STATEMENT OF NORBERT T. TIEMANN, FEDERAL HIGHWAY ADMINISTRATOR, U.S. DEPARTMENT OF TRANSPORTATION, BEFORE THE HOUSE PUBLIC WORKS COMMITTEE, SUBCOMMITTEE ON INVESTIGATIONS AND REVIEW, REGARDING NARROW BRIDGE SAFETY, JUNE 14, 1973.

Mr. Chairman and Members of the Subcommittee.

I very much appreciate the opportunity to appear before you to discuss the hazards to highway travel posed by narrow bridges and other obstructions. Since this is my first appearance before the Subcommittee, I want to take this opportunity to say that I am looking forward to continuing the close and productive past relationships that the Federal Highway Administration and the Subcommittee have enjoyed.

The narrow bridge problem on all classes of highways is a major concern of the Department of Transportation and FHWA because of the large number of these dangerous bridges and the recent tragic accidents which have occurred on some of them around the country.

The 1968 Federal-Aid Highway Act required an inventory and inspection of all bridges on the Federal-aid highway systems to determine both the number and locations of bridges which are below standard width. This inventory, which is being conducted by the State highway departments, is scheduled for completion this year. Meanwhile, another inventory of generally deficient bridges, which was made in response to Section 204 of the 1970 Federal-Aid Highway Act, has already provided us with partial information on the problem of narrow bridges. While this latter program is directed toward removing from service those bridges which are most in danger of failure, the data on the 8,536 bridges submitted by State highway departments included 522 structures on the Federal-aid Primary System which have a roadway width of 20 feet or less. Widths of less than 20 feet on Primary System bridges are generally considered inadequate.

Using the available data, plus sample data derived from the 1970 Highway Needs Study, it appears that there could be as many as 6,000 bridges on the Primary System alone having roadway widths of 20 feet or less. On all of the Federal-aid systems, we presently estimate that there are about 12,000 bridges which are structurally deficient, and an additional 12,000 which are functionally obsolete and dangerous due to inadequate geometrics, such as substandard widths. The cost of replacing the narrow bridges on the Primary System alone is estimated at about $1.2 billion, based upon an assumption of $200,000 per bridge.

Although it is well known that there is a definite relationship between bridge widths and bridge accident rates, there has been little effort to analyze the costs as related to benefits of constructing wider bridges. One problem in conducting a cost-benefit analysis of bridge widening, as with other accident studies, is the lack of acceptable costs associated with fatalities and serious injuries. Also, accident projections must be made on a probabilistic basis. Because of the high cost of bridge widening and construction, economic justification for such projects requires a proven high accident potential, using reliable accident records as a source of information. We are studying these problems very closely at FHWA, because we need information that we can apply to structure designs on new highways as well as for replacement of existing narrow bridges.

I think it would be well to point out to you the highway safety implications of two different Federal programs providing for the restoration of bridges damaged or destroyed in a natural disaster. One program provides for the construction of modern structures incorporating all of the proven safety features developed by the engineering profession. The other program limits the

›enditure of Federal funds to repairs only, if that is the least expensive remedy, or simply replacement projects which tend to foster the continuance of unsafe design practices.

One of these is, of course, the Federal-aid highway program. Under the provisions of Section 125 of Title 23, U.S.C., the Federal Highway Administration administers an Emergency Relief Fund for the repair and reconstruction of roads and bridges on the Federal-aid highway systems, and Federal domain roads, damaged as the result of major disasters. With respect to bridge replacements, the law allows the replacement cost of a comparable facility, "which meets the current geometric and construction standards required for the types and volume of traffic which such facility will carry over its design life."

In other words, bridges damaged by a natural disaster can be replaced by new facilities designed and constructed to carry the volume of traffic that is expected to be generated 20 or more years in the future, depending upon the "design life." Accordingly, a replacement structure may be widened, lengthened, realigned or skewed to eliminate unsafe curvature at each end of the old bridge. The Emergency Relief Program in these respects is in full accord with FHWA's Special Bridge Replacement Program, which provides for the replacement of bridges that are unsafe because of structural deficiencies, physical deterioration, or functional obsolescence.

On the other hand, under the Disaster Relief Act of 1970, the Federal Highway Administration provides technical and engineering assistance to the Office of Emergency Preparedness in regard to the repair or reconstruction of roads and bridges not on any of the Federal-aid highway systems. Under the provisions of the Act, a bridge damaged by a natural disaster must be repaired or reconstructed "on the basis of the design of such facility as it existed

immediately prior to such disaster and in conformity with applicable codes, specifications and standards." Even if the bridge was in limited use due to its hazardous condition prior to the disaster, eligible repair costs are limited to the amount required to provide the same capacity and dimensions as existed at the time of the disaster. Additional lanes or improved alignment of the structure and its approaches are not eligible for Federal funding. Also, the funds considered eligible are in some cases far less than needed for the desirable standards in regard to widths.

We at FHWA share with you and all Americans the very real concern over the existence of these narrow, unsafe bridges on all highway systems and the tragic loss of life that occurs with distressing regularity. These deficiencies are among the more hazardous situations that a motorist is likely to encounter on the more than three million miles of rural two-lane roads in this country. Incredibly, some of these bridges date back to even before the 20th Century and are especially dangerous for several reasons. Principally, the physical obstruction of the bridge abutments and parapets, most of which are unguarded, represent dangerous obstructions to motorists. Secondly, narrow bridges represent real or motorist-perceived traffic flow restrictions. These changes in the cross-section of the roadway are unexpected events for which the driver is most likely ill-prepared, and which sometimes lead to erratic driver behavior.

The large number of accidents at and in the vicinity of narrow bridges attest to the safety hazards that they represent, and point

up the urgent need for effective remedies. Among the possible remedies are: complete reconstruction of all narrow bridges; protection of the motorist from exposed obstructions; and development and placement of suitable traffic control devices to warn and protect the motorist.

Due to the extreme costs involved, the rebuilding of all narrow bridges on our Nation's highways obviously represents a long-range solution, at best. However, immediately available and economically feasible are measures that can be taken to protect drivers from exposed bridge abutments through properly installed guardrails and other devices to control vehicle paths and minimize the effect of vehicle impact. The Federal Highway Administration has strongly stressed the vital need for such improvements, and will continue to include them in all safety programs to lessen the narrow bridge problem. In line with this, during Fiscal Years 1974 and 1975, FHWA will conduct research that will lead to a series of standard modifications for upgrading substandard bridge railings and bridge rail-guardrail transitions to an acceptable level. These improved railings and railing transitions will be especially important on narrow bridges where maneuverability during an emergency situation is critically limited.

During this same time period, FHWA is also going to be conducting research on developing new concepts for the high-performance and multi-application energy-absorbing barriers--popularly known as crash cushions. As you know, these come in several forms, including clusters of empty drums, plastic cylinders filled with fluid, etc.

Their purpose is to shield hazardous obstructions that cannot be removed from the roadway. Specific design objectives for these new crash-cushion concepts include (1) low maintenance, (2) a wider range of possible impact conditions than existing devices, (3) multiple impact capability, and (4) utilization of minimum space. One possible location for these smaller, more efficient energy-absorbing barriers is at unprotected bridge parapets, especially on narrow bridges. In addition, we believe that more extensive use of traffic control devices designed to guide the motorist successfully through the hazardous narrow bridge locations, represent short-range potentially high payoff solutions to some of the problems. These could include signing, signals, warning lights, etc. However, the large range of narrow bridge configurations and the lack of definitive traffic control device designs specifically applicable to these configurations has so far resulted in less than adequate utilization of traffic control devices.

Aside from the ongoing research, which hopefully will provide needed answers to gaps in our technological knowledge, we also recognize that we must aggressively and fully master the knowledge and technology now available to us.

Toward that end, FHWA has completed the preliminary stage in the development of traffic control designs which promise to be very effective measures.

If we cannot remove all hazards from the highway--and obviously in some instances we cannot--then we must provide drivers with

sufficient specific information to enable them to avoid collisions. In other words, if we cannot always physically protect the motorist from hazards, we must give him enough information so he can protect himself.

Our approach to this has been to combine the traffic engineering and the human factors engineering disciplines toward development of a traffic control system of positive guidance, specifically for restricted areas such as narrow bridges. The system centers around determining what information a driver needs and how best to transmit it.

Positive guidance refers to that information transmitted to motorists which will enable them to select the speed and path most appropriate to the operating conditions of the highway.

Motorist selection of appropriate speed and path is dependent upon the ability to detect a hazard, perceive it as a threat, identify alternative courses of action, evaluate probability of success of each alternative, select appropriate course of action, and initiate action, and, of course, to be given this information enough in advance to be able to utilize it.

In some cases, positive guidance would be as simple as providing maximum visibility of the hazard; while in others, it could be as complex as providing specific information, such as the assignment of right of way.

Power lines are often nearby at narrow bridge sites and it may be practical to consider sign illumination or general illumination of the narrow bridge as a possible solution. This again is merely a

means for preparing the motorist with information critically necessary to his safe travel.

The goal of this program is the development of new traffic control device measures which provide the motorist with sufficient information to negotiate narrow bridges successfully--and which can be implemented now.

We have solicited the assistance of the National Advisory Committee on Uniform Traffic Control Devices, and this item will be included on the agenda for the Committee's mid-year meeting in July.

As soon as we complete these consultations and our own studies to develop new and better ways to control traffic at narrow bridges, appropriate supplements to the existing standards will be published and distributed by the Federal Highway Administration. We shall also make use of our popular Handbook on Highway Safety Design and Operating Practices to publicize the successful techniques for handling traffic safely at narrow bridges. The Handbook is a well illustrated document which has been extremely helpful in disseminating useful advances in highway technology.

We are optimistic that this positive guidance system can be developed quickly and applied now to reduce the accident potential at narrow bridge locations and other roadway restrictions. I can assure you we are doing everything possible to accomplish this.

Continuing improvements in accident records systems will help to identify narrow bridges and similar locations where a real need for action exists. The selection of the proper corrective treatment will draw upon many alternatives. Certainly our Federal programs

will urge widest possible application of the latest improvements in traffic control as well as in other areas of highway and traffic engineering.

Thank you for the opportunity to present FHWA's views and plans for improving traffic conditions at narrow bridge locations. Through the elimination of the worst and most dangerous conditions by reconstruction, the protection of the motorist and other road users from remaining obstructions, and the provision of improved guidance through these hazardous areas, we can and must reduce the accident potential, as well as the actual number of tragic accidents with which we are all too familiar.