HIGH Steel News

Information from High Steel Structures LLC

Summer 2014

New Innerbelt Bridge Brings Modern, Innovative Design to Cleveland's Skyline

Like many of the nation's cities that are served by an aging interstate system, Cleveland has been faced with rising congestion and funding challenges for the maintenance or replacement of vital transportation infrastructure. The city is taking a big step forward with the new Innerbelt Bridge, the first phase of the Innerbelt Corridor Plan, a multi-billion dollar effort to modernize the Innerbelt Freeway system.

In 2009, when the Ohio Department of Transportation (ODOT) received over $900 million in stimulus funds from the American Recovery and Investment Act, it invested over a fifth of the allocation in the single largest transportation infrastructure project in the state's history – the replacement of the Cleveland Innerbelt Bridge.

The new Westbound Innerbelt Bridge, courtesy Walsh/HNTB Innerbelt Project Team

The Cleveland Innerbelt Bridge project includes two new bridges, carrying Interstate 90 across the Cuyahoga River, several existing roads and "The Flats," an industrial area. The scope of the projects includes replacing the 1959 Pratt Deck Truss bridge with two, nearly identical spans.

The project sequence began with the construction of a new $293 Million westbound structure. ODOT chose an industry leading best-value design-build contract to secure the construction of the new 4,347-foot bridge. In September 2010, after five weeks of technical evaluation, officials determined which of three proposals provided the best value. ODOT and the City of Cleveland awarded the contract for the new westbound bridge to the team of Walsh Construction and design firm HNTB Ohio Inc.

High Steel Structures LLC (HSS) was awarded a contract to fabricate some 22,000 tons of structural steel for the 16-span bridge.

A Design for the Future that Honors the Past

Walsh and HNTB won the contract with a steel delta frame design. According to Thomas Flask, Transportation Engineer, HNTB, the team was influenced by other nearby bridges over the Flats and the Cuyahoga River, such as the Hope Memorial Bridge and Veterans Memorial Bridge, when determining the bridge's design, in order to ensure that the new bridge fit well with those bridges and the skyline. In fact, one of the requirements for proposals was that the bridge incorporated arches as a design element.

"We selected the delta-girder design because it is a unique design in Ohio that shows prominent arches between each pier, and also acknowledges Cleveland's history

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A Look At The World's Bridges

Double Helix Bridge

Singapore

The Ying and Yang of Asian culture inspired the Double Helix Bridge in Singapore. Built in 2010, the incredible 280-meter pedestrian bridge has a double spiral design that resembles the structure of DNA. Straightened out, it would measure 2,250 meters. The Double Helix Bridge weighs 1,700 tons, and was fabricated from 650 tons of duplex stainless steel and 1,000 tons of carbon steel. It was designed by an international design consortium of Australian architects Cox Group, engineers Arup and Singapore-based Architects 61.

Message from the President Brian W. LaBorde

"BrIM-ing" with Collaborative Ideas for Bridge Data

Recently I met with other bridge industry professionals to discuss changes needed to improve our industry's direction for the future. The group agreed that improved collaboration between designers and fabricators is key to decreasing costs and improving efficiency in the steel bridge building process from design to delivery.

Our staff routinely assists the industry by reviewing steel designs and suggesting ways to cut fabrication and shipping costs. In that same spirit, High Steel is currently assisting the National Steel Bridge Alliance to develop a national forum for design fabrication questions. But beyond these efforts, we feel that the next step is finding ways to collaborate with the industry.

High Steel has a long tradition of embracing technology to improve our processes and better collaborate with our customers. While regulating agencies can take time to embrace change, perhaps the industry can begin to make progress now by adopting Bridge Information Modeling ("BrIM"). Like Building Information Modeling (BIM), BrIM is based on one central data source that all project stakeholders can access, use, and extend.

Traditionally, bridge information is worked on by project stakeholders one at a time. This approach is time-consuming because the entire package needs to be finalized before the next phase can begin. Any error has the potential for a change order. With BrIM, stakeholders use software instead of paper to transfer project data. Of many benefits, two stand out. First, all parties use the same information, so coordination is greatly improved, and second, with one data source, errors are dramatically reduced.

Using BrIM, the designer is designing the bridge and building the data behind it so that there is a complete picture as analysis is completed. The general contractor then uses the model to determine construction sequencing, eliminating the need to recreate design assumptions. The fabricator can reuse the data to develop programs required to fabricate steel, adding material

certifications, non-destructive testing results, etc. Finally, the owner can use this information to help maintain the bridge.

We have already seen how successful this type of process is during design-build projects, when we work with designers to develop efficient fabrication practices. BrIM offers benefits for all stakeholders, but using data instead of paper is a significant paradigm shift that will take effort, patience, and diligence. Let's work together to implement BrIM and achieve superior steel bridges.

Customer Satisfaction Surveys –

worth the time or just a bother?

by **Steve Bussanmas,** Senior Vice President of Sales & Marketing

We all get the letter, e-mail or phone call asking us to take the time to respond to a survey gauging our satisfaction with a product or service. On average we respond 10 to 15 percent of the time, which goes up to about 30 percent if a promotional gift is added. Thus, for the surveyor it becomes a numbers game to get enough responses to complete a statistically accurate report.

Personally, I complete a survey when the product or service is important to me and especially if I will be a repeat consumer. If the experience was good, I am in hopes that my response will keep the company on the right track. If any part of my experience was problematic, I hope that the company will take my response to heart and correct the problem before my next purchase. I would guess that most of you fall into the same category, passing on most surveys but responding when you think you may get something out of it.

At High Steel Structures, we send out surveys to gauge the contractor's experience in three different areas. The surveys take approximately ten minutes to complete so they would be considered short by comparison to many.

The first is on the sales experience at the time of the bid. Was our scope clear and concise; did we provide quality answers to questions; was the pricing timely, etc.?

The second deals with the experience in executing a contract with High Steel Structures. Were the dealings fair; was any negotiation done in a timely manner; was the contractor satisfied with the outcome, etc.?

The final survey is sent after the project has been completed and addresses how we managed the project for the contractor. Was the steel delivered on time? Was it a quality product that fit? Would you use High Steel again?

As you can see, we are very serious about gauging our performance. Your answers help us to identify the ways that we can improve the customer's experience. Each year we issue a report on the three separate survey results, and the department heads are then tasked to prepare and execute action plans that will address the lowest rated areas.

Since most of our customers are repeatedly bidding on steel projects any surveys from High Steel they answer will likely affect their future experience. We value your feedback on each job, and I hope after reading this article, you will take the time to answer future surveys you receive from us.

High Steel Provides Key Pieces for Manhattan West

The Manhattan West Development project is creating valuable land in New York City where there was once only open air above a rail yard. The project is located on Ninth Avenue between West 31st and West 33rd Streets and Dyer Avenue in New York City.

In early 2013, Brookfield Office Properties Inc. began construction on the first phase of the project, the platform for the development site, which is located above an active rail yard consisting of 15 tracks operated by Amtrak, Long Island Rail Road (LIRR), and NJ Transit, carrying as many as 1,400 trains daily from Penn Station throughout the northeast.

According to the developer, the $330 million platform, a series of 16 bridges, will complete the surface upon which the 7-million-square-foot Manhattan West development will rise. The platform comprises over half of the site's five acres, which will ultimately feature dual two-million-square-foot Class A office towers, a residential tower, a 1.5 acre open public space, and retail throughout. The cores of the towers will be constructed on bedrock to the north and south of the platform.

New York based Turner Construction is managing the platform installation. The construction process utilizes post-tensioned pre-cast segmental bridge technology, with the design calling for each of the 16 "bridges" to span 240 feet across the rail yard. The first step was building the temporary structural steel platform and crane runway upon which the construction equipment could operate. Under a contract with Stonebridge Steel Erection of South Plainfield, NJ, High Steel Structures LLC provided some 1,400 tons of structural steel used in the crane runway.

The project was unique in that the weight of the columns was especially heavy, given their relatively short length of 26 feet. "The columns were massive in that they were made up of W14x730 wide flanges with 4" cover plates on both sides, some of which had a total weight over 26 tons," notes High Steel Project Manager John Flaud.

Part of the scope of the project was the design of the bolted and welded connections. High Steel partnered with Upstate Detailing, Inc. (UDI) to determine variables such as the size of the bolts, size of the weld, and plate thicknesses.

Once the crane runway was built, a traveling crane picks up the individual precast segments for the platform spans and delivers them to a temporary platform above the tracks. After the segments are stressed and the span is self-supporting, an overhead gantry lifts the entire span and travels along a runway to "launch" it into its final position over the rail yard. Once the spans are all in place, a 6" slab will be cast over the entire platform, and the space will serve as an outdoor plaza providing pedestrian access to the Manhattan West Development.

Construction of the platform is expected to be completed this year, positioning the project to begin receiving tenants in 2016. The total Manhattan West project cost is estimated at $4.5 billion.

For more information about the project including a detailed animation of the platform construction process, visit the project's website at www.manhattanwestnyc.com.

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as a steel town," explains Flask. "From an engineering perspective, the delta-girders allowed cost savings by building higher concrete piers and shallower steel sections than you would see in a more traditional bridge, such as the 1959 Innerbelt Bridge."

HNTB's Project Manager, Ken Ishmael, further explains, "While the design honors the steel bridge history in Cleveland, it's immediately recognizable as a very modern, innovative design. It is an elegant bridge with clean lines, relating Cleveland's old steel-bridge look to the steel bridges of tomorrow."

Complex Fabrication for an Extraordinary Bridge

As High Steel Structures' Williamsport, Pa. plant began fabrication, it became clear that the project would be unique. To put the requirements into perspective, one must consider that the bridge's delta spans each vary in size and have different girder lines resulting from the curvature of the bridge.

Five delta frames sit on top of each pier located between Piers 2 and 11 on the 14-pier bridge. Each delta requires six individual fabricated pieces – two "knuckle" girders to form the top corners, the "V" girder for the bottom, to rest on the pier, two arched "leg" girders to attach the "V" to the bottom fork of the knuckle girders, and one top girder to attach the knuckle girders underneath the roadway (see Figure 1).

The typical delta frame is approximately 16 feet across at the "V," or bottom girder, and 100 feet across at the top girder, near the bridge deck. The knuckle girders, which tie all of the other girders together, are approximately 70 feet long and vary in height. In all, 40 deltas were fabricated for the project.

The Innerbelt project was in fabrication from November of 2011 until August 2013.

According to High Steel Senior Project Manager, Ken Glidden, apart from shipping these massive field sections, the sheer size of the yard assemblies presented challenges to set up and check the fit of the delta leg sections.

"People that did not see these girders up close may not be able to comprehend just how large they are by looking at the bridge from a distance," Glidden comments. "There are flanges on some of these girders that are 3 inches thick and 48 inches wide. To put this into perspective, these flanges are the size of a sidewalk, just massive, massive pieces of steel!"

Knuckle girder in fabrication

Glidden notes that the assemblies took up a lot of real estate in the yard, and the large weights of some of the girders meant that multiple pieces of equipment were needed to transport them into and out of the assembly areas.

"It was a complex set of maneuvers that our yard personnel had to perform," said Glidden. "They performed it very well, and in a safe manner, which is always the most important objective."

Putting it all together

High Transit LLC delivered the massive steel girders for the bridge from High Steel Structures' plant in Williamsport, Pa. to Cleveland. Shipping the pieces required careful planning, with some loads being very long and heavy, at 119' long and 190,000 lbs., and the "knuckle" girder loads being exceptionally wide, at 18.5 feet.

The straight girders, with equipment, weighed 285,000 lbs. (gross), and the overall vehicle length exceeded 160 feet. The knuckle girders combined with equipment weighed 180,000 lbs. and were 100 feet long and 19.2 feet wide shipped in a stable "lay-down" position.

The most direct route for the project's 90 super loads would have been I-80 West through Pennsylvania to I-77 North in Ohio to the jobsite, a 287 mile trip. However, with construction on Interstate 80 in Pennsylvania prohibiting passage of the 19.2-foot wide loads, the permitting and routing process resulted in a 438 mile journey via western New York, increasing the route by 151 miles. Additionally, scheduling for a NYSDOT safety inspection and police escort in New York increased the delivery time by an extra day.

In the field, the superstructure began to take shape as ironworkers erected the forty delta frames atop the piers, first welding the V-girder to the bearing, which is already bolted to the top of the pier. The sequence continued with the delta legs being connected to the V. The top girder was then held in place, supported by temporary columns that were bolted to the legs. Once all those connections were secure, the knuckle girders were brought to the ends and connected to the top girder and delta legs, completing the assembly.

The deltas were connected to each other between the piers using a closure girder. The closure girder connects to a knuckle girder on each side. In terms of the actual construction, two cranes were necessary to lift and hold each closure girder in position.

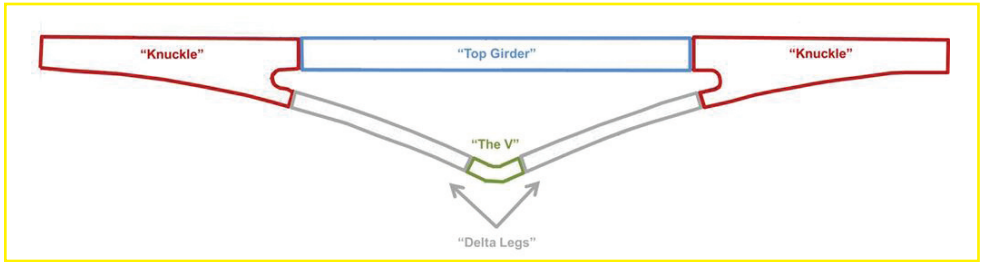

Figure 1: Delta Frame Diagram, courtesy of Ohio Department of Transportation

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A knuckle girder is shipped from High Steel's Williamsport Plant

Ironworkers waited in position on both piers as the girder was lifted. Using radios, the ironworkers communicated with the crane operators to guide the girder into the splice plates. The cranes would hold the girder while the ironworkers spliced each side. Once bolts were in place, the next girder could be lifted. It typically took several hours for each girder, depending on the size and the surroundings.

The straight girders in the traditional spans at the ends of the bridge were field spliced due to their lengths. Since the piers are a few hundred feet apart, they needed to be shipped in reasonable lengths which maxed out at 120 feet. In the case of the transition between traditional and delta girder spans, two straight girders for each girder line were required to reach the next pier. This is because one side did not have a knuckle girder to close some of the distance.

According to the project team newsletter, the project celebrated its "Topping Out" on August 30 on Abbey Avenue in Tremont. The occasion marked the erection of the last structural steel girder for the bridge. The girder was signed by the ironworkers, adorned with an evergreen tree symbolizing growth and good luck, and the U.S. flag. The use of a U.S. flag and tree on the steel beam is an American ironworker tradition that dates back to the beginning of the last century.

In November 2013, Lieutenant Governor Mary Taylor and officials from the Ohio Department of Transportation held a ceremony to celebrate the completion of the new $293 million westbound I-90 Innerbelt Bridge. The bridge was dedicated as the "George V. Voinovich Bridge" in honor of the state's recently retired US Senator who was born and raised in Cleveland. Prior to serving in the Senate, Voinovich also served as Ohio Governor and Cleveland Mayor.

"This project means a lot to the City of Cleveland and to Northeast Ohio," Taylor said. "State and local partners came together to make the Innerbelt Bridge a reality."

The westbound structure currently carries both the interstate's eastbound and westbound traffic while the deteriorating truss is demolished and the twin structure is built. Demolition of the existing bridge is under way, and construction of the new eastbound span is expected to be completed in the fall of 2016.

Special thanks to HNTB's Thomas Flask, and the project team website located at www.innerbelt.org for contributing key project information for this article.

Erecting a Delta Frame - Courtesy Walsh/HNTB Innerbelt Project Team

JUST THE FACTS:

Project Name:	George V. Voinovich Bridge (Westbound)
Location:	Cleveland, OH
Owner:	Ohio Department of Transportation
Designer:	HNTB Ohio, Inc.
Contractor:	Walsh Construction
Total Contractor Bid:	$287,400,000
Total Steel Tonnage:	22,000
Material:	A572/GR50

Recent Contracts Awarded

SR 95 Sect GR3, I-95N
Philadelphia, PA
James J. Anderson Construction Co. • 8,765 Tons

The East End Crossing
Louisville, KY – Utica, IN
Walsh-Vinci Construction • 6,026 Tons

SR 903 Sect 03B, Jim Thorpe Bridge
Carbon County, PA
Allan A. Myers, Inc. • 2,199 Tons

Dulles Metrorail Phase II
Loudoun County, VA
Capital Rail Constructors • 1,844 Tons

Fall River Interchange
Fall River, MA
Barletta Heavy Division, Inc. • 1,843 Tons

PA TPK Southern Beltway
US22 to I-79 Sec 55A 1-1
Washington County, PA • 1,752 Tons

Rte 5,8 & 12 (North-South Arterial and Viaduct)
Oneida County, NY
Sealand Contractors Corp. • 1,576 Tons

SR 81 Sec 358, I-81 Bridges
Luzerne County, PA
HRI, Inc. • 1,289 Tons

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"Lay down a good weld and give good measure"

Sanford High 1931

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