

A HIGHWAY SAFETY STANDARD FOR BICYCLE FACILITIES

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ABRIDGMENT

More than 1,100 pedal cycle deaths each year for the last 2 years have focused national attention on the growing bicycle safety problem. The Highway Safety Act of 1973 requires that bicycle safety provisions be incorporated into highway safety standards. The Federal Highway Administration is the agency responsible for developing a standard that will encourage safe operation of bicycles in the highway environment through improved traffic engineering practices and physical facilities. In many instances, no physical improvements will be needed. In others, the widening of the outside travel lane or paving of the shoulder may be required. Some situations may justify a bicycle roadway separate from high-speed motor vehicle traffic. The standard will provide guidance to appropriate officials so that safe and usable bicycle facilities will be planned and constructed where needed. Discussion among educators, enforcement officials, and engineering experts has shown that there is agreement that improving bicycle safety will require a combination of all three areas of specialization. Providing a safe facility is only a partial solution to the bicycle-motor vehicle conflict.

•THE OFFICE of Highway Safety, Federal Highway Administration, develops, publishes, and administers highway safety program standards relating to the highway environment of states and local governments. In the past, this office has been very much involved with highway safety features for the motor vehicle operator and protection of the pedestrian. However, much still remains to be done in this field.

Everyone at one time or another is a pedestrian. This cannot be said about bicycling. Although Americans now own an estimated 85,000,000 bicycles, many of them are used infrequently. Still, more than 1,100 pedal cycle deaths have been reported each year in this country for the last 2 years, and estimates for 1974 surpass that figure. A few facts must be noted, however, before methods to reduce the number of bicycle deaths can be considered.

The Consumer Product Safety Commission, which monitors hospital emergency rooms, estimated that 372,000 adults and children were treated for bicycle-associated injuries during the year ending June 30, 1973. Almost 90 percent of these injuries, though, were from accidents that did not involve a motor vehicle, for example, a child catching his or her foot in the bicycle chain or an adult going too fast around a corner and skidding on gravel. The 40,000 crashes that do involve a motor vehicle account for the overwhelming majority of all bicycle deaths.

The fact that most of the bicyclists killed or injured in accidents are under 15 years of age is also important in consideration of safety programs. These youngsters have not driven an automobile on public roads and, therefore, may not fully understand the behavioral requirements of operating a vehicle in heavy urban traffic. Because of highway hazards facing bicyclists, the Highway Safety Act of 1973 requires that bicycle safety provisions be incorporated into highway safety standards. The National Highway Traffic Safety Administration is currently working on a standard relating to education of bicyclists and the enforcement and legislative aspects of bicycle safety. Further information on the safety administration's proposed standard is available from them.

The Federal Highway Administration's responsibility centers on developing a standard for a safe highway environment in which to operate bicycles by improving traffic

engineering practices and physical facilities. Implementation of the proposed standard will become part of the states' highway safety program and may be funded with federal highway safety money. Coverage of the standard extends to each state with the cooperation of its political subdivisions, and each federal agency that controls highways open to public travel or supervises design, construction, and maintenance of these highways.

The standard will recognize that providing adequate and safe facilities for bicyclists is an integral element of planning and of the community highway transportation system. Promulgation of the new standard does not mean that every road in America will be required to have a parallel 8-ft-wide (2.4-m) paved bicycle lane. This undertaking could cost \$25,000 to \$35,000 per mile (\$16,000 to \$22,000 per km) or even more.

It will require that existing and potential bicycle use and safety needs be determined for all types of bicycle users—school children, recreational riders, and commuters. In many instances, no physical improvement will be necessary. In others, outside travel lanes may need to be widened, lanes exclusively for bicycles may be required, or facilities separate from high-speed motor vehicle traffic may be justified.

Research into locational criteria and bikeway design is under way in the Office of Research, Federal Highway Administration. The Office of Highway Safety is using the results of these studies in drafting the standard. Also, the Office of Research has recently expanded its interest and budget to look into the concept of citizen acceptance of alternative modes of transportation. The hope is to find answers to questions like the following: What are the economic and environmental trade-offs among walking, bicycling, taking a bus or train, or driving a private automobile? What incentives make people choose the mode they do? What makes a man or woman choose to ride a bicycle or walk to work? The concept of a bicycle boulevard and redesign of intersections may be a product of these efforts.

States and communities across the country are in different stages of bikeway development. Examples of good-quality separate paths are shown in Figures 1, 2, 3, and 4. Figures 5, 6, 7, and 8, however, show bike paths that are unpaved, have poor sight distance, or are unprotected. Providing bike routes on busy streets is effective only if there is strict enforcement of parking regulations. Well-marked sidewalk bike paths (Figure 9) are adequate only if they are maintained and provide necessary clearance (Figure 10). When bike routes must be placed on the street, consideration should be given to details such as grate configuration. Figure 11 shows a grate that is safe for bicycle travel.

Attempts at channelizing bicycle traffic in on-street paths often lead to conflicts between bicyclist and motorist (Figure 12). Figure 13 shows a damaged barrier where conflicts have resulted. The boxed-in bicycle lane shown in Figure 14 can be dangerous and is only necessary if street traffic travels at high speeds. Factors such as traffic volume, speed, and movement determine whether the treatments shown in Figures 15, 16, 17, and 18 are necessary or adequate. Figures 19, 20, 21, and 22 show signs and devices that have been used for the benefit of bicyclists and bike facility planners. The University of California, Davis campus, is a bicyclist's dream (Figure 23).

In regard to state legislation, Oregon has appropriated, as a minimum, 1 percent of its state highway fund to its cities and counties for nonmotorized highway use since 1971. In 1974, California issued a new section of its Highway Design Manual entitled *Bike Routes*, which was developed with the input and cooperation of many citizens of the state, including expert bicyclists.

California's positive attitude toward accommodation of bicycle traffic on state highways is illustrated by a section entitled *General Design Philosophy*. In part, it reads as follows (1):

The standards in this section provide guidance as to how the existing road system may be supplemented with facilities or measures specifically designed to enhance the safety and feasibility of bicycle travel. The standards represent an attempt at a consensus as to what is required to provide a good level of service for cyclists. Since experience and research in this area are relatively limited, the standards are based on a combination of theory, empirical analysis, and the subjective judgment of cyclists.

Figure 1. Wood-planked hiker-biker trail near Mt. Vernon, Virginia.



Figure 2. Bike trail on creek right-of-way in Denver.



Figure 3. Trail on abandoned railroad right-of-way in Tiburon, California.



Figure 4. Bicycle path separated from pedestrians on Santa Barbara campus of University of California.



Figure 5. Unpaved, poorly maintained trail in Mt. Vernon, Virginia.



Figure 6. Bikeway that crosses busy highway and that provides poor sight distance for bicyclist and motorist near Mt. Vernon, Virginia.



Figure 7. Well-marked but poorly protected bike lane in Berkeley, California.



Figure 8. Well-marked but blocked bike lane in San Francisco.



Figure 9. Sign marking sidewalk bikeway in Palo Alto, California.



Figure 10. Sidewalk bikeway with inadequate clearance.



Figure 11. Street grate that is safe for bicycling.



Figure 12. Channelized bikeway in Davis, California.



Figure 13. Channelized bikeway marked by barrier damaged through conflicts in Lafayette, California.



Figure 14. High planter boxes and curbs enclosing bike path in Sausalito, California.



Figure 15. On-street bikeway in Davis, California.



Figure 16. Exclusive bike lane on high-speed Danville Highway in California.



Figure 17. Bike lane in each direction in Denver.



Figure 18. Placement of bicycle through lane between left and right automobile turning lanes in Seattle.



Figure 19. Explicit sign warning motorists of bicycle's presence in Seattle.



Figure 20. Inductive loop detector in bicycle lane in Eugene, Oregon.



Figure 21. Push-button signal for bicyclists that activates traffic signal.



Figure 22. Bicycle signal in Europe that turns from red to green for cycle-only movement.



Figure 23. Biker's heaven in Davis, California.



It is recognized that much of the existing street and highway system is suitable for general cycling.

In planning any highway improvement, consideration should be given to the bicycle as a potential part of the traffic mix. . . .

The California manual also mentions the need for separate facilities when they will be used extensively by young children, but the adequacy of the highway shoulder for use by mature riders is discussed frequently in the publication. It cites a few facts that an inexperienced bikeway planner may sometimes overlook. One is the bike rider's urge to maintain momentum; therefore, the number of required stops should be minimized. Another is the cyclist's tendency to select the most direct route that, in his judgment, is acceptable, whether or not it is designated as a bicycle facility. This is where the importance of having the user's input surfaces.

The new federal highway safety standard and accompanying manual will address these points and other similar ones. They will provide guidance to the appropriate officials so that safe and usable bicycle facilities will be planned and instituted when needed.

CONCLUSION

Education, enforcement, and engineering experts agree that improving bicycle safety will require a combination of all their areas of specialization.

It must be realized that providing a safe facility, no matter what form it takes, is only a partial solution to the bicycle-motor vehicle conflict and resulting deaths. Further education of the motoring public regarding bicycle use and potential for conflict will be necessary as will training bicyclists to ride in a reasonable and predictable way. Both of these elements of a safety program are as important as the facility.

REFERENCE

1. Bike Routes. In Highway Design Manual, California Department of Transportation, Section 7-1000.2, M 74-44, July 1974.