REHABILITATION OF THE CONTROL SYSTEM FOR THE TWIN BASCULE BRIDGES AT LAKE PONTCHARTRAIN CAUSEWAY, LOUISIANA

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In 1956 the 24-mile stretch of bridge known as "The World's Longest Bridge" was constructed across Lake Pontchartrain, Louisiana. The bridge connected New Orleans on the south shore with Mandeville on the north shore and allowed a much shorter access to New Orleans from the north side of the lake. The bridge was two-lane, with a hump at four, twelve and twenty mile locations from the south shore. One bascule span was located eight miles from the north shore and another eight miles from the south shore. A turnaround was also constructed nine miles from the south shore.

By 1965, traffic had increased to over two million vehicles per year across this two-lane bridge, and the need was seen to construct a parallel bridge as soon as possible since the traffic level had exceeded safe limits for a two-lane structure. David Volkert & Associates, Inc. was employed by the Causeway Commission for feasibility studies, preliminary and final plans, and construction inspection of the new bridge. The initial north bascule span was removed, and two twin bascule spans were constructed as part of the newly designed bridge. The south bascule was removed and replaced with a high level fixed span in the new design. Construction was completed and the bridge was opened to traffic on May 10, 1969. The new bridge became the north bound lanes, and the existing structure was then designated as the south bound bridge.

Seven crossovers were constructed to allow routing of traffic in the event of bridge damage by marine vessels or by vehicular accidents. Each crossover is

illuminated. As a matter of interest, in recent years call boxes at half-mile spacing on both bridges and computer controlled variable message signs at each crossover have been added for convenience and safety.

David Volkert & Associates' design won the 1969 AISC Prize Bridge Award in the movable span category.

At the time the new bridge was opened for traffic, the average daily traffic across the bridge was 5,500 vehicles, and the bascules were operated approximately sixty times per month. In 1986 the vehicular traffic reached a daily average of 18,200 with the bascules operated sixty times.

In 1967 the electrical system was designed to have two separate 2400/4160 volt sources of power to the bascule spans. The alternate feed was from the north shore (Central Louisiana Electric Company). The primary source was from the south shore (Louisiana Power & Light), and these sources could be controlled on the 480 volt side by means of open knife blade switches. In addition, a connection for a 480 volt emergency generator was also installed.

A span control system which consisted of wound rotor motors, primary saturable reactors and electro-mechanical relay control was installed. The motors were TENV and have given very little trouble over the years. Because of the bascule configuration, the reactors were installed beneath the bascule pylons out of the weather, but were in the corrosive salt laden atmosphere of the lake.

Although the control and drive system was "state-of-the-art" when designed some twenty years ago, much of the original equipment had outlived its useful life and had become a constant source of maintenance and operational problems in recent

years, especially the electro-mechanical relays and limit switches. This also resulted in much of the original equipment being obsolete and replacement parts no longer available.

David Volkert & Associates has been the consultant for the Causeway Commission since 1967 and performs an annual inspection of the entire bridge. During the last two or three years, it became apparent that the bascule drive and control system either needed total replacement or a major overhaul. Recommendations were made to the Commission for authorization to conduct an in-depth study of the bascule system to determine the exact status of the system. The study was conducted and the results were conclusive that a total rehabilitation was required. We felt that a rehabilitation of the existing system should result in the utilization of new "state-of-the-art" components and retain some of the original components, which still had a long and useful service life remaining, for a price that would be lower than a totally new system. In addition to being cost effective, the downtime required would be less than a totally new system.

From the initial design of the project, we felt that it would be in the best interest of the client to use a "performance" type specification rather than a full detailed design. This was done for several reasons, some of which were:

1) The time frame for system design was fairly short, especially since two different systems were being considered.

2) Since the client was a government agency, a performance specification worked very well in assuring competitive bids and not limiting competition.

3) David Volkert & Associates, even though we are a full service engineering firm, recognizes that there are manufacturers who specialize in such design and can provide a very satisfactory and acceptable system.

4) A detailed design would most likely mean using a particular manufacturer as a basis of design and, therefore, any drawings developed during the design stage could not be used as "As-Builts". In addition, a minimum of drawings would be required during the design stage.

5) A performance specification allowed rigid contract requirements relating to torques, times and operational results, but also allowed the bidders to use inagination and experience to be brought out in their proposal and design.

6) Contractural obligations and differences in actual systems could result in difficulties during the shop drawing stage of the project.

It was initially decided that the control system would be a programmable controller in order to simplify operator functions, and it was also determined that a totally redundant system was necessary in order to assure a continuous flow of marine or vehicular traffic in the event of a malfunction or failure of any portion of the control system.

As mentioned earlier, the motors had proven very satisfactory during the life of the system and were in fairly good shape. The contractor was allowed to bid rework of the existing motors or to supply new motors.

During the design process, we were constantly in contact with major electrical equipment manufacturers discussing different system designs. During these

discussions, it became apparent that a direct current system also had merit. This alternative was reviewed and deemed feasible.

The system was finally designed using an automatic transfer switch for power source transfer and allowing the bidders to bid on either an A.C. or D.C. type system, using a Programmable Controller as the master control component.

Bids were received on May 5, 1987. Only two bids were submitted. After a review of the bids, the contract was awarded to General Electric on June 18, 1987, for a bid price of $237,000.

Because of the importance of maintaining operation of the bascule as long as possible and in order to minimize disrupting both marine and vehicular traffic, the contract required that all components and materials be on site prior to actual start of construction and that only four (4) weeks would be allowed for the bascule to be out of service. There were many items that had to be precisely scheduled in order to complete the project on time and with minimum inconvenience to motorists, the majority of whom were regular commuters.

A few of these items are:

1) Notice to all marine traffic by the U.S. Coast Guard a minimum of thirty days prior to disabling the bascule.

2) Scheduling of the Causeway police force for traffic control when only one lane can be used.

3) Proper programming of the Variable Message Signs.

After contract award, the contractor immediately began to compile shop drawings for materials proposed for installation, schematics of the system, and P.C. logic diagrams. Throughout this process, the contractor was very conscientious of his obligations and did an outstanding job of providing all information required by the contract documents. A minimum of changes were required in the shop drawings, thus making it much easier for us to review and comment.

Prior to actual construction, General Electric provided a two-day preliminary training session on the operation of the programmable controller and the D.C. drive system. This was attended by Causeway Maintenance personnel and DV&A personnel. After installation of the system, additional training sessions will be held since one of the contract requirements is that on-site training be provided for both the bascule operators and maintenance personnel.

Construction actually began on September 14, 1987, and within three days all the old equipment not scheduled to be reused had been removed and installation of new components had begun. There were some parts and equipment such as the cabinets, incoming main breakers, limit switches and wiring external to the cabinets that were reused.

At the time of this writing, construction is still underway but is progressing somewhat ahead of schedule. It is anticipated that the construction will be satisfactorily completed in advance of the scheduled completion date of October 9, 1987.

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