

REPORT OF COMMITTEE ON GUARD RAIL

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SYNOPSIS

The Committee report reviews the development of guard rails from the early periods when stone or wood was the material, to the present when a large number of types are in use. It points out that the tensile strength of guard rail cable has been tripled since 1919. Standardization of guard rail insofar as interchangeability of parts is concerned is recommended. Such standardization of parts would lead to simpler maintenance by reducing the number of replacement parts carried in stock and admit of more competitive bidding.

In the development of modern highways and the attendant evolution of vehicle speed, it became apparent to highway engineers that in addition to location, design and construction, another feature called for serious consideration, safety.

In 1928, at the Eighth Annual Meeting of the Highway Research Board, H. S. Mattimore presented a "Report on Guard Fence Research."¹ This report covered the evolution of the guard rail, through the medium of field tests, from the wooden barrier up to and including the two cable rigid offset design.

Since 1928 we have seen the further evolution of the cable rail and the introduction into the field of steel plate, woven wire mesh, steel beam, wire tape, steel strip and others. In attempting to evaluate these some highway engineers resorted to overall tensile strength tests in the laboratory, others to field tests, or a combination of both. Practical experience has taught us that the field test is the desirable one.

In 1933 the State Highway Department of Georgia ran a series of field and laboratory tests under the direction of Mr. S. B. Slack. Again the same year the Pittsburgh Testing Laboratory, under the direction of Mr. P. J. Freeman, made a series of tests for the Toncan Culvert Manufacturer's Association. In 1934 the

State Highway Department of Missouri ran a series of field tests under the direction of Mr. F. V. Reagel. In 1934 the Texas State Highway Department ran a series of field tests under the supervision of Mr. J. B. Early. As the result of these tests some designs were found acceptable and others were not.

Changes have since been made in some of these designs, which brings up the problem of evaluation as of the present writing. Confusion exists in the minds of engineers relative to design and efficiency as witness the statement of Follwell and Hardenbergh, who editorialized in the February 1938 issue of *Public Works* as follows:

"WHAT ARE HIGHWAY GUARD RAILS FOR?"

"Our perhaps elementary understanding of highway guard rails has always led us to the conclusion that they were safety factors, designed to protect the traveling public from hazards at certain danger points along highways. Unfortunately, much competition has developed among various manufacturers, and this competition seems to have reached the point where some engineers are either confused or are bewildered by patents and patent suits, or threats of them. In some cases specifications have gotten tangled up, too. Personally we don't know much about writing specifications for guard rails and in the present state of affairs we don't crave the job of writing them; nor of buying guard rails either. Isn't it about time that one of our stronger technical associations appointed a top-notch committee to so straighten out these matters that the buyers of guard rails can give first consideration to the matter which is of first importance—the safety of the traveling public?"

¹ *Proceedings, Highway Research Board, Vol. 8.*

It is not the purpose of this Committee to expound on the merits or demerits of type or design. What we are primarily interested in is—will the structure do the job? In other words; has it the strength and durability, necessary to protect modern traffic.

We have mentioned the evolution of the guard rail, and also the reason for this evolution. Upon graduating from the horse and buggy days the horseless buggy jumped the approximate travel rate from *five* to the "damning" speed of *fifteen* miles per hour. Now the same horseless carriage is traveling at legal speeds of from *forty* to *fifty-five* miles per hour, and, in some places speed limits have been eliminated entirely.

Now let us see what highway engineers have been doing with guard rails during this time. Prior to 1919 guard rails were built of wood or stone, the former predominating, with some cable. From 1919 to 1924 the combined tensile strength on an average cable guard ranged between 20,000 and 30,000 lb. From 1924 to 1932—the combined tensile strength of the guard ranged between 40,000 and 50,000 lb. From 1932 to the present, the strengths of the various guards have been increased and now average between 70,000 and 90,000 lb. in tension. In this short summary you can see that the engineer is endeavoring to keep up with the safety features demanded by modern traffic. With the increase in traffic speeds the problem of

suitable guard rail becomes more serious and complex. Up to the present it has been a case of meeting a price; from now on, especially on our express highways, the problem becomes that of designing to meet conditions. Dealing with the pleasure car alone is not sufficient. Bus traffic, carrying thousands of passengers during the course of the year must be protected. Trucks,—what about them? We recognize them as part of our ever growing traffic volume. Is not some thought necessary in this direction?

In conjunction with considering numerous phases of the modern highway guard rail, thought must be given to standardization, insofar as the interchangeability of parts is concerned. The Problem Committee on Guard Rail, of the American Road Builders' Association, has tackled this problem and is showing some results. Standardization is the only means of placing guard rail in line for competitive bidding, and of cutting down the number of parts which must be carried by a maintenance organization in order properly to maintain its guard rail in a safe condition at all times; also for providing against the eventuality of a manufacturer discontinuing production, which has happened and is happening today.

It is the opinion of the committee that the problem, while complex, is not incapable of solution and its aims are in that direction.