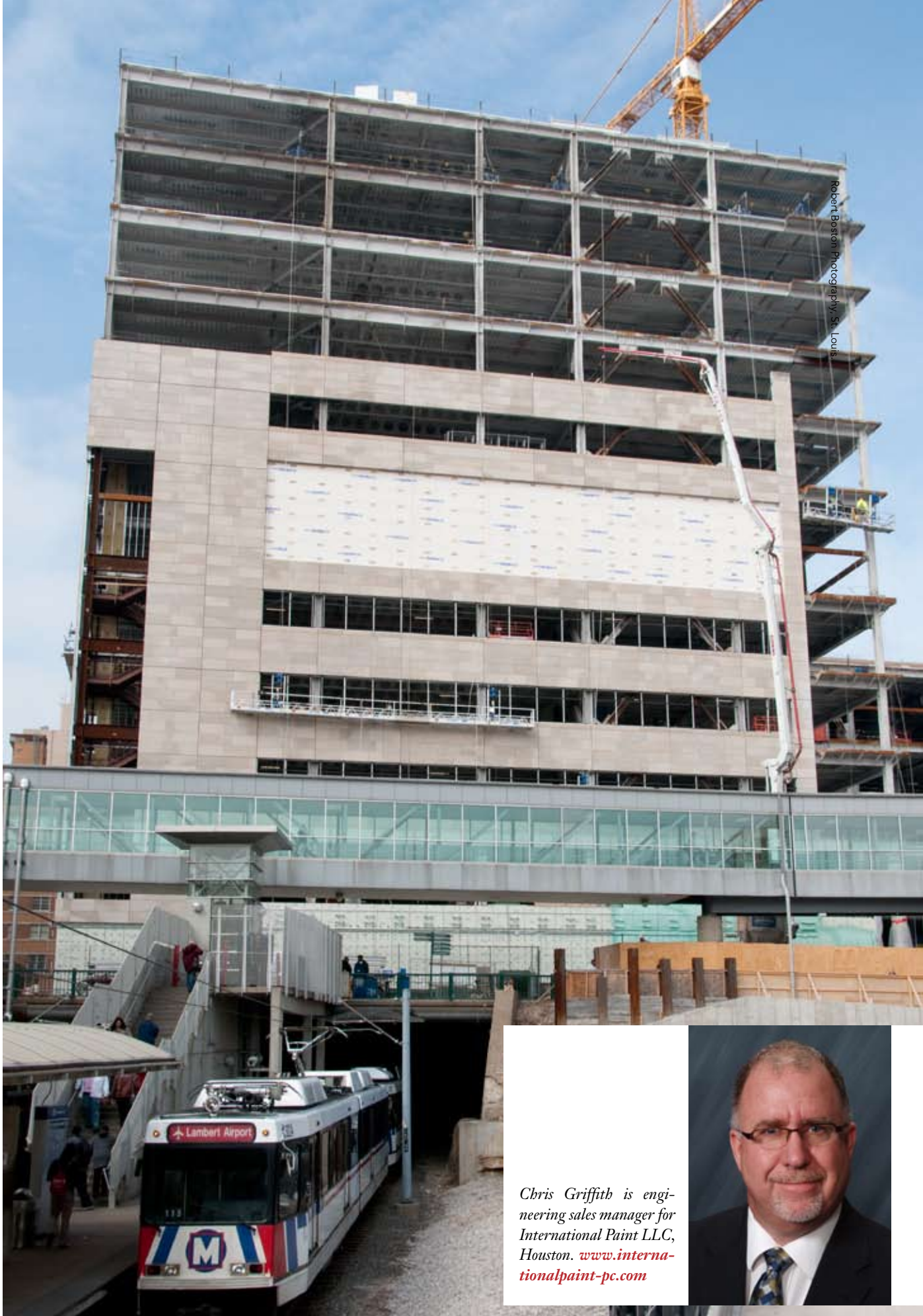
BY CHRIS GRIFFITH

THE BIOMED 21 initiative at Washington University School of Medicine in St. Louis was launched in 2003. The initiative has gained widespread recognition for its collaborative, interdisciplinary research and subsequent advancements in treating some of society's most prevalent health problems. By 2007, the program's success prompted BJC HealthCare, one of the largest nonprofit health care provider organizations in the U.S., to help fund the construction of a new research center on campus to house laboratories and support facilities for BioMed 21, which has since been renamed the BJC Institute of Health.

The architect, Canon Design, St. Louis, designed a portion of the 675,000 sq.-ft facility to be constructed as a canopy over the St. Louis MetroLink tracks that cross the campus property. To support the base floor of the 11-story structure, architects specified 45-ft to 55-ft cellular SMARTBEAM® construction. They were selected instead of standard wide-flange beams because of their light weight yet comparable strength and their excellent vibration control capability. The cellular design also allows for an easier installation of the ductwork through the openings in the beam webs, as opposed to cutting custom penetrations in the solid steel webs.

Above: A fireproofing system consisting of primer, a layer of carbon fiberglass mesh between two layers of intumescent fireproofing material, and a polyurethane topcoat was applied at ground level and in a climate-controlled environment in the fireproofing contractor's facility.

Opposite page: Because the new BJC Institute of Health facility was designed to straddle the MetroLink rail lines in St. Louis, a shop-applied fireproofing system saved much time and aggravation.



Robert Boston Photography, St. Louis.

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Photo: Robert Boston Photography, St. Louis.

The St. Louis MetroLink rail lines are visible beneath the cellular beams for the base floor of the new BJC Institute of Health at Washington University, which all had to be placed between 1 a.m. and 3 a.m.

Because the new research center would literally straddle the MetroLink tracks, architects also had to provide a passive fireproofing system that would protect the steel against the high temperatures of a hydrocarbon fire, which can reach 2,000 °F. They also wanted to provide long-term corrosion and chemical resistance protection. The project's fireproofing contractor recommended International Paint's Chartek 1709 epoxy intumescent fireproofing technology based on its 30-year track record of protecting steel structures in this type of environment.

Another consideration was that the MetroLink tracks are in constant operation, making field application of fireproofing material extremely difficult. The performance benefits of the Chartek fireproofing technology, along with its shop-application capability allowing the structural steel to be installed as a finished system, led to its ultimate selection and use.

Application

The fabricated beams were shipped to the fireproofing contractor's plant in May 2008. The steel sections were blast cleaned to the specified SSPC SP-10 near white surface finish, followed by application of a fast-curing epoxy-based primer.

Next, a five-person crew spray-applied the first coat of Chartek 1709 at 210 mils. Carbon fiberglass mesh (HK-1) was then backrolled into the wet material on the bottom of the beam flanges only, which provided a real savings in labor and materials costs over traditional intumescent application procedures.

Just four hours later, the crew applied a second, 218-mil coat of fireproofing to achieve the UL two-hour rating. A highly durable polyurethane topcoat was then applied, completing the fireproofing application in one day.

After 16 hours of curing the beams' coating, Chartek is hard enough that they can be transported to the job site. However in this case, the cured pieces were stored in the shop yard prior to shipping each night to accommodate the project's restricted construction window that mandated a "just-in-time" delivery method.

Using this shop-applied system at ground level in a climate-controlled environment with strict quality control and production measures in place boosted both speed and quality. The fireproofing application to the 38 beam sections and associated truss sections was completed in two phases over a six-week period. That shaved several months of labor off the original construction schedule, compared to a field-applied option, by avoiding the need to set up and remove scaffolding and other field equipment. It also avoided any potential delays due to scheduling conflicts with multiple construction trades on site, seasonal weather changes, and other unforeseen field problems.

Construction and Erection

The building's unique design configuration presented several construction challenges. First, the new research center would replace the existing structure canopied over the MetroLink tracks. In order to protect the tracks during demolition, the general contractor would need to erect the first and second floors of the steel structure around the existing canopy. Also, because the MetroLink tracks are in continuous operation, demolition and erection of the beams was only permitted between 1 a.m. and 3 a.m. each day, creating a very narrow window in which to work.

After a temporary work platform was erected, demolition of the existing canopy began in late summer 2008. The stored beam sections were loaded onto flat bed trucks and transported 100 miles to the job site each night. Beginning in October 2008, approximately three beams were installed each day during the short two-hour window, with the final placement in November.

Despite the considerable handling of the beams during transportation and erection using standard industry practices, the repair and touch-up to the epoxy intumescent fireproofing was almost negligible, at 1% to 2% of the surface area. These results are similar to the robust performance being reported on other shop-applied Chartek projects around the globe. Additionally, using this type of fireproofing means the beam's flutes do not have to be packed with mineral wool after the top flange is attached to the floor assembly, offering further savings in labor and materials over traditional methods. MSC

Owner
Washington University, St. Louis

Architect/Structural Engineer
Canon Design, St. Louis

Structural Steel Fabricator
Hammerts Iron Works, St. Louis (AISC Member)

Cellular Beam Manufacturer
CMC Steel Products, Hope, Ark. (AISC Member)

Fireproofing System
Fire Stop Technologies, Taylorville, Ill. (contractor)
Precision Finishes, St. Louis (surface preparation)
Midwest Fireproofing, Frankfort, Ill. (application)