

## **2018 AGC ACE Awards**

**Category 5: Best Building Project, Subcontractor, (\$2- \$6 Million)**

**Specialty Contractor: Drake Williams Steel**

**Project Name: U.S. Olympic Museum**

How creative can a museum display be to fully engage the visitor? Imagine standing at the bottom of a swimming pool and watching Olympic athletes competing for the gold medal above you. Likewise, how creative can a steel framed building be to deliver a stunning visual impact and emotional draw? Behold the U.S. Olympic Museum fabricated and erected by the Drake-Williams Steel team.

### **Solutions of Special Projects**

The daunting challenge to build this architecturally inspiring project was identified in the original solicitation for qualifications, calling for an “integrated design process” working with the general contractor, GE Johnson. Based on the intricate structural framing layout, traditional 2-dimensional contract documents were inadequate to address the geometrically challenging design needs. Early award of the steel package with only schematic design documents allowed the ambitious design concepts to be realized. The specific scope of work, constructability and project details were developed through a process of collaborative meetings. GE Johnson, the architect, structural engineer, fabricator and steel erector formed an integrated, functional team to address issues and complete the design.

Jim Johnson, owner of GE Johnson Construction, with a 37-year history of working with Drake-Williams Steel, commented during a meeting “this may be the most difficult project we have ever done together.”

## **Project Execution, Management & Team Approach**

A unique and effective team approach was developed during preconstruction. Drake-Williams Steel strategically partnered with the Engineer of Record to perform the steel detailing, shop drawings and connection design. The synergy between engineer of record and detailer provided tremendous efficiency as the structural engineer's design and steel fabricators shop drawings progressed simultaneously. Direct questions with instant clarification eliminated delays in the traditional shop drawing submittal & RFI process.

With project management and detailing leadership from Drake-Williams Steel regarding the structural steel frame, this team was further incorporated in to the overall project planning process. The key integration structure was the Building Information Modeling (BIM) coordination meetings with the general contractor. Held twice weekly, critical issues of exterior skin support, clash detection and coordination with other trades were addressed. Searching for greater adjustability and tighter tolerances for the exterior skin, the team ultimately changed the structural support to include a proprietary "Radius Track" system. This departure from the original design provided a better solution for the sophisticated and signature exterior feature. As evidence of this close collaboration, there were only 6 RFI's issued for the structural frame.

Upon completion of the design and shop drawing process, trusting team partners still have the opportunity to improve performance on the project. One such example was the constructability of the awkward double bent columns. With fabricator, detailer and erector working together, the center pick point was calculated, allowing Drake-Williams Steel to punch holes and provide lifting lugs, thereby improving safety and speed of erection. Steel erector foreman from LPR Construction, Keith McClure, observed "the integrated team was great, working well together and looking for solutions."

## **Construction Innovations & State-of-the-Art Advancement**

The intricate geometry and complex connections of the structure, required not only a high performing team, but also access to the most recent technology and equipment. Robotic fabrication equipment provided accurate measurements and precise cuts for the complex bevels and skewed connections. The automated 6-axis plasma “Python” utilized computer numerically controlled (CNC) data imported directly from the 3-D shop drawing model. Compound bevel cuts, slotted holes, copes and beam penetrations are some of the automated processing that replaced formerly time-consuming layout and complicated manual measurements. The layout and welding of assemblies were then performed on the shop floor, in a controlled environment, for shipment to the field.

Utilizing the best technology available with an experienced team paid dividends. John McCorkle, Senior Project Manager for GE Johnson stated, “based on the complexity of the structure, we had amazingly few issues with fit up of the steel in the field.” Not available a few short years ago, this high-tech equipment offers greater accuracy and speed of fabrication for elaborate assemblies. The interoperability of today’s software allows this integration of software, machines and skilled operators.

Each team member utilized their own software for maximum efficiency for their specific discipline. Engineer of Record KL&A utilized Revit software to identify the size of structural members and the strength of connections. Detailer KL&A relied on SDS2 detailing software to itemize each steel member, length, hole size and location, cutouts and all dimensions. Drake-Williams Steel further manipulated the SDS2 shop drawing model to capture electronic files for use by fabrication equipment on the shop floor. The burn table, punch-line and robotic plasma machine all use different file types. Finally, Navisworks software was utilized by GE Johnson and the entire team for clash detections between trades.

## **Commitment to Safety**

Just like a world class athlete training for the Olympics, the structural steel team expected to work with no injuries or accidents in order to perform at the highest level. Benefiting from a strong safety culture and utilizing a site-specific safety plan, the project achieved no accidents, injuries or OSHA recordable events in both shop and field environments.

Significant strategies included engineering and fabrication of temporary shoring for safely erecting difficult cantilevered sections. Operating with 100% fall protection above 6 feet as well as use of man-lifts for difficult access points demonstrated commitment to the safety of our work force. Additionally, the 120-foot truss span presented a unique set of challenges. The truss was shop fabricated in two pieces and shipped to the job-site as oversized loads for assembly on the ground. With safe and easier access to splice points, the truss was quality checked for connection points and hoisted with a single crane pick.

## **Contribution to the Community**

Just as the monstrous truss was highly visible during construction, the U.S. Olympic Museum will be noticed as the very first project developed as part of a master plan “City of Champions.” The City of Colorado Springs is integrating private donations with funding through the Colorado Economic Development Commission to bring a new vibrancy and economic opportunity to underutilized and previously vacant industrial land.

With the momentum provided by construction of the museum, additional projects have been identified and partially funded. A new sports medicine facility, visitors center for the Air Force Academy and a sports stadium/concert venue in close proximity to downtown will provide new services and entertainment venues for locals as well as attract tourist spending in the region.

## **Conclusion**

The topping off ceremony is commonly acknowledged as a significant construction milestone and completion of the structural steel frame. Broad smiles from the construction team demonstrated pride of craftsmanship during the topping out BBQ. The dramatic blue sky and majestic Colorado mountains were an appropriate backdrop for this stunning architectural achievement. U.S. Olympic Museum will proudly stand as a memorial to the hard work and athletic accomplishments of our country's Olympians. As the only Olympic Museum in the United States, this 21<sup>st</sup> century icon will inspire future Olympians and provide an enduring legacy for the proud Drake-Williams Steel professionals involved.









