

"SERIOUS PROBLEMS CREATED BY THE NUMEROUS SUB-STANDARD COUNTY BRIDGES"



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We are told that pre-historic man built bridges using vines and logs. Much progress has been made in bridge design and construction since that time; but, in spite of this progress, we still have bridges made with log beams and log abutments. We are still using bridges that were built many years ago for light loads and low traffic on roads where the loads and traffic have increased many times, and is continuing to increase, without much thought of bringing them up to today's standard.

A drainage structure is classified as a bridge when the distance between the abutments measured along the center of the road is 20' or more.

A bridge may be sub-standard for the following reasons:

1. Vertical clearance less than 14'.
2. Horizontal clearance less than 18'.
3. Maximum capacity less than 15 Tons.

Condition No. 1 pertaining to vertical clearance is usually not too serious. The maximum legal height for vehicles is 12'6" on all roads except Class "AA".

Condition No. 2 pertaining to horizontal clearance is not too serious on low traffic roads if the bridge is sufficiently long to prevent head-on collisions and has a width of about 13' to accommodate farm machinery.

Condition No. 3 is serious if the bridge has a capacity of less than 15 Tons. On a recent survey of school bus routes over state maintained roads it was found that some of the school buses weighed as much as 15 tons when loaded. In addition to the school buses you have the farm-to-market and market-to-farm truck traffic plus other heavy traffic such as trucks hauling stone, pipe line construction, soil conservation equipment, and in some cases coal truck or oil well drilling equipment. So you can readily see that any bridge can be expected to carry loads up to, or even more than 15 tons.

On the county road systems of Kentucky are approximately 9,300 bridges or nearly 2½ times as many bridges as we have on our state maintained system. We have 724 sub-standard bridges on state maintenance or about 18% that are sub-

standard. We do not have a count on the sub-standard bridges on the county road system, but it is reasonable to assume that the percentage is much higher than on the state maintained system.

A weak or sub-standard bridge is very expensive to maintain because excessive deflections under load cause damage to the bridge. So many of these bridges have wooden floors and beams of untreated native lumber and every few years it is necessary to rebuild or replace the rotten or broken timbers. After two or three rebuilding jobs you have spent enough money to replace with a more permanent material.

In addition to the expense of maintaining a weak bridge, there is an additional expense to the user when he has a load too heavy to cross the bridge and has to travel many miles to avoid crossing the bridge. Of course, this is an indirect cost to the county, but in the case of hauling stone for the road on the other side of the bridge it may cost much more per ton to haul around a weak bridge.

The danger of sub-standard or weak bridges certainly is a concern to all of us. School buses loaded with children are using bridges that were built for the horse and buggy days. The bridges when built were not expected to carry such loads and now that they are older and certainly weaker we are using them for modern traffic. Some of the users of weak bridges have the misconception that if they cross a weak bridge with a heavy load once, or maybe several times, that the bridge will continue to be safe for heavy loads. Overstressing the bridge members is like bending a wire; if you continue to bend the wire it will finally break.

Replacing the sub-standard bridges will cost millions of dollars and the longer it is delayed the more it will cost if prices continue to rise. In most counties the condition is becoming more acute each year because the bridges are wearing out and the traffic is increasing. We must meet the problem head-on and not be content with repairing the structure for a year or so, but use vision and spend for the future. A part of Rural Highway and Rural Secondary allotments could be used for a year or two on structures alone. This would get the program started until a new form of revenue could be provided. The problem of providing new revenue should be one for the County Judges Association to consider and recommend to the Legislature. You must remember that the cost will run into the millions if a worthwhile program is put into effect. To give you an idea of these costs, of all the bridges constructed under contract by the Highway Department for a year, ending June 30, 1958, they cost an average of \$15.48 per square foot of roadway or about \$400.00 per lineal foot of bridge. In addition you will have the cost of adjusting the approaches to fit the new bridge.

As an example of what these sub-standard bridges could cost you in case of a flash flood, you will recall the newspaper reports of bridges washed out in Ohio County by a recent flood. In this county alone 30 bridges were reported washed out or damaged beyond use. Traffic was tied up and schools were closed. In checking on these bridges it was found that not one bridge under state maintenance was washed out or damaged. It is reasonable to assume that these bridges will be replaced with temporary structures. If native timber is used it will last about four years if the bridges are not destroyed by flood or fire.

What can we do with these bridges? This condition cannot be corrected in a short time but will require several years of effort on the part of each county. The problem is usually much greater in the poorer counties. In the Highway Department we are eliminating these bridges as the money is made available. On our low traffic roads, where there is little chance of the roads and bridges being rebuilt in the construction program, we are using maintenance funds to rebuild or rehabilitate weak bridges. In many cases we have steel truss spans where the truss is strong enough to carry 15 ton loads, but the floor system is weak. These floor systems can be strengthened, and if the span will not carry the dead load of a concrete floor, a metal plank floor with bituminous filler can be used and the additional weight is little more than the weight of a wooden floor; then we have a bridge that will give many years of service.

On shorter span bridges we are using precast concrete spans or steel beams with concrete floor. Where piling can be used for the sub-structure this is an easy and economical bridge to build. Some of the counties in the western part of the state are using Rural Highway and Rural Secondary Funds to rebuild their obsolete wooden bridges, using precast concrete spans for the superstructure.

We should remember that the old proverb about, "A Stitch in Time Saves Nine", certainly applies to bridges. Many of the county bridges have gone without paint and repairs until they are beyond economical repairs, but there are many bridges that can be repaired at a reasonable cost if repairs are not delayed too long.

Many good blacktop roads lead to a worn out bridge that is actually too dangerous to cross. How many stop to realize that the road is useless without a bridge to get to the other side? Like a chain with a weak link a road is no better than its weakest bridge.

The counties are not the only ones who have neglected their bridge maintenance. Our Highway Department did not have an Engineer assigned to bridge maintenance until seven years ago. This does not mean that there was no bridge maintenance, but it was neglected in some cases long enough to require major repairs; when, if found in time corrective measures could have been taken and saved considerable money.

I will show you some slides that I made shortly after being assigned to bridge maintenance. Not all of these slides were made on sub-standard bridges, but it will show you that all bridges should be inspected occasionally, not from an automobile, but by getting out of the car and inspecting under the bridge, as well as the roadway. Inspecting and maintaining your bridges may present a problem to the counties that do not have a county road engineer, or a supervisor capable of making the inspections and supervising the maintenance work.

Some counties seem to operate their bridge work only on an emergency basis. In many cases they do not have crews of their own and the Highway Department must come in to help in an emergency.

I would like to give you a typical case that happened a few years ago in one of our counties. The county had a traffic bound road that they wanted blacktopped, and on this road was a weak bridge. The county agreed to assume the responsibility of the bridge if the state would blacktop the road. In less than a week after the blacktop was finished a truck caused the bridge to collapse. The county called on the Highway Department for help. I visited the bridge with the County Judge and asked him what help he would need. He told me he did not have material, crew, or the money to replace the span.

I only hope this paper has helped in some way to make the counties realize that the county bridges should be their responsibility and a bridge program should be started.