

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: July 14, 1983

Forwarded to:

Honorable Elizabeth Dole  
Secretary  
U.S. Department of Transportation  
400 Seventh Street, S.W.  
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

H-83-35 through -37

On February 28, 1981, a passenger car traveling south on Kenilworth Avenue, State Route 201, in Cheverly, Maryland, vaulted the approach guardrail leading to the bridge over the Amtrak Northeast Corridor (NEC) tracks. The car landed on a southbound track and was hit by a passenger train traveling at 107 mph. The locomotive derailed, and the train traveled 3,700 feet before coming to a stop. The driver of the car was killed, and 11 of the 50 occupants of the train were injured. The consequences of this accident could easily have been more severe. 1/

The approach guardrail to the east parapet of the bridge for southbound traffic on Kenilworth Avenue was 117 feet long with a post spacing of 12 feet 6 inches and a height of 20 inches; the low height was partly due to sod and soil buildup. The approach end section was not properly flared, and the transition from approach rail to the bridge railing was not attached to the bridge railing nor was it gradually stiffened as it came closer to the bridge railing. After the accident, a 65-foot section of the guardrail closest to the parapet was replaced. The post spacing used was approximately 6 feet 3 inches, and the height of the replacement sections averaged 23 inches above the ground. The work did not include attaching the bridge end of the guardrail. Thus, neither the preaccident guardrail nor the replacement guardrail met presently effective guidelines promulgated by the American Association of State Highway and Transportation Officials (AASHTO). After the Safety Board pointed out to the State of Maryland that the replacement guardrail still did not meet current standards, it was raised to a 27-inch height and it was properly transitioned and attached. The Safety Board believes that if the original approach guardrail had been constructed to current standards, the car's vaulting of the guardrail and the subsequent train derailment probably would not have occurred.

1/ The National Transportation Safety Board (NTSB) has investigated two other accidents which involved a vehicle falling from a highway structure onto another transportation facility (in both cases another highway), resulting in the death of 13 people (See HAR-70-5 and HAR-77-1). In terms of fatalities, the most severe highway accident which has been investigated by NTSB involved a vehicle plunging through a bridge rail onto the ground below killing 29 people. (See HAR-77-2).

The Safety Board recognizes that there is a low probability of a vehicle falling off a bridge and into the path of a train. However, since the NEC is the busiest section of railroad in the United States, with more than 1,000 trains operating daily, the Safety Board believes that the highway bridge barrier system on bridges over the NEC should at least meet the guidelines provided by AASHTO.

To determine the extent of the problem and the condition of traffic safety features of the bridge barrier systems on highway bridges crossing the NEC, <sup>2/</sup> the Safety Board initiated a four-phase investigation in which four traffic safety features were examined:

Phase I of the Safety Board's investigation involved a general assessment of any potentially hazardous conditions in these bridge barrier systems as observed from the head locomotive of a regularly scheduled NEC Amtrak train. Using this method, only two of the four traffic safety features could be assessed, the approach guardrail and the transition section. The assessment included a determination of the adequacy of the post spacing and whether or not the transition section was attached to the bridge railing. The results of this phase indicated that one or both of the two traffic safety features were deficient in 245 of the 310 bridges which could be assessed in this way. It can be reasonably expected that among the bridges not assessed like deficiencies exist.

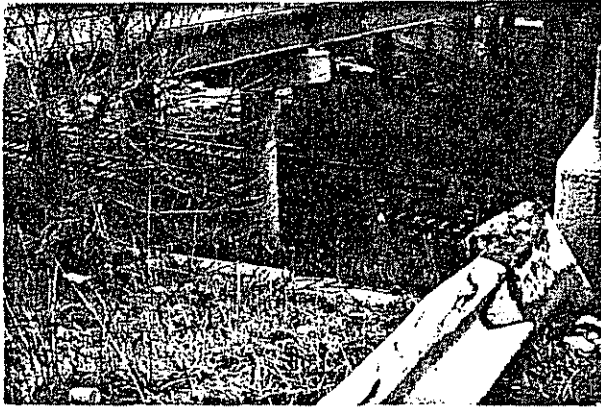
Phase II of the investigation involved an assessment of all four traffic safety features through an examination of the Structure Inventory and Appraisal (SI&A) sheets for the NEC highway bridges. These sheets are on file with the Federal Highway Administration (FHWA) and/or with the individual State. In item 36 on the SI&A sheets, the four traffic safety features are rated as either meeting or not meeting acceptable AASHTO standards. Usable data were found for 298 bridges. These data were then separated according to the highway system -- Federal-aid (223 bridges) or non-Federal-aid (off-system) (75 bridges) -- a factor in establishing Federal program eligibility to aid in identifying possible funding sources for upgrading. The data indicated that 81 percent of the bridges over the NEC and on the Federal-aid system and 92 percent of the bridges over the NEC and on the off-system had at least one inadequate traffic safety feature. The transition section of the approach guardrail was reported to be unsatisfactory more often than any other feature.

Phase III of the investigation consisted of onsite inspections of 62 bridges to verify the SI&A sheet data and to determine the extent of the inadequacies of the traffic safety features. The Safety Board found that actual conditions were worse than those indicated by the SI&A sheet data and that the inadequate conditions in many cases were of a very serious nature. Figure 1 illustrates the type and magnitude of some of the conditions. None of the three installations shown in figure 1 could redirect an errant vehicle impacting at angles and speeds normally used in the testing of barrier systems.

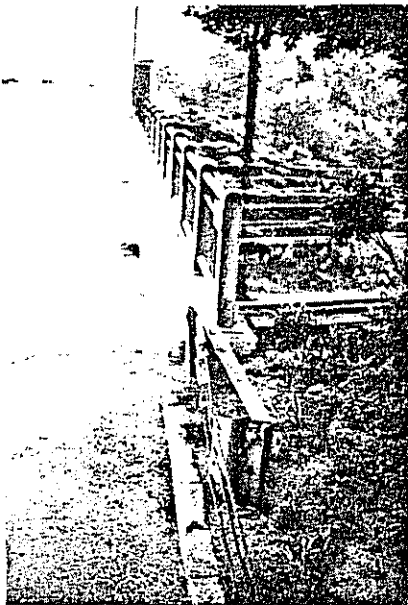
In the fourth and final phase of the investigation, the conditions of the traffic safety features on NEC bridges were compared with the conditions on the rest of the bridges in the NEC States using the SI&A sheet data. The analysis indicated that at least 81 percent of the NEC bridges for which SI&A sheet data were available had one or more inadequate

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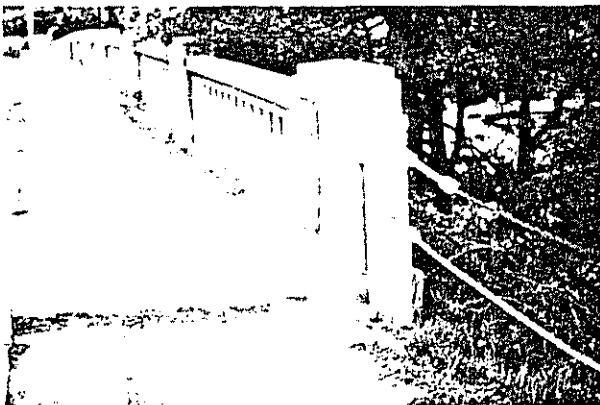
<sup>2/</sup> The NEC extends from Washington, D.C., to Boston, Massachusetts, a distance of 456 miles. The tracks occupy rights-of-way in the District of Columbia, considered a State for purposes of this investigation, and the States of Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, and Massachusetts. There are 453 overhead highway bridges on this route.



A. The approach guardrail is on a principal arterial. Speed limit is 45 mph. Average daily traffic in one direction is 40,000, 8 percent of which is trucks. The average height of the guardrail was 20 inches. There are 72 trains daily with a maximum speed of 105 mph (120 mph in the future), using the tracks below.



B. The approach guardrail is on Interstate 95. The maximum posted speed is 55 mph. The average daily traffic in one direction is 45,000, 13 percent of which is trucks. None of the traffic safety features are satisfactory. The top of the cable guardrail is 22 inches above the pavement; it is not attached to the bridge, and the bridge rail is the panel discontinuous type. There are 78 trains daily with a maximum speed of 45 mph (55 mph in the future) using the tracks below. (Note: This bridge is on a toll road and Federal money is not available for correction of the indicated hazards.)



C. The approach guardrail is on a major arterial. Speed limit is 40 mph. Average daily traffic is 17,000. None of the traffic safety features are satisfactory. The two cables are mounted on concrete posts at a minimum of 17 inches above the bridge sidewalk. There are 31 trains daily with a maximum speed of 79 mph (100 mph in the future), using the tracks below.

Figure 1.—Examples of inadequate traffic safety features on highway bridges over the NEC in three different States.

traffic safety features while 78 percent of the rest of the bridges in the States had at least one or more inadequate features. While this indicates only slightly worse conditions on the bridges over the NEC, when coupled with the underbridge characteristics, the condition of the NEC bridges poses a much greater safety hazard.

The U.S. Congress has authorized approximately \$2 billion for the improvement of the NEC and has mandated that safety on the NEC be given primary emphasis. The Federal Railroad Administration (FRA) has stated that "... the design considerations for all elements of the system shall emphasize safety." While work is being done to rehabilitate more than 200 of the railroad bridges over highways and to eliminate or improve railroad-highway grade crossings on the NEC, no attention has been directed toward systematically improving the traffic safety features of the barrier systems of highway bridges used by motor vehicles passing over the corridor. Federal and State programs should be directed at making these improvements.

The FHWA has the responsibility for reviewing and approving State highway projects when Federal-aid highway funds are to be used. It would appear to be the agency best able to coordinate a program for upgrading highway bridges crossing the NEC which have inadequate traffic safety features in the bridge barrier system.

The FHWA's Hazard Elimination Program (HES) is a major highway program (90 percent Federal funding) which is available to correct inadequate traffic safety features and other highway hazards on and off the Federal-aid system.<sup>3/</sup> However, because of the accident identification procedures and analytical methodology used by the States in the selection process, the upgrading of traffic safety features of bridge barrier systems has not received adequate consideration. Compared to other accidents on the highway system, the frequency of vehicle accidents involving bridges, and in particular bridge barrier systems, is low due to the fact that bridges occupy relatively few of the total miles along the highway system. However, based on length alone, the bridge portion is about 50 times more hazardous than the rest of a highway.<sup>4/</sup> If the accident identification process were expanded to properly identify accidents on bridges and to give adequate weight to accident severity and to possible underbridge consequences of an accident, bridges having inadequate traffic safety features would probably rank high enough to receive funding for corrective action.

Regular highway construction funds (75 percent Federal funding) are available to the States for improvement of traffic safety features on Federal-aid highways, but States generally prefer to use the monies for other highway improvements. One State along the NEC (Rhode Island) has recognized that the correction of bridge traffic safety hazards is important enough to warrant using construction funds for such projects.

Another Federal program (which remains a relatively unused source in the correction of inadequate traffic safety features) is the Highway Bridge Replacement and Rehabilitation Program (80 percent Federal funding). It is seldom used for the correction of inadequate traffic safety features because FHWA's policy is not to allow the use of the program funds for the improvement of bridge traffic safety features only; these

<sup>3/</sup> Before passage of the Surface Transportation Assistance Act of 1982, HES funding was limited to the Federal-aid system (other than the Interstate). The 1982 Act extends the funding to off-system highways.

<sup>4/</sup> Hall, J. W. et. al., "Roadside Hazards on Non-Freeway Facilities," (Transportation Studies Center, University of Maryland College, 1976).

improvements must be included as part of a more comprehensive bridge improvement project. The Safety Board believes, based on its study of the traffic safety features of the barrier system on the bridges over the NEC, that such funding should be made available for these improvements and would probably be a cost-effective use of the funds. Also, making available a percentage of the bridge replacement and rehabilitation funding for use in the updating of traffic safety features could give impetus to the NEC States to establish a systematic program for eliminating inadequate traffic safety features on the NEC bridges. Another useful aspect of the use of this funding program is the availability of the funding for improvements on all publicly owned NEC bridges (as now is the case for HES funding) regardless of whether they are on or off the Federal-aid system.

There is, of course, a need for additional funds to update and repair the entire highway system. The Administration's recent enactment of a 5-cent-per-gallon additional tax on gasoline will provide additional funds for repairing and updating the highway infrastructure under the foregoing programs. The Safety Board believes that in establishing priorities and budget requirements, safety improvements, such as the improvement of bridge barrier systems over the NEC, should be regarded as high priority items.

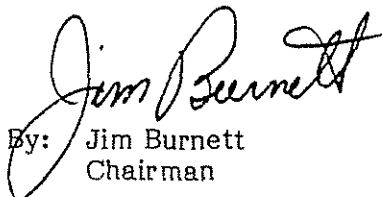
Therefore, the National Transportation Safety Board recommends that the U.S. Department of Transportation:

Direct the Federal Highway Administration and the Federal Railroad Administration to coordinate activities related to the improvement of inadequate traffic safety features on barrier systems of highway bridges over the Northeast Corridor. (Class II, Priority Action) (H-83-35)

Encourage the States on the Northeast Corridor (NEC) to give greater priority to the identification, evaluation, and correction of inadequate traffic safety features on the barrier systems of highway bridges over the NEC, taking into consideration the potential hazards posed to rail traffic by vehicles which might penetrate the existing barrier systems. (Class II, Priority Action) (H-83-36)

Make available to the States on the Northeast Corridor (NEC) a percentage of the monies apportioned to them in the Highway Bridge Replacement and Rehabilitation Program for use in the improvement of inadequate traffic safety features of barrier systems of highway bridges which pass over the NEC, whether or not the improvement is a part of a comprehensive bridge improvement project. (Class II, Priority Action) (H-83-37)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations.

  
By: Jim Burnett  
Chairman

