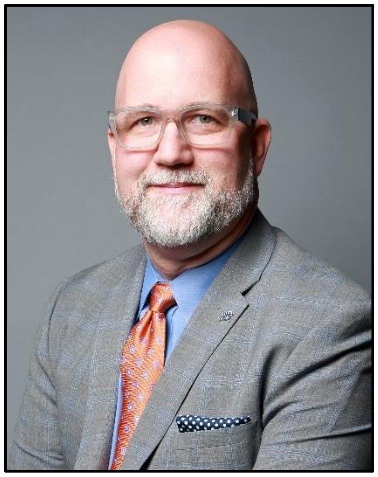
THE NEW JOHNSON STREET BRIDGE-A UNIQUE BRIDGE IN A UNIQUE PROJECT



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BIOGRAPHY

Keith R. Griesing, PE is the Chief Technical Officer and Principal of Hardesty & Hanover and served as the design manager for the Johnson Street Bridge project. Mr. Griesing has over 25 years of experience in the design and construction of major bridge projects, including several signature bridges. He has been involved in numerous movable bridge project in the US as well as throughout the world.

Brian J. Mileo, PE is a Project Manager and Principal Associate with Hardesty & Hanover and has 20 years of experience in the design and construction of movable bridges. He served as Lead Designer and Project Engineer for the Johnson Street Bridge project. Other signature projects Brian worked on include the Woodrow Wilson Memorial Bridge (Washington, DC) and the Port River Expressway bridges in Adelaide, Australia.

SUMMARY

The Johnson Street Bridge is an existing Strauss bascule bridge that serves as a critical link to the downtown business center of the City of Victoria. In order to provide the City with a new and reliable transportation link, the existing bridge was scheduled for replacement.

The replacement bridge was developed as a visually striking structure to maintain the visual continuity of the existing iconic and beloved "Blue Bridge". In addition to the strong visual presence, the movable bridge employs unique span support and operating machinery systems.

The many unique features combine to make the new Johnson Street Bridge a one of a kind movable bridge structure. This uniqueness of design was combined with a specially developed project delivery model. The project delivery included a blend of design-bid-build aspects with features of other alternative project delivery models designed to create an environment of collaboration amongst the project parties.

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PROJECT LOCATION

The Johnson Street Bridge project resides in the City of Victoria, British Columbia. Victoria is the capital city of British Columbia and is a popular tourist and living destination due to this proximity to the natural splendor of Vancouver Island and the temperate climate.

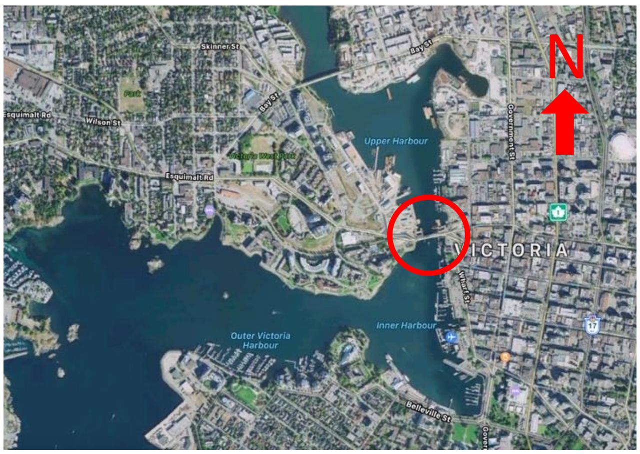

Figure 1-Project location

The crossing is adjacent to the inner harbor of Victoria and separates Inner Harbor from Upper Harbor as the waterway extends north between the core of Victoria and Esquimalt to the west (See **Figure 1**).

INTRODUCTION AND HISTORY

The original Johnson Street Bridge was comprised of twin Strauss bascule bridges (See **Figure 2**) that serves as a critical link to the downtown business center of the City of Victoria. The bridge was constructed in 1924.

The existing Strauss bridge, affectionately referred to as the “Blue Bridge” by local residents due to its aquamarine color, carries three travel lanes and one pedestrian sidewalk. The bridge was paired with a rail bridge of similar construction. The rail bridge provided access for the E&N railway to the industrial areas outside of the City of Victoria.

The main movable spans had a length of 45m from the heel trunnion to the toe and operated independently from one another.

Figure 2-Twin Strauss bridges

The two Strauss bridges eventually were unable to adequately serve the needs of the travelling public and an assessment was initiated to determine how to improve the structure.

PROJECT CONCEPTION AND INDICATIVE DESIGN

In 2009, the prime consultant, WSP Group Canada Ltd., then known as the MMM Group, began an assessment of the structure to determine the best reconstruction alternative to extend the service life of this important link for the community.

Victoria is a city with a high volume of cyclists, both recreational and commuter. The lack of a dedicated bicycle facility on the structure posed risk to the cyclists and also caused delays to traffic since cyclists utilized one of the travel lanes to cross the bridge. The existing bridge also featured an open grid roadway deck as well as a timber walkway. The timber walkway was retrofitted with steel mesh in order to provide improved slip resistance on its surface during wet conditions. Both of these riding surfaces were not desirable and an improved deck surfaced was considered.

Additionally, it was determined that the seismic vulnerability of the aged structure was a concern that needed to be addressed. The presence of lead-based paint further created a challenge for rehabilitation options.

After review of the condition of the existing bridge and the objectives of the City of Victoria with respect to the operation and maintenance of the structure, it was determined that replacement of the structure was preferred.

Throughout 2009, through community outreach, the desired features of the new bridge were identified. These features were weighed and the options for rehabilitation and replacement were more fully assessed in a report developed by WSP and presented to City Council in June 2010. After this presentation, additional public outreach was initiated including open houses and surveys to members of the public.

Through coordination with the city and the public, WSP developed a bridge concept that would present a strong visual character and be a new icon for the City of Victoria.

In August 2010, the City Council voted to replace the Johnson Street Bridges.

PROJECT PROCUREMENT

The City of Victoria and the greater Victoria area are home to a limited population with respect to funding a large infrastructure project such as the replacement bridge. In order to fund the project, the City of Victoria explored means to limit the cost with a ceiling amount (maximum price) in order to mitigate the financial risk of the project.

To achieve this, the city developed a procurement model that provided the bidders with a base preliminary design, referred to as the Indicative Design, as well as the core project objectives. The procurement model also included the ability of the proposing contractors to include proposed changes to the Indicative Design, referred to as Optimizations, to ensure the maximum price was not exceeded. These Optimizations were conceptually developed by the proposers during the bidding process and would be executed by the project designer in the advancement of the design.

As a result, the project was a blend of design-build and design-assist procurement models with the designer remaining contractually engaged with the owner (City of Victoria) rather than the contractor as in a design-build model.

In this model, the objective was to define a maximum contract price for a specific scope and establish defined risk sharing amongst the project parties.

The awarded construction contract included the accepted Optimizations. As noted above, the design team remained under contract with the City of Victoria but would work collaboratively with the Contractor to advance the Indicative Design with the accepted Optimizations to a level sufficient to proceed with construction.

With respect to the approach and other fixed structures this followed a very traditional path with Issued for Construction drawings. With respect to the movable bridge systems, since the fabrication was deemed on the critical path of the project, drawings were issued at a level described as Issued for Detailing. At this level of development, the design computations were complete and verified while the drawings included the information necessary for the contractor to initiate the detailing process.

DESIGN OPTIMIZATIONS

Based on the assessment of the Indicative Design, the contractor proposed a number of optimizations to mitigate project risks or to increase the probability of not exceeding the maximum price.

Optimizations were proposed and included in the awarded contract for three main areas for the movable bridge. These include:

- Bascule Pier Configuration
- Span Support and Drive Machinery
- Truss Member Cross Sections

For the bascule pier, the pier was shortened in the longitudinal direction in order to limit the amount of excavation required for the pier (See **Figure 3**).

Additionally, this change reduced the length of the rear portion of the bascule span and changed the span from a deck on counterweight structure to a forward heel break with an additional fixed deck over counterweight span.

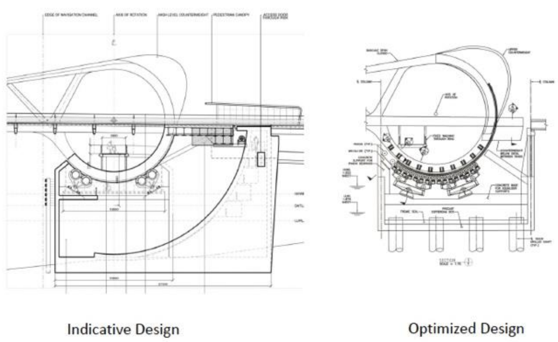

Figure 3-Bascule pier optimizations

The span support and drive machinery were also changed. The eight-roller system of the Indicative Design was changed to a multiple roller system with equalized trucks.

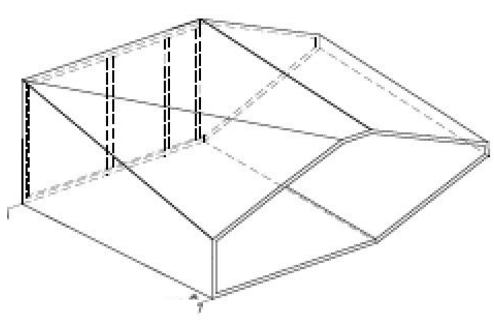

Figure 4-Indicative truss cross section

The Indicative Design featured truss members comprised of multiple facets with constantly changing dimensions (See **Figure 4**). While this led to a visually slender and dramatic truss section, it required substantially complicated steel detailing and fabrication. These cross sections were changed to a trapezoidal upper chord and rectangular diagonal and lower chord members (See **Figure 5**).

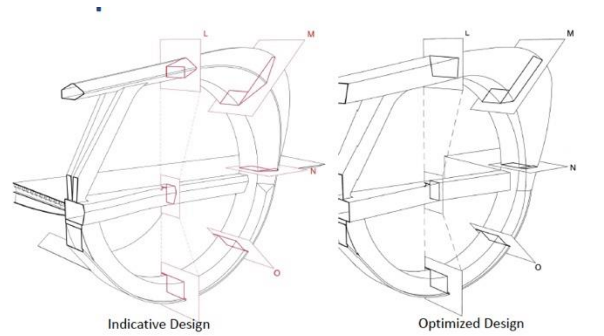

Figure 5-Truss optimizations

Additionally, the approach structures were modified from orthotropic steel structures to prestressed concrete box beams.

KEY DESIGN FEATURES

The new Johnson Street Bridge was a unique structure from its initial conception. The presence and popularity of the existing "Blue Bridge" led the project development team to a design that paid homage to the existing bridge but embraced a modern design aesthetic and technology.

The new movable bridge is a single leaf bascule bridge with adjoining fixed spans. The total length of the bridge from abutment to abutment is approximately 160m **(**See **Figure 6)**. This includes two spans of 30m on the east approach. These simple span concrete box girder spans meet the rear of the bascule pier and connect to the 19.26m deck over counterweight. The deck over counterweight is of similar box beam construction as the approach spans.

On the west approach, the single 28.95m approach span bears on the rest pier to the east and the west abutment to the west. The approach roadways at both ends are supported on retained earth that also utilizes geofoam blocks to minimize the overburden load from the fill.

Figure 6-Bridge layout (Note bascule span not shown)

The bridge cross section includes two 1.8m wide bike lanes, one for each direction of travel. The bike lanes are at the outside edges of the travel way. The roadway includes three 3.0m wide lanes, two westbound and one eastbound with the opposing directions of travel separated by a 0.3m buffer. Illinois Type 2399 (PL-2) traffic rails are at the edge of the travelled way. The total travelled way width is 12.90m. At the bascule span, this roadway lies between the main span trusses which are spaced at 15.22m on center **(**See **Figure 7)**.

The bridge also features two outboard decks. On the north side of the bridge there is a 5m clear width

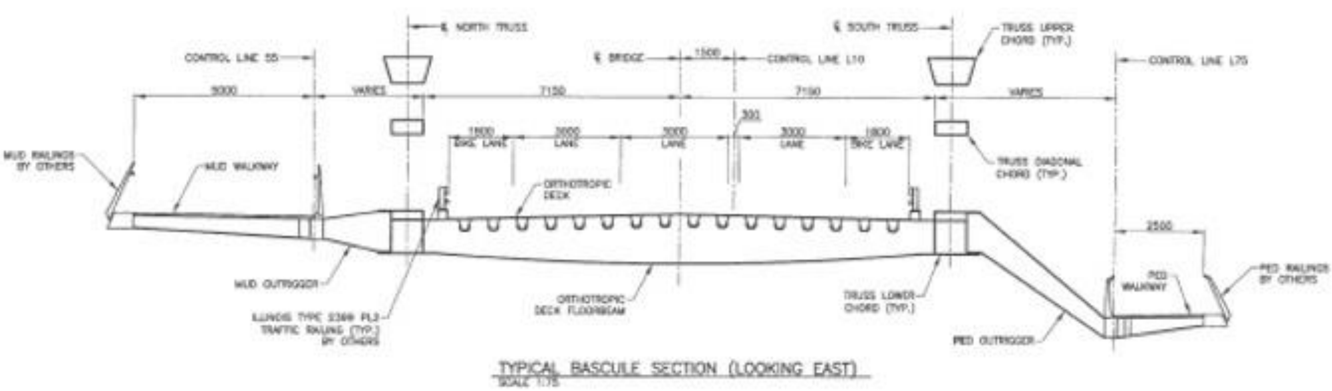

Figure 7-Typical cross section of bridge

multi-use deck (MUD). This deck serves both pedestrians and cyclists and connects to the at-grade sidewalk network at the approaches. On the south side, there is a 2.5m clear width pedestrian deck (PED) that connects to the waterfront path on the Victoria side of the structure. This path also connects to the pass-through walkway at the bascule pier.

On the approaches, these decks are independent structures. On the movable span the outboard decks are supported on cantilever floorbeams.

The bascule span is 53.4m from the center of rotation to the toe bearing at the rest pier. This span length provides a 41.7m horizontal clearance navigation channel with a vertical clearance of approximately 4.8m with the span in the seated position. This vertical clearance is limited by the pedestrian walkway structure that extends below the level of the truss lower chord and floor system.

With the bridge open to its full 77 degree angle, a 30m vertical clearance is provided for the full 41.7m width. Unlimited vertical clearance is provided for a width of 35.3m from the rest pier fendering system.

BASCULE PIER

The bascule pier is a hybrid of an open pit and closed pit bascule pier system. The overall plan dimensions of the bascule pier are 25m wide (transverse direction) and 20.5m long. The pier is founded on sixteen-1.8m diameter drilled shafts. The shafts include 7m deep rock sockets and have an average depth of 30m.

The foundation for the bascule pier was designed for the service loads as well as seismic and vessel impact forces. The face of the pier on the navigation channel side includes energy absorbing fixtures to distribute vessel forces across the pier face.

Figure 8-Bascule pier interior

The bascule pier includes a two-level mechanical electrical building structure at the west (channel) side of the pier **(**See **Figure 8)**. This building houses the bridge machinery at the floor level of the pier and the electrical distribution and control panels in the upper level.

The roof of the building upper level serves as a pedestrian deck and outlook from within the bascule pier. This deck extends to the south to connect to the pedestrian walkway and permits visitors to pass from the walkway through the ring of the moving span.

As this walkway is supported on the fixed structure the bridge moves independently around this walkway **(**See **Figure 9)**. This unique feature provides viewing access to both the waterway as well as into the bascule pier and allows pedestrians to see the inner workings of the span support system and the operating mechanism of the bridge.

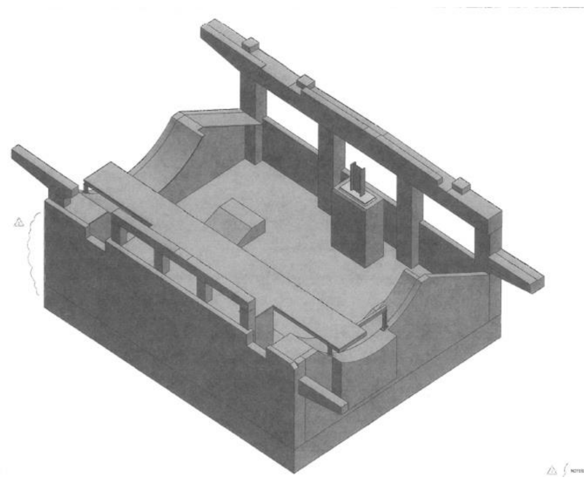

Figure 9-Bascule pier and platform

The side walls of the bascule pier are curved to match the shape of the lower portion of the truss rings and provide protection to the span support system and drive machinery from direct exposure to weather. The curved elevation of the wall is matched by a cover slab that provides cover over the span drive machinery.

The east and west sides of the bascule pier include column supported capbeams that support the deck over counterweight box beam structure. Similar extensions off the pier walls support the multi-use deck and pedestrian deck structures.

A concrete column at the east face of the pier supports the movable span seismic restraint. The seismic restraint is a steel column with wear plates that engages a slot with similar wear plates on the back face of the lower counterweight. In the event of a seismic event, the restraint limits the transverse displacement of the lower counterweight (due to its high mass) relative to the two rings and the pier. Through the cyclic loading of the restraint during a seismic event, energy is absorbed and the out of plane forces on the rings reduced, protecting the trusses and the roller support system from excessive forces and displacements.

The bascule pier also includes restricted access walkways and stairs to provide access from the control room and pedestrian walkway level to the lower pit and mechanical / electrical building. This includes access to the hydraulic motors and mechanical elements of the span support structure to ensure maintenance can be performed in the future.

BASCULE SPAN STRUCTURE

The bascule span is a half through truss type structure with an orthotropic steel deck system (See **Figure 10)**. The movable span is supported in the bascule pier to the east by the span support system and the rest pier to the west by the toe bearings. As with all single leaf bascule spans, the toe reaction under dead load is limited by the span imbalance with a slight net positive dead load reaction. Live load on the bridge provides additional positive reaction on the toe bearings and is the majority of the load seen at the toe of the bridge.

Figure 10-New bridge in closed position

The truss structure is comprised of a rectangular box section lower chord with dimensions of 1.2m high by 0.92m wide. The diagonal members are similarly rectangular box sections with typical dimensions of either 0.4m or 0.75m high by 0.92m wide. The depth of the diagonal members vary due to the curvature at the truss nodes.

The top chord cross section varies along its length. The section it generally configured as a trapezoid with a top flange width of 1.37m and a bottom flange width of 0.92m. The depth of the top chord is typically 0.75m.

The truss is not configured like a typical truss with gusset plates. As a result of the visual character of the bridge, the truss is a fully welded structure with no external connections at the nodes. This was achieved through coordination of the design needs with the fabrication process. The top and bottom chords were fabricated as three-sided tubs. The webs were cut to match the elevation of the truss and welded splices were made in the length of the diagonals (See **Figure 11**). The fourth side of the top and bottom chords as well as the flanges of the diagonals were comprised of continuous plates, referred to as the inner flange loops. These inner flange loops were inserted in the voids of the trusses and then welded with complete penetration groove welds to complete the boxes and create the final truss appearance.

Figure 11-Truss fabrication

The floorsystem for the span is an orthotropic steel deck (OSD) with integral floorbeams. The deck plate and floorbeams are welded to the truss using complete penetration groove welds. The truss bottom flange plate included extensions to mate with the bottom flange of the floorbeam. Additionally, a web extension was attached to the truss inner web face to position the splice for the floorbeam approximately 0.35m from the face of the truss. This allowed the deck plate to extend beyond the splice and connect to the horizontal extension from the truss inner web. This staggering of the weld locations improved the joint fit-up and mitigated the effects of intersecting welds for the deck connection.

The OSD comprises a 16mm deck plate with sixteen-10mm thick U-shaped ribs spaced at 0.8m on centers. The ribs are 305mm deep and 350mm wide at the deck level. The ribs are welded to the deck plate with partial penetration welds with a minimum penetration of 70%. The weld and OSD fabrication process were validated before production welding through a mock-up test panel that underwent both non-destructive and destructive testing.

The OSD is coated with a BIMAGRIP polyurethane adhesive grit wearing surface. The wearing surface has two levels of friction-one for the roadway travel lane areas and one for the bicycle travel lane areas on the main deck-to provide the necessary traction and rider comfort for each use.

The outriggers which support the multi-use deck and pedestrian deck are of variable length and elevation to follow the vertical and horizontal curves of each of the pathways. The typical section of the outrigger is a rectangle with a width of 0.3m and depth of 1.2m at the truss. The depth tapers as required by the geometry of the walkway it supports. The box section of the outrigger changes to an I-section at the deck level to facilitate the connection of the longitudinal walkway beams with the outriggers.

The connections of the outriggers to the trusses are made with bolted connections. Bolted connections were desirable from both a fatigue and vibration standpoint but also from a constructability standpoint. Since the outriggers would be installed in the field at the pre-assembly yard, limiting the amount of field welding was a benefit to the schedule.

Since the structure is a bascule bridge, counterweights for the balance fill are required. This bridge includes two upper lobe counterweights **(**See **Figure 12)** that are integral with the truss ring structures and a lower counterweight that spans transversely between the rings.

Figure 12-Upper (lobe) counterweight (unpainted during construction)

The upper counterweights are comprised of six individual cells. Four of the cells have permanent fill that is enclosed behind welded cover plates. Two of the cells have removable cover plates that are fastened with countersunk bolts. These cells have a calculated mass of fill material in place for the initial balance. The covers can be removed and the balance adjusted if necessary in the future.

The lower counterweight consists of a transverse beam that spans between the lower portion of the two rings. The beam **(**See **Figure 13)** follows the shape of the rings and supports the central box of the counterweight.

Figure 13-Lower counterweight beam

The transverse beam is connected to the rings through a bolted splice connection. This includes inner and outer splice plates for the curved webs of the beam as well as top and bottom splice plates for the flanges.

The transverse beam connects to integral extensions from the ring flanges that are curved to mitigate the stress concentrations at the connections.

Figure 14-Lower counterweight box

The central counterweight box is integral with the transverse beam **(**See **Figures 14 and 15)**. The box includes multiple cells for the placement of balance fill. The fill is placed in access hatches in the top plate of the box.

For the Johnson Street Bridge, the majority of the fill is cast lead blocks. Each block weighs approximately 5 tons. The blocks were detailed to fit in the cells of the counterweight with a high level of efficiency. In order to prevent the fill material from shifting during operation, the fill is grouted in the field at final assembly.

Figure 15-Lower counterweigh at fabrication

The counterweight was designed so that the curved transverse beam and the central box align with the limits of the machinery and electrical rooms when the span is in the open position.

Due to the complexity of the structure and the fact that it is a movable bridge, full shop assembly of the bridge was required. This aligned with the Contractor's needs for field assembly as well. The field assembly plan included placement of the span in as few components as possible. Through their assessment of the schedule and the available equipment for heavy lifts, the Contractor determined that the forward portion of the span could be installed nearly fully assembled. This required one field splice between the rings and the forward span.

Due to the desire to maintain the visual uncluttered appearance of the trusses, the splice could not utilize traditional splice plates and bolts. Through coordination with the Contractor, the design team developed a splice that consisted of end milled face plates on the truss member sections and a combination of structural bolts and high strength tensioned rods. **(**See **Figure 16)**.

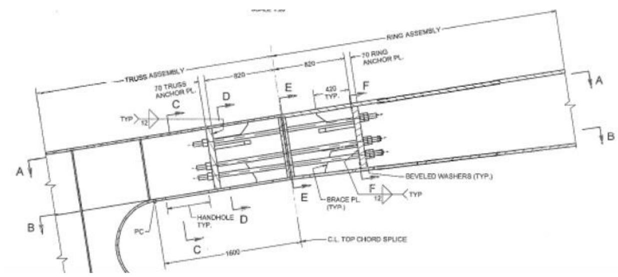

Figure 16-Typical field splice

Due to the limited access inside the box members, the use of treadbar and jacks was not feasible. As a result, the team opted for the use of 50mm diameter F1554 Grade 105 rods with multi-jack bolt tensioning nuts (Superbolts). This permitted typical bolting equipment to be used to develop the necessary tension in the rods.

The top and bottom chord utilized eight rods each and the diagonal member included four rods combined with the 25mm diameter face plate high-strength bolts.

During the design development the Contractor fabricated a wood mock-up of the connection to ensure access to the connection was sufficient. Based on the mock-up tests, the design was modified to provide additional access holes and handholes.

The fit of the field splice was a key part of the laydown shop assembly **(**See **Figure 17)** and great care was taken to ensure the contact between the end milled faces of the truss members. Once the laydown fit was confirmed for each truss/ring connection, the full shop assembly progressed.

Figure 17-Truss/Ring laydown assembly

The full shop assembly followed the field assembly plan and was used to complete fabrication of the forward portion of the span. For the shop assembly, the two rings and lower counterweight box were positioned and aligned. Once the center of rotation was verified through the geometric control plan, the lower counterweight to ring connections were drilled.

Once the rings and lower counterweight were assembled, the trusses were reconnected to the rings at the field splice locations. After additional geometric checks, the OSD superpanels were fit to the trusses and the welds from the OSD to the trusses were completed **(**See **Figure 18)**.

Figure 18-Shop assembly

In order to meet the schedule demands and to permit advanced painting and shipping, the rings and lower counterweight were detached from the now assembled forward portion of the span (trusses with deck). The outriggers and walkway decks were then shop assembled to the forward span and fabrication and assembly was completed.

The walkways were disassembled in the shop for shipping. The forward portion of the span was painted and shipped as one unit.

BASCULE SPAN MACHINERY SYSTEMS

The bascule span machinery consists of two primary systems and a number of secondary systems. The primary systems are:

- Span Support System
- Span Drive Machinery

The span support system consists of the span support segments and rail affixed to the underside of the ring structure and the span support rollers.

The span support segments are structural steel supports that are attached to the underside of the ring through longitudinal tab plates on the ring **(**See **Figure 19)**.

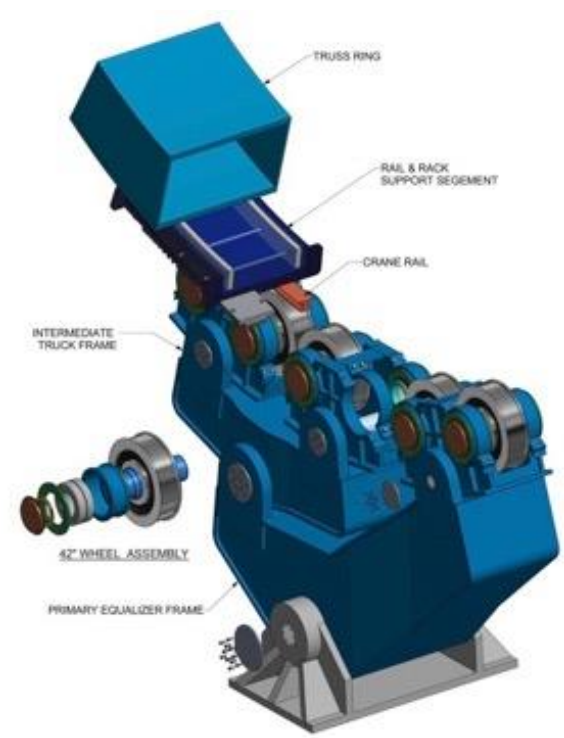

Figure 19-Span support system

Machined bushings extend from the flanges of the support segments through the ring tabs and are held in position by through rods. **(**See **Figure 20)**. The bushings hold the precise alignment of the span support segments. The span support segments were machined at the outer diameter to ensure the proper radius and bearing for the rail.

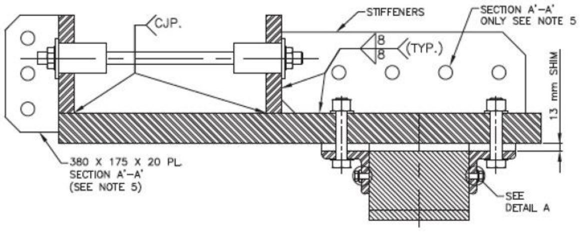

Figure 20-Span support segment (rail not shown)

The rail is a DIN A150 rail. Similar to the span support segments, the base of the rail was machined to ensure full bearing on the span support segments. Standard hard rail clips were used to attach the rail to the span support segments.

Due to the high loads on the rail and the desire for uniform bearing on the ring structure, the void between the span support segments and the ring bottom flange (outer diameter) was filled with high strength epoxy grout (Chockfast Red). This ensured that the rail loads transfer from the rail head to the base and through the grout to the ring structure. The grout also allowed typical structural steel fabrication tolerance to be used for the ring fabrication while the precision machined fabrication remained with the machinery components.

The span support segments also support the span drive rack. As a machinery component, the rack needs to be precisely aligned and the tight geometric controls on the span support segments facilitated alignment of the rack to the rail to ensure both elements are concentric to the center of rotation.

The span support rollers provide a low friction support system and transfer the approximately 3 000 metric ton (6.6 million pound) dead load of the span and counterweights to the bascule pier floor. The span support system consists of four identical systems with each pair supporting one ring **(**See **Figures 21 and 22)**.

Figure 21-Span support rollers in shop assembly (one of four systems shown)

This system includes a fixed base that is mounted to the pit floor of the bascule pier. The central pin of the base supports a two-level equalizer system. The equalizer beams connect to three two-wheeled trucks. The wheels are 1.07m diameter and made of hardened forged steel with sealed bearings to ensure longevity over the life of the bridge.

Figure 22-Ring on span support rollers

The equalization system ensures that the load from the structure is uniformly distributed throughout all angles of opening even in the event that the ring distorts under the varying load conditions from open to close.

The span operating machinery is closely integrated with the span support systems. As noted above, the rack is affixed to the span support segments. The rack extends through approximately 96 degrees from the seated position to the full open position to ensure both pinions stay engaged throughout the 77 degrees angle of opening. The racks are fabricated from high strength forgings with teeth with a face width of 325mm and pitch diameter of 16 688mm. Each rack (one per ring) is engaged by two pinions with 350mm face width and 582mm pitch diameter. The rack to pinion ratio is 28.6 to 1.

Each pinion is driven by a hydraulic motor that provides high torque at low speed **(**See **Figure 23)**. Each pair of motors are mounted on a common support base that is affixed to the bascule pier floor. The hydraulic motors are mounted on the ends of the pinion shafts and have torque arms to the base to provide the necessary stability.

Figure 23-Span drive motors and rack

The four hydraulic motors are powered by a common hydraulic power unit. **(**See **Figure 24)**. The system consists of three main pumps and provides equal distribution of flow to the motors to ensure synchronous movement. Positive span control is accomplished by configuring the four, low speed/high torque hydraulic motors in a “closed loop” hydraulic circuit. Load distribution among the four main pinions is automatically accomplished through the system loop pressure.

Figure 24-Hydraulic power unit in shop testing

In addition to the primary machinery systems, the bridge also includes span locks at the toe as well as a centering device. The span locks are forged bars that are mounted to the face of the rest pier. When the bridge is in the seated position, the lock bars are driven to engage a wear plate mounted to the underside of the end floorbeam. The span locks prevent the span from inadvertent opening under environmental conditions or operator error.

The centering device includes a receiver slot on the rest pier. The receiver is engaged by a projection from the bascule span as the span seats. The wear plates are configured with tapers that allow lateral misalignment at initial engagement. The gap between the mating facing reduces through the length of the guide to ensure the bridge seats centered after each operation.

BASCULE SPAN CONTROL SYSTEMS

The bascule span is controlled from the Operator’s Room at deck level through a multi-function control desk **(**See **Figure 25)**. The desk includes a touch screen human machine interface (HMI), control switches, and indicating lights for the key status indicators. The control room also includes monitors for the closed-circuit television camera system to provide the operator with views of the critical areas during operation.

Figure 25-Operator's Control Desk

Figure 26-Electrical Room

The control system includes a programmable logic control (PLC) that allows fully automatic push-button operation for the span. The PCL system performs the system checks necessary to ensure the sequence of operation progresses safely and consistently for each operation.

The span is powered by three 100 horsepower pump motors and each pump motor is controlled by a dedicated variable frequency drive. The pump motors provide the hydraulic flow to the four hydraulic motors that turn the span, there are two hydraulic motors on each side of the span. The PLC monitors the span position and speed, adjusting each of the drives to ensure proper span operation.

As discussed above, the control equipment is housed in the second level of the room at the west face of the bascule pier. This includes the Motor Control Cabinets and other electrical cabinets **(**See **Figure 26)**. Each motor (that is not controlled by a drive) is provided a smart overload relay that is ethernet enabled, for improved control and detailed monitoring of the equipment. Further the Ethernet enabled overloads allow for independent operation of the motor from the overload directly as a backup to the PLC control system.

STATUS AND CONCLUSION

As of early February 2018, the bascule span has been installed and the preliminary balance has been completed. The initial span operation was completed on 5 February 2018 in manual control mode.

The contractor is completing the final installation of railings and ancillary components on the bascule span and preparing for final span balance testing. Subsequent to the span balance testing, the contractor will conduct the performance acceptance testing and the endurance acceptance testing prior to turnover of the structure to the Owner.

The bridge is scheduled to be opened to traffic at the end of March 2018. Project completion is scheduled for July 2018 after completing demolition of the existing bridge and finalizing the approach roadway transitions and plaza spaces.

Figure 27-New Bridge in Open Position

ACKNOWLEDGEMENTS

Owner:	City of Victoria, BC
Prime Consultant:	WSP Group Canada LTD, Vancouver, BC
Contractor:	PCL Constructors Westcoast, Richmond, BC

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