Deep Creek Bridge Replacement
Over the Intracoastal Waterway
• The project is located at the community of Deep Creek in Chesapeake, Virginia. The bridge will carry George Washington Highway (U.S. Route 17)/Cedar Road across the AIWW DSC, and will replace an existing bascule bridge structure.
Purpose

• The purpose of this project is to replace the existing two-lane, 20-foot-wide single leaf bascule bridge over the DSC. The needs for this project arise from the inefficient operating conditions of the existing bridge associated with narrow roadway, increasing traffic volumes, and traffic delays. The existing bridge does not meet current design standards recommended by the American Association of the State Highway Officials (AASHTO) in terms of roadway width and design load. The original design capacity was 15 tons.

• The original structure was opened to traffic in 1934. When the bridge is opened the horizontal navigation clearance between the fenders is 60 feet. The toe of the existing leaf overhangs the fender by 5 feet when the bridge is fully opened; therefore the overhead clearance is unlimited for a horizontal distance of 55 feet. The existing vertical clearance when the bridge is closed is 3.9 feet. The mechanical equipment is in good condition.
Location

- The project is located at the community of Deep Creek in Chesapeake, Virginia. The bridge will carry George Washington Highway (U.S. Route 17)/Cedar Road across the AIWW DSC, and will replace an existing bascule bridge structure. One north leaf (westbound roadway) of the proposed bridge will be centered on the existing structure, while the south leaf will be located immediately south of the existing bascule bridge on a parallel alignment. The twin leaf bascule bridge was located as close as possible to the existing structure to minimize roadway relocations and right-of-way cost.
Utilities

- Existing utilities within the project limits will be relocated/and or adjusted to accommodate the proposed roadway design and right-of-way requirements.
- Water distribution will be limited to necessary relocations of hydrants, mains, and service connections.
- Sanitary sewer construction will be limited to raising and resetting manhole covers and cleanouts, and protection of existing facilities.
- Gas mains are present in the area.
- Communication and electrical utilities are also impacted.
Bascule
Twin Spans
60 Channel Width
3 Lanes Westbound
2 Lanes Eastbound
Build Eastbound 1st
with Operator’s House
Demolish Existing then
Build Westbound
Bascule Type

Rolling Lift
Hydraulic Cylinders
Approach Span Allowed for
Smaller Movable Span
Live Load Lock

One tail lock will be installed behind each bascule girder. The lock is composed of a strut/link arm. The strut will be driven by a cylinder powered from the hydraulic power unit. The strut articulates such that it pivots under a rear load shoe and latches into position. This latching produces uplift at the rear of the girder that in turn produces a positive reaction at the live load shoes on the rest bent.
Hydraulic Power

Hydraulic installations are designed for specific applications. Components like valves, couplings, pumps, motors, gages, and filters are supplied by various manufacturers and shop assembled into compact power units. These units are fully tested prior to shipment and installation, minimizing the required fieldwork.

Hydraulic equipment for this project will meet the requirements of the 1988 AASHTO Standard Specification for Movable Highway Bridges and will be manufactured in accordance with the National Fluid Power Association, Joint Industry Conference, and ANSI Standards.

The hydraulic system will be designed to move the span under Conditions A through C of AASHTO Standard Specification for Movable Highway Bridges, Section 2.5.3. The hydraulic components are proportioned so that the system working pressure will not exceed the maximum allowable at the cylinders against the specified loads.

The minimum working pressure ratings for hydraulic components will be 3,000 psi for cylinders, pumps, valves, pipe, tubing, and their fittings and for all other components; 5,000 psi for flexible hose and fittings for pressure lines; and 2,000 psi for drain lines.

Pressure control valves will be provided in the system to protect equipment from damage due to excessive operating and static pressure.
Machinery Room
Plan & Elevation

Machinery Layout
Pumps & Reservoirs
Operating Cylinders
Piping on Back Wall
Hydraulic Power Units

Skid Mounted
Shop Assembled
Shop Tested
Valve Manifolds

Compact
Less Pressure Drop
Reduces the Number of Fittings & Piping
Centrally Located
Reservoirs

Large capacity to dissipate heat
Stainless steel to prevent corrosion of the inside – then contaminating the fluid.
Mounting of sensors.
Manufacturer chose to paint SS because of heat stains from welding.
Hydraulic Cylinders

- Rod in Cylinder in the Closed Position
- Stainless Steel Piping to Rod End
- Ceramic Coating on Cylinder Rod
The bridge operating cylinders will be of the clevis-mounted type designed for an operating pressure of 3,000 psi and a maximum shock pressure of 5,000 psi. Cylinders will have approximately a 12-inch bore, 7-inch diameter piston rod, and a 8'-3" stroke, and will be cushioned at both ends. Cylinders will be welded type construction. Each bascule leaf will have two operating cylinders.

The piston rod will be ceramic coated.

The cylinder end and piston rod ends will be furnished with suitable clevises to attach to structural members.
Piping

The layout of the hydraulic piping will be as shown on the plans. Piping will be stainless steel with flange connections.
Pipe welded and pressure tested in the shop.
Stainless steel pipe does not need to be painted.
**Hoses**

Flexible hose assemblies will be installed between piping and the cylinder manifolds.

Alignment: No Twisting or Rubbing.

Spiral Armor Covering.
Bridge controls will use hard wired relays and a Programmable Logic Control (PLC). The PLC will control the hydraulic control interface, including pump motor control functions and will receive analog signals from linear displacement transducers linked to the hydraulic cylinder. The PLC will be programmed to provide position outputs for nearly closed, nearly open and fully open interlocking and indication and position readout on the console. A communication link between the PLC and the console will be established. Hard wired relays will control the traffic gates, barriers, and bridge navigation lights.
Control Desk

Bridge operator control and interface will be accomplished using a custom fabricated stainless steel console. The console will have pushbuttons, selector switches, key operated switches, and a built in flat screen monitor.
• Photos featured in this presentation are of the bridge in the community of Great Bridge in Chesapeake Virginia. If you have some spare time you can drive 17 minutes south and see it. It is on Route 168, Battlefield Boulevard.

Questions?