REHABILITATION OF A SCHERZER BASCULE BRIDGE
Mechanical - Electrical Systems

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The rehabilitation of the mechanical-electrical systems is certainly as important to the reliable operation of a movable bridge as structural repairs and greatly impacts the ability of the owner to maintain the bridge. An interesting case for discussion is the Cos Cob Bridge owned by Metro-North Commuter Railroad Company and located over the Mianus River between Cos Cob and Riverside, Connecticut. The bridge carries two commuter tracks and two North-East Corridor main line Boston to Washington tracks.

The bridge is a Scherzer Bascule and consists of two independent side by side single leaf spans, each carrying two tracks.

The existing mechanical system consists of electric motors located on the operator's house structure, and a lengthy configuration of shafts, couplings and gears running to a rack and pinion located at the centerline of each scherzer leaf. The rack is attached to an operating strut pinned to the scherzer leaf at its centroid. Rotation of the pinion causes the operating strut to pull horizontally, rolling the leaf on its track girders.

The long gearing and shaft system proved to be very inefficient due to the losses through the numerous bearings and gears, including a bevel gear set. Our inspection of the mechanical system indicated that all shaft bearings had excessive clearances and required work; however, the gears showed minimal wear. The system was also a maintenance problem in terms of access to the various lube points which resulted in some parts not being properly lubricated.

We decided to eliminate the majority of the machinery by moving the motors out to the span. The gearing and shafts were removed and demolished, except that the last two gear sets were retained. This reduces the number of lube points on the farthest leaf from 24 to 6. The bearings of the remaining shafting will be re-lined and re-bored to provide clearances in an acceptable range. All the machinery for each leaf will now be located centrally for ease of maintenance.

The mechanical work also included rehabilitation of the front and rear locks by replacing deteriorated shafts and re-lining bearings.

The existing electrical system was built to be powered by a 25 cycle source. The railroads 25 cycle generating plant has been shut down for about five years. As an interim measure, motor-generators sets have been installed to convert the present 60 cycle source to 25 cycle.

The existing 25 cycle motors and brakes are obsolete and spare parts were increasingly difficult to come by for the Railroad Maintenance Forces. The general condition of the entire system was poor. A complete replacement of the electrical system using 60 cycle components was recommended. This included SCR speed controlled motors, brakes, limit switches, indicators, wiring, and a new State-of-the-Art micro processor based control system. The control console will consist of a keyboard with T.V. monitor. In the automatic mode, the bridge will operate by pushing one button. A diagram of the bridge will be shown on the monitor and each activity or limit switch indicator will show up at its location. Failure of any required indication or activity will be highlighted on the screen. The manual mode will allow operation step by step if required.

The micro processing system will be totally redundant. At failure of any processor part, the system will operate on its back-up micro processor. Maintenance personnel will replace the part with spares provided and send the part back to the shop for repair. This redundancy will provide for a much more reliable operating system.

Another interesting feature is a hand-held keyboard with monitor which the maintenance forces will have. This keyboard will plug into the system at the console or at the location of other operating parts. From the hand-held keyboard he can operate the bridge completely or perform individual operations by-passing the interlocking. This will allow the maintenance man to operate equipment while he is there to observe without cumbersome communications back to the operator.

The control console includes a printer which will automatically print a log of the date and the time the bridge is opened, how long it stayed open and any malfunctions. The printer can also be used as a diagnostic tool for maintenance by printing the results of check subroutines.

We feel this renovation will modernize the operation of this 80 year old bridge, provide for a greater reliability and decrease the time spent by maintenance forces at the site.