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TENNESSEE BRIDGES THE GAP  
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I did not grow up in Kentucky, but I spent a good deal of time as a boy visiting my grandparents in Green County; so I am somewhat familiar with Kentucky. In my observations over the past I didn't find a great deal of difference in Kentucky and Tennessee. Geographically, they lie in the same area, and I think the ways that the two departments of transportation work in very similar ways. The problems of the counties and cities on the local level for both states are very similar. With Tennessee and Kentucky, either the counties will have very little money or will be very rich and able to attend to their own needs. This leads me to the subject of my discussion today.

On December 15, 1967, there was a major bridge disaster that occurred over the Ohio River. This disaster took the lives of forty-six men, women, and children. I think for the most part over the country up until that time, people had been rather complacent about their bridges. Probably more so than they had been about their highways. In the late 20's and early 30's in Tennessee, we had a major bridge building program. We built bridges over all of our major rivers, on our major highways. Then, the bridges were shuttled off to the side. We began to try to connect those bridges with highways. Although those bridges became old and deteriorated in time, we didn't put a whole lot of money into maintenance probably a little bit like Kentucky. We were putting most of our money into new construction.

I believe this scenario probably reflected what was going on across the nation. And so with this disaster, it suddenly woke everybody up in the engineering profession that maybe there is a ticking bomb out there somewhere. It caused Congress to take some action to determine what the problem was all about. They passed legislation requiring each one of the states to inventory their bridges on the Federal Aid System. Each one of the states then began scurrying around as fast as they could to get this implemented, and eventually a satisfactory inventory was produced.

Along with this proposition to inventory the bridges came some very limited funding to replace bridges, but it was a drop in the bucket. By 1978, we had completed our inventory of federal-aid bridges. It became apparent by looking at the

Federal Aid Inventory and also samplings of the Off Systems across the country, that the problem was immense. The problems with the Federal Aid System were nothing in comparison with the problems of the Off System. Congress passed some further legislation in 1978 to require all of the bridges on public roads in the United States to be inspected. This was carried out somewhat differently across the nation, but in all states it was done.

The Tennessee Department of Transportation did undertake the inspection of all bridges across the state. I believe this is the way that Kentucky did it. Typically what we found on the Off System was that the bridges were of short spans, moderate in length, and low in traffic. Most were in very bad condition. Many had never been designed as proper bridges in the first place.

When we finished our inventory of the Off System, we found that Tennessee had 18,000 bridges on the total transportation system. Of this, there were some 6,266 which were posted, and 1,122 that were closed. Roughly 5,700 of the 6,200 posted bridges lay on the Off System. Virtually every one of the closed bridges lay on the Off System. As I indicated, Tennessee had a little bit of a problem on the Federal Aid System. Tennessee had an immense problem with the county and city bridges. Tennessee had already decided to put the maximum funding that was possible on the Off System. The Federal Aid Legislation required states to put sixty-five percent of the funding on the Federal Aid System, and fifteen percent on the Off System with twenty percent of their funding as discretionary money. Tennessee put the extra twenty percent on the Off System, which amounted to thirty-five percent of their federal funds.

In reviewing the costs that we were experiencing in trying to replace a bridge under the Federal Bridge Replacement Program, we estimated that it would take us some forty years just to address the bad bridges that were in the inventory in 1978. This did not take into account any bridges that would go bad after 1978. Tennessee concluded from its analysis of her problems that typically it would take somewhere in the neighborhood of eighteen to twenty-four months to plan, survey, design, let the contract, and get a bridge built on the Federal Aid System. On the average these bridges were costing Tennessee around \$250,000. Tennessee had some program of involvement with her local governments where the state and local governments contracted to do some work. When this was done, it was done in accordance with state and local government procedures, and the law. We found that when we did work this way we could get work completed on the average of less than twelve months. Also, a bridge would cost us something less than \$50,000. With this idea in mind we felt like there might be a better way of going about our situation on the Off System than just trying to address it with Federal Aid Funds. The bottom line of both particular situations was that when we finished we had done both projects in accordance with AASHTO and state specifications, ending up with identical structures. Each one had the same load-carrying capacity and would serve the public in the same manner.

Thus, Tennessee put together a program to accelerate the replacement of Off System bridges. The first thing accomplished was the development of a set of project specifications that would serve all local governments. Tennessee wanted the design to be identical with the AASHTO standard specification for highway bridges. This way Tennessee would ensure that the bridges under this program would be the same as those under any other program. The construction specifications would be in accordance with state standard specifications, and this again would make them the same as any bridge. Tennessee wanted to design them in accordance with a live loading of HS20-44, and this is the heaviest live loading that's in the AASHTO bridge specifications.

Next, Tennessee developed a hydraulic design criteria that dealt with the type of bridge Tennessee was dealing in -- a little bridge that might typically be located on a gravel road, or some sort of country road, in which the approaches were not built to be above high water. Tennessee decided that a ten-year flood frequency might be appropriate for trying to design these bridges by a minimum proposition. We designed them for over topping of their approaches, and this allowed us to build bridges without putting an inordinate amount of money into the approaches. We set out the methods in which the hydraulic information would be calculated, and this was in accordance with what we were doing in the Division of Structures in Tennessee. Tennessee then sent out a statement to the following regulating bodies: FEMA, TVA, Corps of Engineers, and local governments. The statement implied that any standards that these people or regulations had would have to be met. We left that up to the local government. We didn't address that from a state level.

Another issue that Tennessee was concerned with was that all bridges should have a minimum life expectancy of fifty years. In Tennessee, the bridges in the west Tennessee area were mainly timber bridges. It was these timber bridges for the most part that were bad. If you built a timber bridge in accordance with modern day timber standards using the proper type of timber recommended for bridge construction a bridge might last fifty years. I haven't run across a fifty year timber bridge in Tennessee, and I haven't seen one in Kentucky. Normally the construction method is to utilize something less than that. A lot of times in Tennessee it was just timber that had no preservative treatment whatsoever, straight from the sawmill. We felt like if we were going to put money in this program, we wanted bridges that would last. We certainly didn't want something that next year would be inspected and then load posted. Thus, Tennessee decided to make a statement that the bridge type should be of a kind that is expected to have a fifty-year life. This dictated that the bridges would be out of concrete and steel. I said earlier that you could build a good timber bridge. When bridges are built out of timber materials, and with the proper construction, they're generally not competitive with concrete and steel. We indicated that we would cooperate with this program in every manner possible. Providing the state standards that we had available as far as structures helped to lessen the expense.

Another major issue that we considered was the requirement that all bridges have a minimum bridge width of twenty-two feet. At that time, there were possibilities of using wider bridges on a Federal program. However, in reviewing the Federal standards and reviewing our own standards, we felt that we could justify this. We went to the Federal Highway Administration and ultimately got their concurrence in using a minimum bridge width of twenty-two feet. On most of the Off System bridges in Tennessee this particular width is the one that governs. The next step in our process was to go to our legislature and seek some enabling legislation.

The first program we dealt with concerned bridges that had load ratings less than ten tons. We had a tremendous number of bridges that school buses could not cross. We wanted to deal with those first. We put into law that we could not replace bridges that carried weight limits over ten tons. We wanted to get the biggest bang for our dollar. We put into law that we would be dealing with bridges that were less than fifty feet in length. The bridges over fifty feet in length were dealt with on the Federal program. We wanted to deal with bridges that had low traffic counts. We talked about an average ADT of seven-fifty or less. We indicated how we would apportion the money to each of the counties. We apportioned this money directly on the basis of the number of deficient bridges that they had falling into these categories, divided by the total number of deficient bridges that fell in these categories for the entire state, utilizing the square feet of each one of those bridges. We indicated that

the first order of business was going to deal with those bridges that were closed. Bridges closed to traffic are much worse than a posted bridge.

Another part of the proposition was that Tennessee was going to deal on the same basis with locals that we were dealing with the Federal program. The feds had the 80/20 basis. The local governments would need to put up twenty percent of the proposed expenditure. A key feature of this is that the required match could be provided as an in-kind contribution to the project. This meant that the local governments did not have to put up hard cash. Another issue we wanted to resolve with the local governments in Tennessee concerned fairness. The locals were going out and fixing the bridges. We did not want to penalize them for having attempted to do a good job. We put into our legislation that we would give credit towards matching requirements for those counties that had taken bridges found to be deficient in the initial inventory and repaired and replaced them with a minimum load limit of fifteen tons. That way a county that had been responsive to their needs would not be penalized by our program. We put all of this together and got it passed through the legislature in Nashville. We came out with a proposition that was a contract between the state and the local governments, whereby the state and local governments could replace the bridges that they could best construct.

With the 80/20 program, Tennessee attempted to maximize the savings and other benefits of both state and local governments with bridge construction. The state had the responsibility of supplying the bulk of the funding. The state was good at raising money. We felt we were the experts in the bridge game, so we were going to set the specifications for the projects. We approved the plans and then performed the final inspections to ensure that the structures had been built in accordance with the proper requirements. We saved an awful lot of money. We let the local governments do the things we felt they could do very well. We asked them to obtain professional engineering services. We wanted all of these bridges designed by licensed professional engineers. These engineers would prepare the plans for the counties, let the bridges to contract for the counties, and/or cities, and then supervise the construction.

Another great money-saving feature of the 80/20 program was that we asked the counties to obtain the rights-of-way. When the State of Tennessee went out to obtain a right-of-way, the state told the individual that he could obtain full market value for his property if he so desired. We had found out that when the local governments obtain rights-of-way for their roads, they explained to the property owner what type of road improvement would occur in front of their land if they would just help the local government by donating a little strip of land on each side of the road so the improvement could come about. In most instances, the local property owners were very glad and willing to help out and participate. By letting the local governments obtain the rights-of-way, we were able to obtain the rights-of-way almost cost free for the bridge improvements. We also felt that the local governments could relocate utilities more efficiently than the state could. The utility companies generally were operating at the local level, and that's where the contacts were. The locals could get this job done much better than the state. Also, most of the local governments in Tennessee have their own highway departments. They have equipment and are able to do a moderate amount of work. We felt that these local governments could construct their own approaches to the small bridges, and thereby save a good deal of money.

Putting together all of these things that the local government could do better than the state, putting up funds, engineering services, building approaches to the bridges, saved the taxpayers money and time. We would give locals either direct credit for the funds that they expended or credit for the work they had done towards meeting their twenty percent match. For the most part, the out-of-pocket expenditures that the

local governments had to make were for procuring engineering services. They could come up with the rest by some other means. We gave credit for the worth of any right-of-way that was donated. We hit the ground running on this program.

In Tennessee during this 80/20 program, I served as head of the Division of Structures. I had most of the elements in the Division of Structures for implementing the program from the state level, and therefore had pretty much control of the process myself. Between July 1, 1982, and November 1, 1984, we were able to replace 1,453 structurally deficient bridges on Tennessee's Off System. We replaced those for a total cost of \$50 million, which averaged somewhere in the neighborhood of \$34,000 per structure. Most of these were surveyed, designed, contracted, constructed, and inspected in less than twelve months. With such a large program the average costs of the structures came in lower than what I expected. We actually did this program in four phases. In phase three and phase four Tennessee pumped another \$10 million into the 80/20 over the next two years. During the two years, we replaced another 280 bridges in one year and about 247 in the next.

Since Tennessee was making great strides towards reducing our problem on the Off System, we felt it would be unfair for us not to receive the monies that we would ordinarily have coming to us to replace these bridges at the Federal level. We asked our Congressional delegation to pass legislation to help us get the Federal monies Tennessee deserved. We wanted any project for the replacement or revitalization of bridges, and which was wholly funded from state and local sources in the State of Tennessee to be eligible for Federal funds. Another key provision was that if the bridges were constructed in accordance with all standards, and the key word is standards, then of all funds expended by Tennessee after July 1, 1982, 80% could be used as a match towards our Federal program. This meant 80% of the money that was expended on this State 80/20 Program was built up into a little pool. Over a period of several years we built our Federal System with 100% Federal funds. Observers might say we got the use of our money twice. We enabled the Federal Highway Administration to renew maybe four or five times as many bridges from our inventory as would ordinarily have been possible under the Federal program, and Tennessee was not penalized.

What we call the Demonstration Program has been successful and somewhat evangelic in Tennessee. We want to let all of the other states have an opportunity to do this same thing. The major requirement is that the bridges be certified by the state to be carried out in accordance with all standards applicable to such projects under Section 144 and that the bridges are no longer deficient bridges. If this is the case, a state can gain credit for those programs against their Federal program.

In order for Tennessee to receive credit for these bridges, it was a required the bridge inspection teams do a hands-on detailed inspection of all of the bridges. Next, I had to certify that the bridges had been constructed in accordance with the appropriate national and state standards, that they were no longer deficient bridges, and had been taken off the deficient bridge list. In order to ensure that we were doing the job correctly, the Federal Highway Administration went around with our people on a sampling basis to ensure that everything was correct. When that was done they were very pleased and satisfied that the program had been successful. This program has resulted in some other spin-off rewards.

Sometimes the local governments in Tennessee, due to pressure from their citizens, or lack of funding, were not able to be responsive to our request to post or close bridges. In most cases they would post or close a bridge and the sign would only remain overnight. It would somehow disappear. Even when we would pile up large stacks of rock or logs, they would seem to be able to move off into the night. It was a difficult situation. To get the counties to be more responsive to this program, we would get them to repair or repost some of their structures. We developed a priority

replacement list for each county with our closed structures ranking first. Then if a local government desired to skip over one of those structures, they were required to demonstrate to us that they had brought that structure up to a minimum of ten tons by their own means. This way we got a little more bang out of what we were doing. It prompted the local governments to repair a few bridges they would not ordinarily have done. This enabled us to reach bridges that were higher on the list.

As far as Tennessee is concerned, this is probably one of the most successful programs we've ever had. The program was able to use taxpayers' money to deliver cost-effective products that serve the public in a time of need. The program addressed a problem in the best manner that Tennessee could.