HIGH Steel News
Spring 2019

New Interchange Provides the Missing Link to Interstate 95 and PA Turnpike

It was a Presidential vision to build a highway that would link the entire East Coast from Maine to Florida. That President was Dwight Eisenhower, known as "Ike," and the year was 1956.

Finally, after more than 62 years, the American highway system championed by Eisenhower is complete. The last link to connect I-95 with the rest of the East Coast is in Bucks County, Pennsylvania, where I-95 now joins the Pennsylvania Turnpike.

The I-95 Interchange was completed in September 2018, with oversight by the Pennsylvania Turnpike Commission. The new infrastructure solves the multi-decade gap in the I-95 highway with a finely tuned system of flyover ramps, toll plaza facilities, environmental mitigation sites, intersections, six overhead bridges, widened highways and new connections to the New Jersey and Pennsylvania turnpikes.

The long awaited I-95 and I-276 connection is open to traffic. *Photo Credit: PA Turnpike*

High Steel Structures and High Structural Erectors won fabrication and steel erection contracts for construction sections D10, which bid in the summer of 2014, and D20, which was bid in the spring of 2015. Together, the projects required 4,855 tons of structural steel.

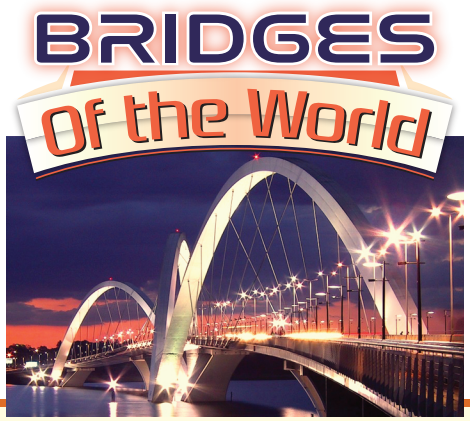
Both contracts featured large, multi-span curved flyover structures. Section D10's flyover is a 14-span viaduct carrying I-95 northbound over Ramp G, I-276, SR 2049 (Durham Road), and SR 0413 (New Rodgers Road). Section D20's flyover is a 15-span structure carrying I-95 southbound over I-395, four ramps, I-276, and SR 2049.

The design for both structures consisted of three units, with units 1 and 3 featuring a continuous steel multi-girder superstructure, and unit 2 featuring a pre-stressed concrete bulb-tee superstructure. High Structural Erectors (HSE) erected all three units for both flyovers.

High Steel Project Manager, Mike Kennedy was assigned to the projects, working directly with general contractors PKF Mark III (D10) and the Nyleve Bridge Corporation (D20).

"Both contracts required a substantial number of weathering steel I-girders which varied between 7-8 feet in depth, and up to 131 feet in length," explains Kennedy.

continued on page 3



Juscelino Kubitschek Bridge

Brasilia, Brazil

Best known as the Ponte JK Bridge in Brazil, the Juscelino Kubitschek Bridge shines at night, when it lights up the skyline of Brasilia. The dramatic steel and concrete arch bridge crosses Lake Paranoá, with a span of 3,900 feet. Four pillars are supported by three 200-foot-tall asymmetrical steel arches that crisscross diagonally. Steel cables alternate at each side of the deck, in a gracefully twisted design by architect Alexandre Chan and structural engineer Mário Vila Verde.

Message from the President

We're Prepared

John O'Quinn, President
High Steel Structures LLC

We had a fantastic visit from Pennsylvania Gov. Tom Wolf in February. His visit accentuated a modern reality and the fundamental revolution in parents' minds and in family conversations across the country: the idea that the best path to a good future is a college degree, whatever the topic and whatever the cost, is outdated.

This revolution is coming none to soon. And unfortunately, many are learning this lesson in a painful manner. During the governor's visit, Dr. William Griscom, president of Thaddeus Stevens College, spoke woefully of how many students with a four-year degree are back to his school, often with a mountain of debt, to learn a practical trade because they could not find gainful employment.

Of course, there is absolutely nothing wrong with a college degree, and those who have expended the diligence to earn their degree are to be highly commended. In some fields, particularly those that are STEM-oriented, demand is high for jobs with a college degree and hiring rates exceed 98%. But certainly not all. If your goal is to provide a living for yourself and your family, the prudent course is to understand salary expectations before choosing your course of study. Unfortunately, many folks are not getting that return on their college investment because jobs in their chosen field simply aren't there.

Fortunately, a ready solution exists for this problem: there are many good jobs at good companies that provide gainful employment at starting salaries in the $40k to $50k range without a four-year degree. At High Steel, the demand for shop workers has grown, even as automation has made manufacturing more efficient and less labor intensive. The days of laying out holes by hand and drilling them by hand are over, but folks are needed to program and operate the drilling machines. Stick welding is now used on an exception basis, but mechanized welding requires operators, and robotic welding requires programmers. Future automation will continue to take the hand work out of manufacturing, but that will change jobs, not eliminate them.

Yes, the movement away from "everyone needs a degree" is on, and High Steel is in front of it. We need people, and we offer good jobs: jobs that pay well, offer good benefits, provide the opportunity to live in healthy communities, and provide the stability of an 85-year family-owned company tenure. Further, we've now established High Steel University not only to strengthen incumbent worker skills but also to facilitate the transition of new-hires to the shop floor efficiently and with very strong knowledge about the skills they will need for success.

Governor Wolf knows that the key to Pennsylvania's success in the future lies in filling manufacturing jobs with skilled workers, and he knows that Pennsylvania companies must find effective ways to bring new folks on board and make them productive. He liked what he saw at High Steel. Like so many others, we need new good folks, and we're prepared to bring them on board.

Steel Price Update

By **Rich Truxel,** Vice President Sales & Estimating

Despite ongoing tariffs and strong demand for steel, the price of fabricated structural steel has remained stable over the previous year.

Owners and contractors often ask how to limit their exposure to fluctuating raw material prices. Here are three recommendations:

1) **Commit to a fabricator as soon as possible.** For bid - build projects the fabricator can buy the steel immediately to eliminate the risk of price fluctuations. For a design build project, we can work with the steel mill to obtain fixed pricing for a period of time. Material can then be procured as soon as the size of the webs and flanges are determined; it is not necessary to wait for RFC drawings.
2) **Provide raw material payments.** This reduces the risk of price fluctuations and the total cost of the job. If raw material payments are not available the fabricator will not procure material until the job is set to go into fabrication, which may result in a long period of time between project award and material procurement, thus increasing the risk. If the owner is not willing to make raw material payments this increases the carrying costs to the fabricator which are passed on in the form of higher prices. Owners have lower carrying costs than fabricators, so it is more efficient for owners to finance the cost of raw materials.
3) **Offer a material cost adjustment clause.** Most public owners offer a "steel price adjustment clause." This shifts some of the risk of material price fluctuation from the fabricator to the owner. This provides some insurance to the fabricator against very large material price swings. The effectiveness of these clauses is limited because they rely on indexes that have a weak correlation to the market price of steel; they only kick on when the price variation exceeds a threshold of 5-10%, and they can be cumbersome to manage.

We encourage owners to follow all 3 practices. Employing practices 1 & 2 on any given project will usually mean the steel price adjustment mechanism will not be triggered.

Call us any time to discuss the best practices for bidding and procuring structural steel.

New Interchange Provides the Missing Link to Interstate 95 and PA Turnpike *continued from page 1*

"While girders of this type are common to fabricate, the project also contained two challenging components to fabricate and erect: one post-tensioned integral pier cap and one large straddle bent for each structure."

High Steel Senior Design Engineer, Susan Steele, P.E., was responsible for the final bridge erection engineering for the project.

"The erection procedure for the post-tensioned pier caps required setting the steel superstructure on specially built shoring towers which temporarily carried the load of the formwork for the concrete pier cap and decks as well as the steel girder lines which are ultimately embedded in the cap," explains Steele. "These shoring towers supported up to 450 feet of girder assemblies during construction."

D10 section pier bent *Photo Credit: PA Turnpike*

These pier caps are located between spans 2 and 3 in unit 1 of section D10 and between spans 13 and 14 in Unit 3 for section D20.

The other complex feature of the project design is two approximately 80' wide "straddle bents" that support the flyover structures where they span the highways below. In D10 Unit 3, the "bent" straddles I-276 westbound, and in D20, the "bent" straddles I-395 southbound. The design for each of these structures consists of twin built-up steel girders which are connected to form a box shaped straddle bent cap. Each cap is supported by columns adjacent to the roadway.

"While erection for these features was multifaceted, perhaps the most complex part of the erection procedure was the final closure of Unit 1 in section D20, which was completed as a drop-in curved girder segment," said Steele.

PennDOT had scheduled two, four-hour shutdowns of I-95 Northbound to complete this work. Closure of Span 4 required longitudinal jacking from the back span (over 170 feet), and the completion of twelve field splices, each requiring 240 bolts. High Structural Erectors completed this work in just one four-hour shift.

"This was truly an accomplishment! No one thought it could be done in one closure," remarked Steele.

In September of 2018, officials from the Pennsylvania Turnpike Commission, the PennDOT, the FHWA and representatives from various agencies in neighboring states gathered at the jobsite to commemorate completion of major Stage 1 components of the Turnpike/Interstate 95 Interchange Project with a ribbon-cutting ceremony, and traffic began flowing through the new interchange.

The connection of Interstate 95 and the Pennsylvania Turnpike has been a long time coming. When I-95 was completed in 1969, there was an obvious gap. Even though the Pennsylvania Turnpike had been constructed more than 10 years earlier, there was no link between the two major highways. That resulted in considerable confusion for drivers, who were forced to find an alternate route to make the connection. That, in turn, created massive congestion and traffic jams, as drivers navigated around the missing link.

In the 1970s and 80s, numerous traffic studies offered suggestions on how to join the two highways.

continued on page 4

D20 section Nyleve/High Structural Erectors setting beams

D10 Flyover PA Turnpike section *Photo Credit: PA Turnpike*

New Interchange Provides the Missing Link to Interstate 95 and PA Turnpike *continued from page 3*

D10 PKF/HSE beam setting operations over PA Turnpike *Photo Credit: PA Turnpike*

Nothing happened and plans were discontinued for a variety of engineering and environmental reasons. In 2003, an environmental impact study sought to implement a direct connection between the Pennsylvania Turnpike and I-95, while minimizing impacts on socioeconomic and environmental resources.

Beyond an improved linkage between the PA Turnpike and I-95 for easier interstate travel, the new interchange completes I-95 through the Mid-Atlantic region.

"The benefit of completing this missing link is mobility," says Carl DeFebo, the director of public relations at the Pennsylvania Turnpike Commission, adding that the new infrastructure will reduce traffic time for north- and south-bound travelers and ease congestion on local roads that were previously used to connect I-95 to the Pennsylvania Turnpike.

DeFebo points out that the I-95 Interchange will be the last infrastructure project financed by Eisenhower's 1956 National Interstate and Defense Highways Act. The legislation authorized $25 billion for the construction of 40,000 miles of the Interstate Highway System. At the time, the act marked the largest public-works project in American history.

According to the I-95 Corridor Coalition, Interstate 95 is the main thoroughfare for national economic activity, facilitating 40 percent of the country's gross domestic product.

"Today, I-95 is host to more than one-fifth of the nation's road miles and serves 110 million people in the most densely populated region in the country," says DeFebo.

D10 PKF/HSE beam setting operations over PA Turnpike *Photo Credit: PA Turnpike*

When the PA Turnpike/I-95 Interchange Project began in 2010, the project was split into three stages. Most of Stage 1 has been completed, with all components of Stage 1 construction to be completed in 2020. Construction for Stage 2, which consists of six remaining interchange movements, is not currently funded, but final design has continued on some Stage 2 contracts. Stage 3, a future Delaware River Bridge project, is also dependent on funding and will likely not begin construction until after 2025.

"It is an honor to be a part of this history-making project, adding the last link to Interstate 95 and improving traffic flow here in Pennsylvania," says John O'Quinn, president of High Steel.

JUST THE FACTS:

Contract D10

Owners:	Pennsylvania Turnpike Commission and PennDOT
Contractor:	PKF Mark III
Bridge Design:	AECOM
Steel Fabricator:	High Steel Structures LLC
Steel Erector:	High Structural Erectors
Total Contractor Bid:	$142,883,817
Total Steel Tonnage:	2,647

Contract D20

Owners:	Pennsylvania Turnpike Commission and PennDOT
Contractor:	Nyleve Bridge Corporation
Bridge Design:	Gannett Fleming
Steel Fabricator:	High Steel Structures LLC
Steel Erector:	High Structural Erectors
Total Contractor Bid:	$118,772,707
Total Steel Tonnage:	2,208

Towards a Data Exchange Work Flow

By **Ronnie Medlock, PE** VP - Technical Services - High Steel Structures

The time is near to abandon the inefficient and circuitous workflow that has for too long defined the exchange of bridge information between designers and fabricators. And now, a joint task group within the AASHTO/NSBA Steel Bridge Collaboration is laying the groundwork for a new and much improved workflow. This team's goal: a data exchange workflow.

A Failure to Communicate

The opportunities for improving the flow of information between the designer and the fabricator are obvious: computers are used by engineers to design bridges, and computers are used by fabricators to create manufacturing information, including shop drawings, CNC programs, and bills of material. As shown in figure 1, we should get the computers "talking".

This communication should be simple but faces a fundamental challenge: our computers can't communicate because, figuratively, they do not speak the same language. In design, engineers use various software written in a variety of languages and proprietary schemas. In fabrication, fabricators (or their subcontract detailers) use their own in-house software to produce the manufacturing geometry they need to produce bills of material, shop drawings, and equipment code. This software is unique from fabricator to fabricator and detailer to detailer. This communication problem is not unique to information exchange between the designer and the fabricator: the bridge design and construction universe is peppered with stakeholders using a variety of software written in a variety of languages.

How can we resolve this communication breakdown? The solution is to establish a steel bridge fabrication neutral file that all stakeholders can use to share data. With a neutral file, instead of publishing steel bridge information in a plan set (or perhaps in addition to the plan set), the designer would publish steel bridge information in this neutral file format. Then, instead of reading drawings and populating information to shop drawing software by brute force, the fabricator would simply import that file.

Flow of Work via IFC File

The key to having an effective neutral file is standardization. It isn't practical to establish a unique file to accommodate every unique designer to fabricator exchange. For example, High Steel has its own, unique, in-house software for creating bills of material and shop drawings, as does every steel bridge detailer and fabricator (for those who create drawings in-house). It isn't reasonable to expect design software producers to create a different file for every fabricator and detailer who needs one. Rather, a standard neutral file, featuring three key criteria must be established:

1) **a standard format**
2) **a standard data structure, and**
3) **standard content.**

The first of these three criteria has already been addressed. After thorough discernment in conjunction with the FHWA and supported by NCHRP research, the AASHTO Committee on Bridges and Structures (COBS) has deemed that the file format for bridge data exchanges in our community is Industry Foundation Classes, or "IFC".

Originally, the IFC format was specifically created to facilitate information exchanges in the building (vertical) industry. By AASHTO's action, it is now extended to bridges.

Now that IFC has been chosen as the format for bridge data exchange, work can begin on the other two criteria: the data structure and the file content. Hence the effort of the new joint task group.

An important note: the information in the file will be data and not a 3D model. There has been confusion about this because the new work flow is often referred to as an "information model" work flow, and folks perceive "model" to be a 3D model. This information model is a data model, not necessarily a 3D model.

Learning the Talk

Creating and defining exchange models is rather different from bridge design and fabrication. The pros who do this have standard practices and their own vocabulary to help them along. Here are some of the key elements and terms:

continued on page 6

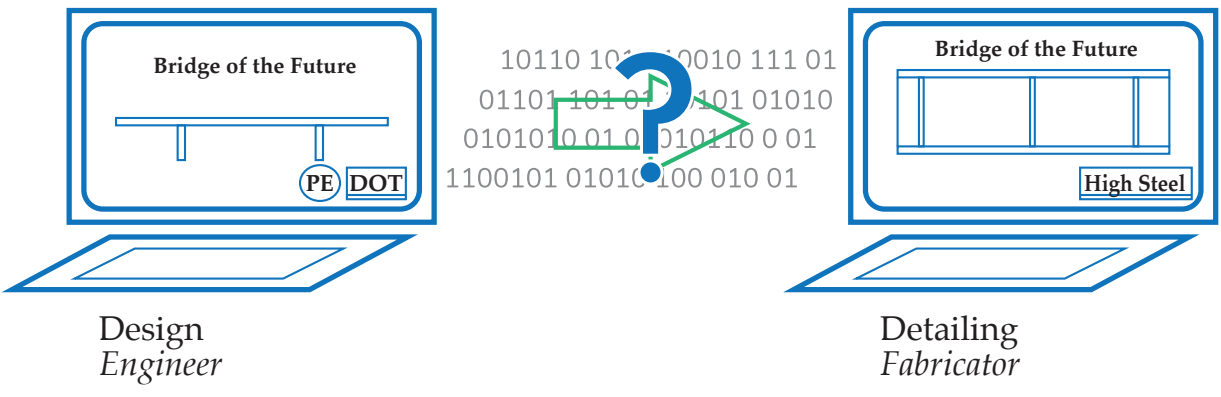


Figure 1 – How can we facilitate the flow of bridge data from the designer to the fabricator?

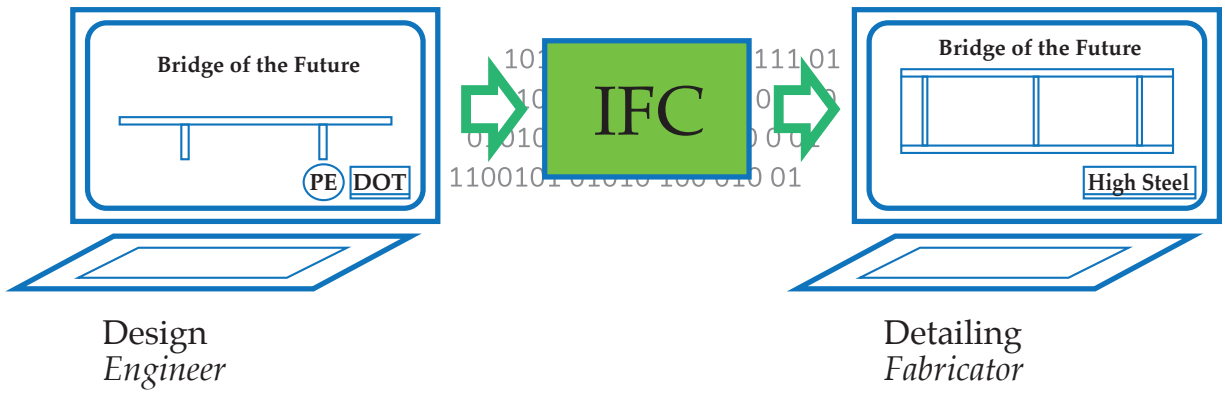


Figure 2: AASHTO has chosen IFC as the standard for exchanges of bridge data.

1) **Stakeholders.** Who are all the people who touch the designer to fabricator exchange and need the information? For example, general contractors and their erectors have interest in this information, as do owners and their shop inspectors. When defining an exchange, it is important to identify all of the stakeholders to ensure the exchange will provide everything that everyone involved in the exchange needs.
2) **Information Delivery Manual.** This manual is where the work processes associated with the exchange are defined. For example, the fabricator will use the information from the designer to create shop drawings; defining how and why this is done will help ensure that the right information gets into the data model. The properly defined collection of processes, MVC (see below), and use cases associated with the exchange is called the information delivery manual.
3) **Process Map.** Featuring the major exchange models, this map provides a visual representation of who the stakeholders are and when they get their information. For example, inspectors get steel bridge information (shop drawings) after the design engineer has reviewed and approved the steel bridge information (shop drawings). The designer-to-fabricator map will be a subset of the complete bridge information process map.
4) **Data Requirements.** Having identified the stakeholders, what are the data that each stakeholder needs? Fabricators must have all the information they need to create bills of material, shop drawings, and computer numerically controlled (CNC) machine programs. Is this the same information that inspectors and erectors need? Ultimately, the information exchanged must be provided for all stakeholders. These are called the data requirements.
5) **Model View Definition.** Once the data requirements are established, they are mapped into the IFC file. This subset of the larger IFC schema is called the model view definition.

Once the MVD is adopted, design software developers will have what they need to create the steel bridge fabrication IFC, and fabricators and detailers will know what IFC file they can expect.

Fully Defined Bridge Information Model

The steel bridge superstructure IFC file is just one of many parts of the complete bridge information model. Eventually entire bridges will be defined as information models, and these information models will replace the plans that we use today. Defining bridge plans as information models instead of paper documents will provide owners with great power and flexibility in maintaining bridges and transportation assets, facilitating the automation of functions such as inspection, load ratings, and condition ratings. Fabricators are just one of the stakeholders who will help build the larger bridge information model as construction progresses. The utility of a fully defined bridge information model is extraordinary; getting our computers talking is the key to building these models.

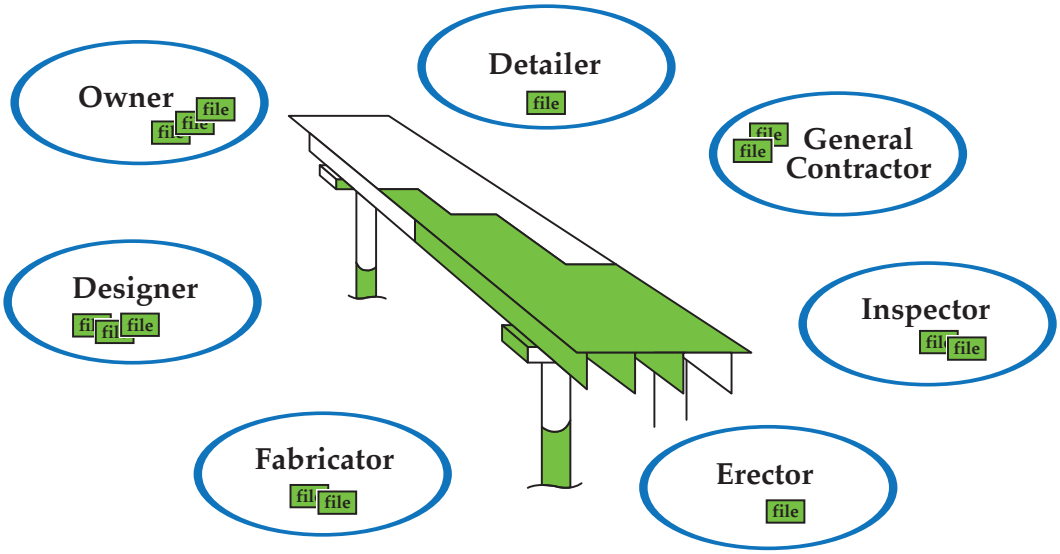


Figure 3 – Eventually IFC files will be used to fully define bridge information models

High Steel Honored with Two Safety Awards

High Steel Structures was among more than 60 structural steel fabrication and erection companies AISC recently honored with AISC Safety Awards for their excellent safety performance records in 2018.

All AISC full fabricator members and erector associate members are eligible and asked to participate, and data for the program is solicited annually. In order to facilitate data collection and to make statistics meaningful in terms familiar to safety professions, the program uses data that companies also report to the Occupational Safety and Health Administration (OSHA).

"AISC's annual Safety Awards program recognizes excellent records of safety performance, and we commend these facilities for their effective accident prevention programs," said Tom Schlafly, AISC's director of safety. "Periodic recognition of safety in the workplace has been demonstrated to provide worker incentive and a reminder of the importance of safe practices."

High Steel's Lancaster Facilities were also honored this spring with High Industries' 2018 President's Safety Award, recognizing the highest level of safety performance across High Industries business units.

"We appreciate these safety awards and celebrate our co-workers' ongoing commitment to living our motto "In safety, we are each other's keeper" every single day," said John O'Quinn, High Steel's president.

An Extraordinary Delivery

On April 11-12, 2019 High Steel Structures and High Transit LLC delivered two super load shipments of massive metalized steel "edge girders" from Williamsport, PA to the Kosciuszko Bridge jobsite.

With a gross weight of 157 tons on 16 axles, these massive loads had an overall length of 129'6" feet, overall width of 14'9" and overall height of 12 feet. The unique visual features of these complex girders include five cylindrical cable-stay anchorage pipes.

The delivery route for this shipment required a full engineering review and a route survey to ensure safe transport. In New York City, crawl speed restrictions and careful positioning were required for the Outerbridge Crossing, Verrazano Narrows Bridge, and the Gowanus Expressway structure at exit 21. In all, the loads took over 20 hours to travel 306 miles.

These pieces are the largest and most complex of the girders for this structure, but not the last. Delivery is scheduled to be completed by early summer. We look forward to sharing more information about this project with our readers in a future edition of the High Steel News!

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"Lay down a good weld and give good measure"
Sanford High 1931

www.highsteel.com

Fast Answers to Your STEEL Questions

Please address comments or requests for additional subscriptions to editor, Lisa Masters, at lmasters@high.net

HIGH Steel News

In This Issue

AISC CERTIFIED FABRICATOR

Recent Contracts Awarded

GR4 I95 Widening / Multiple Structures
Philadelphia, PA
7,538 Tons
James J. Anderson Construction Company, Inc.

KEW Gardens Interchange Phase III
Queens County, NY
5,932 Tons
Halmar International

Southern Beltway Section A2, four bridges
Washington County, PA
4,157 Tons
Trumbull Corporation

I-95 SBL over Rappannock River
Stafford County, VA
2,135 Tons
Wagman Heavy Civil, Inc.

Newark Liberty International Airport – Terminal A Redevelopment Program
Bridges N61, N62, N63
Essex County, NJ
1,898 Tons
Archer Steel Construction Co., Inc.

Arlington Memorial Bridge Project
Washington, DC
1,258 Tons
Kiewit Infrastructure Co.

New York Thruway TANE 18-7
Westchester County, NY
1,205 Tons
Ecco III Enterprises, Inc.

US 1 over CSX
Baltimore County, MD
1,029 Tons
The Lane Construction Corportation

I-295/Malcolm X Avenue Interchange
Washington, DC
915 Tons
Fort Myer Construction Corporation