NOVEMBER 2017 Vol. 38 • No.11 • $4.00

CAM MAGAZINE

"THE VOICE OF THE CONSTRUCTION INDUSTRY"

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Mr. I's School of Business

Rises in The District Detroit

By **Mary Kremposky McArdle**
Associate Editor

As part of the topping-out ceremony, a member of Ironworkers Local 25 – his hardhat plastered with a Mr. I decal in honor of the late Mike Ilitch – watched as the last steel beam and the traditional evergreen tree were hoisted into place on the new Wayne State University (WSU) Mike Ilitch School of Business. The steel building team in the field placed the steel on this 120,000-square-foot building in only about two-and-a-half months. The main steel building team: Detroit-based Ideal Contracting, LLC, was responsible for detailing, fabrication and erection; working under contract to Ideal, Ruby + Associates, Inc., Bingham Farms, served as erection engineer for this showcase project; and Thomas Steel, Inc., Bellevue, Ohio, was the fabricator for the main building.

The team's steely sense of purpose and production swiftly erected the structural steel frame for this four-story building and its complex, multi-dimensional, cantilevered canopy. The canopy will give the building a commanding presence along Woodward Avenue and Temple Street. This choice location is in the heart of The District Detroit; the building's next-door neighbor is the recently unveiled Little Caesars Arena.

PHOTOS COURTESY OF CHRISTOPHER LARK, LARK PHOTOGRAPHY

The Steel Challenge: Installing a complex, multi-dimensional, cantilevered canopy for this showcase, four-story building.

"We started our first steel on April 3, 2017, and we placed our last piece on June 12, 2017," said Ideal Project Manager Phil Tyckoski. "It was a very quick and efficient job."

Mr. I would certainly be proud. Like most enterprises, the business of building is all about efficiency. This self-made entrepreneur was known both for his business acumen and his strong dedication to Detroit.

This same Spirit of Detroit lives in Ideal Contracting's project management team and its peak crew of 20 to 22 ironworkers who brought heart and technical skill to this approximately $50 million dollar project being built by a joint venture of the Detroit offices of Christman-Brinker. "Christman-Brinker was great to work for," said Tyckoski. SmithGroupJJR, another company with deep Detroit roots going back over 150 years, was the architectural firm responsible for the building's design.

Ruby + Associates, another veteran of Detroit's revitalization efforts having worked on the massive roof trusses at Ford Field, developed a steel erection plan for this showcase building. "We analyzed the steel and created an erection plan to provide temporary bracing and to maintain overall stability and load path while Ideal Contracting is erecting the steel structure," said Ruby's Senior Project Manager Jeffrey Gasparott,
PE, SECB.

The word "stress" takes on a whole new meaning for engineers such as Ruby + Associates. From live, dead and wind loads to shear, axial, and lateral forces, structural erection engineers calculate the structural stress - or load and load path - of unseen forces that have very real consequences for human safety and building stability. At the WSU Mike Ilitch School of Business, Ruby + Associates had to accurately determine the load being placed on the steel frame as it was being constructed over the course of approximately 26 different steel installation sequences. They also provided Ideal Contracting with a plan for the placement and removal of a shifting series of temporary bracing systems. In each of their respective professional disciplines, Ideal Contracting, Ruby + Associates and Thomas Steel religiously followed the basic law of structural steel construction: "What goes up, mustn't come down."

Erecting a Steel Sculpture 55 Feet Above Grade

The most challenging part of the WSU project was piecing together the steel for

the cantilevered canopy. Some sections of the canopy cantilever 12 feet, and some steel members were about 50 feet long. More than size, the steel is skewed and splayed at multiple angles. "The canopy was probably the most complicated part of the job, because it not only cantilevers, but it actually slopes in about four different directions," said Tyckoski. "The canopy flares upwards toward Woodward Avenue, and it flares out on both the north and south sides – and everything meets in the canopy's corners."

The canopy has a sculptural quality. "The canopy awning has a three-dimensional geometry that just doesn't happen on every job," said Gasparott. "It is skewed in both horizontal planes, and then also vertically sloped. It presented a detailing challenge and a fit-up challenge that both worked out great."

Fully welded moment, or rigid, connections link the steel members of this complex canopy. "Moment connections provide restraint for flexure (essentially bending of the steel) and torsion (basically rotating or twisting)," said Ruby Project Engineer Myles Badour, PE.

While X bracing, an X-shaped steel assembly, is another way to achieve restraint from these forces, this solution wouldn't fit the desired appearance of the canopy. Because the design intent was to create a seamless look, welded versus visible bolted connections were the preferred choice.

This choice presented some challenging field conditions. "A fully welded moment connection could take several hours to create in the field, and we would have to use a crane to hold the steel piece in place while welding the moment connection," said Tyckoski. "If a welder has six or eight feet of weld, because the welder has to make multiple passes to fill an inch-and-a-half gap on both top and bottom flange of the beam, that process can take every bit of a day, or even two, for each connection to be completely welded."

Ruby + Associates' erection plan offered Ideal Contracting the optimal solution.

Under Ruby's plan, temporary erection bolts held the steel in place during welding, erasing the need for the costly use of the crane. Instead of holding the steel in place for hours, "We could use the crane to keep setting steel, allowing us to maintain our schedule and to avoid wasting any money," said Tyckoski. "It was a tremendous help to have had a plan in place that targeted the best way to efficiently erect the steel pieces."

This process was repeated a dozen times 55 feet above the corner of Woodward Avenue and Temple Street. "Once the welds were made and the steel pieces were stable and attained full moment capacity, Ideal pulled the temporary erection bolts out and plugged the holes with filler material," added Gasparott.

Ruby's overall task was to analyze the structure based on how the job was

This building's next-door neighbor is the recently unveiled Little Caesars Arena, due south of Wayne State University's Mike Ilitch School of Business.

going to be delivered and built. "We actually analyzed the project sequence by sequence," said Gasparott. "We analyzed each of the 26 stages of steel construction to provide stability and then to provide load path for environmental load, such as wind. We are essentially bracing the building for wind loads prior to the building's design system, or the final lateral load resisting system, being firmly in place."

Ruby + Associates "not only provided a temporary bracing plan for Ideal during steel installation, but we also planned removal sequences to get the bracing out of the way," added Badour.

The challenge of erection engineering is increased when managing a cantilevered canopy. "Many times we try to take advantage of the metal deck, but when it is cantilevered, the only way you can get it to work is through using the building's concrete (as a load path for the bracing)," said Badour.

Tight Tolerance

Overall, Ideal Contracting installed 1,200 tons of structural steel for the U-shaped building, said Tyckoski. The U-shaped area houses a courtyard facing the arena and the downtown Detroit business district.

Adding to the project's complexity, all the columns had to be within a quarter-inch tolerance over the entire structure, making for a precision-placed structural grid. "As compared to the code of standard practice, the tolerances are extremely tight in general for the entire building," said Badour.

The first line of "defense" in achieving these tight tolerances was the accuracy of detailing and fabrication on the part of Thomas Steel, the firm responsible for fabricating all of the building's steel minus the specially fabricated column covers.

Steel measurements, dimensions and work points were taken from a model formulated from detailing software. A work point is where two or more centroid lines of structural members intersect, according to an online Joist and Structural Glossary. The lines through the structural member's center-of-gravity may not coincide with the geometrical center lines.

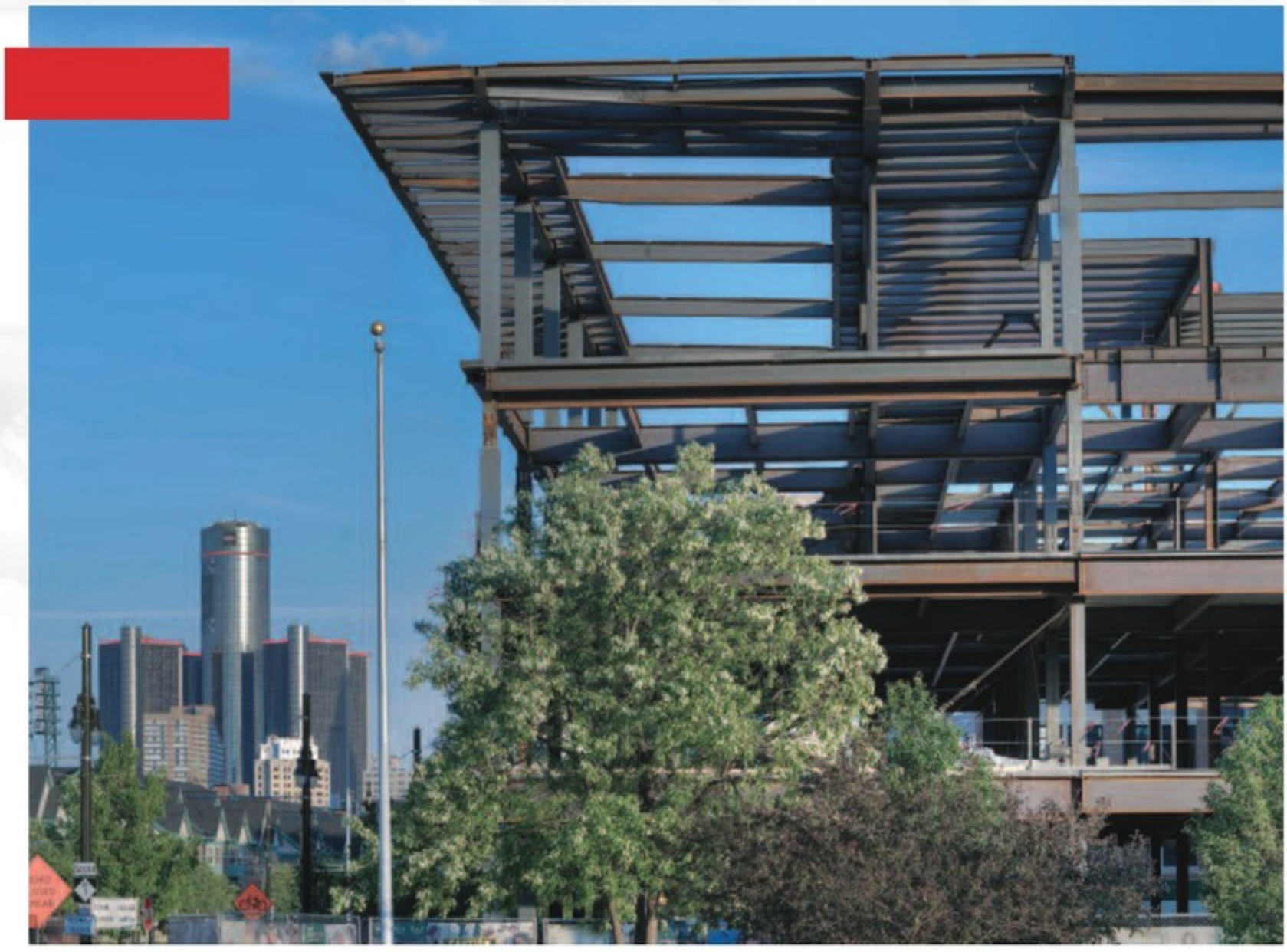
Thomas Steel used an assembly jig in the shop to control accuracy in the location of work points and in each steel member's measurement and configuration. "We measured off of string jig points, the string being a large, straight steel beam," said Thomas Steel President Steve Roth. "Measuring off of these string jig points is how we assured a good fit-up in the field."

Once in the field, "the detailer provides us with the work points on a sheet, and we will periodically take measurements when we are fitting out the steel to make sure we are maintaining the required distance between work points," said Tyckoski.

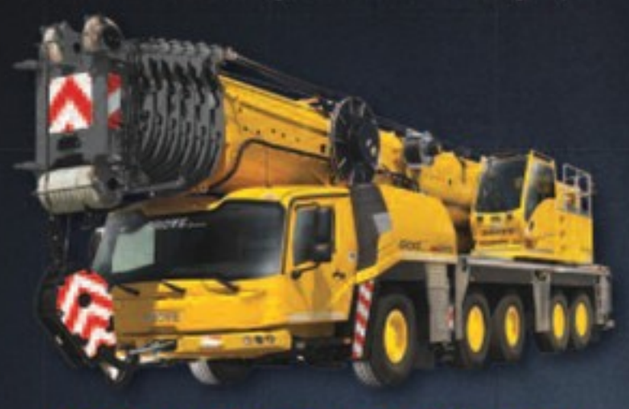
Ideal Contracting's mission was to make sure the tight tolerances were maintained in the field, and the building was plumb and square. Tyckoski explains how both goals were accomplished: "Ideal wrapped structural or plumb cable around the columns and torqued it down tight. Our crew would assess the tolerances in the field with their own leveling instruments. We also enlisted the services of a surveying company to laser shoot it in the field with respect to the final locations. The surveyor would laser shoot where the bottom of the column is in relation to the coordinate system. The surveyor would then shoot the top of the column to assess whether or not it is out of plumb."

Tight Site

The project presented tight tolerances and a tight site. For actual steel erection, Ideal parked its crane in the middle of the building's U-shaped courtyard, and then "we built the first two floors all the way around the U-shaped building, followed by the second two floors," said Tyckoski. "Besides the canopy, the rest of the project was fairly straight forward, being a series of beams, columns and X bracing."



Ideal Contracting, LLC, launched steel installation in April 2017, and completed the steel erection in June 2017. Working under contract to Ideal, Ruby + Associates, Inc. served as erection engineer for the 120,000-square-foot building.



For the X braces of the main building, Thomas Steel made welded connections in the shop, allowing Ideal Contracting to finish the connection using only bolts in the field. "We made full penetration welded connections in the shop with holes in the steel to help Ideal in the field," said Roth. "When Ideal went to erect the braces in the field they only had to bolt the holes. This also helped Ideal to square the building and hold it in place instead of having to rely on cables as much as is usually done in the field."

In addition, Ideal Contracting's own suggestion to use bolted plate connections for the building's more conventional X bracing also boosted efficiency in the field. "The design drawings called for the hollow steel X bracing to be welded to a plate that comes off of the column," explained Tyckoski. "What we were able to do is convince the project team to change that over to a plate-bolted connection, which helped us with erecting the building efficiently." This approach also helps to make the building a little more stable more quickly as compared to a field-welded connection.

Ideal Contracting also ably met the challenge of working on the site's small footprint. "The QLine was operating and we had to be very careful to avoid interrupting its operations and to avoid its energized power lines while erecting the building's steel," said Tyckoski. "Our work was just barely within the fence line."

Given the small site, Ideal also had to "sequence out the job to give us two to three days' worth of steel erection materials," Tyckoski continued. "We carefully planned our deliveries and our delivery time to avoid overloading the site with more steel than was manageable."

Like much of the project, steel delivery was a matter of precision. "It took a great deal of communication and coordination with Thomas Steel's fabrication shop," Tyckoski continued. "I would ask, 'What do you have ready and when can you get it to us? And sometimes, I had to ask them to hold a

load, because of the fact that it had rained and we couldn't accept any more iron on the site at that point."

Because of the site constraints, Ideal even had to carefully plot the swing radius of the crane. Ideal could only swing its crane in one direction, because the arena offices were in close proximity to the site. "Because our crane only swung over the building itself, we were able to keep both Temple Street and Woodward Avenue open," said Tyckoski. "Ideal used a 165-ton lattice boom crawler crane with a luffing jib. The main boom was 127 feet, and the luffer was 105 feet."

The Steel Dream Team

As another challenge, Ideal Contracting coordinated the work of two fabricators, both Thomas Steel and Black Rock Fireproof Column Company. "Black Rock was responsible for the fireproof, shell-like structures placed around some of the structural columns," said Tyckoski. According to its website, the East Hartford, Connecticut company offers durable, aesthetically designed, prefabricated fireproof columns, known as Bridgeport columns.

As Ideal Contracting's role, "we had to coordinate the column splice locations," said Tyckoski. "Typically, we splice the column halfway up. We had to actually reorganize the spliced locations, so that they fell in the ceiling space of the structure. The splices are now hidden, so only the shell is visible to someone walking through the building."

From efficiency to aesthetics, this steel dream team successfully detailed, fabricated and installed this showcase building honoring the legendary Mike Ilitch and dedicated to cultivating the same business savvy and community spirit in its students. As captured by The District Detroit video, at the topping-out ceremony, President and CEO of Ilitch Holdings, Inc., Chris Ilitch, said, "Mike Ilitch was a once-in-a-generation entrepreneur and a passionate community advocate. We are immensely proud that the next generation of great entrepreneurs who will positively impact our community will hold a degree in his name." In speaking at the event, WSU President M. Roy Wilson said, "Building a business school right here in downtown Detroit is another symbol of our commitment to Detroit."

Olympia Development of Michigan, Wayne State University, and the entire steel design, fabrication and construction team, including Ideal Contracting, Ruby + Associates, Ironworkers Local 25, Christman-Brinker, SmithGroupJJR, Thomas Steel, and Black Rock Fireproof Column Cover, have clearly met the high standards set by the building's namesake. The grand unveiling of the completed building is set for 2018.