

Managing Speed

Review of Current Practice for Setting and Enforcing Speed Limits

New TRB Special Report

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In 1995 Congress repealed the National Maximum Speed Limit (NMSL) of 55 mph (89 km/h), returning to the states the responsibility for setting speed limits on major highways. Since then, 49 state legislatures have taken the opportunity to raise speed limits on Interstate highways—and in some cases on other major roads—often to levels that had been in effect before the NMSL was established in 1974. In view of these changes, the National Highway Traffic Safety Administration, the Federal Highway Administration, and the Centers for Disease Control and Prevention funded a study to examine speed limit policies and practices. Special Report 254, *Managing Speed: Review of Current Practice for Setting and Enforcing Speed Limits*, provides guidance to decision makers who must determine appropriate speed limits and related enforcement strategies.

Overview of Current Practice

The current framework for speed regulation was developed in the 1920s and 1930s. Each state has a basic statute requiring drivers to operate vehicles at a speed that is reasonable and prudent for existing conditions. Speed limits are legislated by road class (e.g., Interstate highway) and geographic area (e.g., urban district). The limits generally apply to all roads of a particular class throughout a jurisdiction. However, state and most local governments have the authority to establish speed zones for highway sections on which the statutory limits do not fit specific road or traffic conditions and to set alternative maximum speed limits for those zones.

Legislated, speed limits are established by state legislatures, city councils, or Congress on the basis of judgments about appropriate trade-offs among public safety, community concerns, and travel efficiency. Those limits are based on favorable conditions—good weather, free-flowing traffic, and good visi-

bility. Drivers are expected to reduce speeds as these conditions deteriorate.

The limits in speed zones, on the other hand, are determined administratively. The most common approach is to set the limit on the basis of an engineering study. Such studies take into consideration factors that include operating speeds of free-flowing vehicles, crash experience, roadside development and roadway geometry (e.g., curvature, sight distance), and parking and pedestrian levels in making a judgment about the speed at which the limit should be set.

Regulation of Driving Speeds

The argument can be made that most motorists drive in a reasonable and prudent manner, selecting their driving speeds so as to arrive at their destinations safely. If this is so, why not leave it up to the individual driver to determine what speed is appropriate?

The primary reason for regulating individual choices is the significant risks drivers can impose on others because of inappropriate speed choices. In addition, some drivers are unable to judge correctly the capabilities of their vehicles (e.g., stopping, handling) and to anticipate roadway geometry and roadside conditions sufficiently to determine appropriate driving speeds. Some drivers also tend to underestimate or misjudge the effects of speed on crash probability and severity.

The risks imposed on others and the adequacy of information about appropriate driving speeds vary by road class. These differences are important factors for consideration in setting speed limits for different types of roads.

Speed and Safety

The risks imposed by drivers' speed choices affect both the probability and severity of crashes. Speed is directly related to the severity of injury in a crash: the probability of severe injury increases sharply with the impact speed of a vehicle in a collision, reflecting the laws of physics. Although injury to vehicle occupants can be mitigated by safety belt use and airbags, the strength of the relationship between speed and crash severity alone provides sufficient impetus for managing speed.

Speed is also linked to the probability of being in a crash, although the evidence here is not as compelling because crashes are complex events that seldom can be attributed to a single factor. Many driver characteristics and behavioral factors besides speed—including driving under the influence of alcohol or other drugs, age, attitudes toward risk,

and the experience of the driver—affect the probability of crashes. Nevertheless, speed has been shown to play an important role.

The concept of speed itself is complex. The concept can relate to the speed of a single vehicle or to the distribution of speeds in a stream of traffic. Crash involvement on Interstate highways and nonlimited-access rural roads has been associated with the differential between the speed of crash-involved vehicles and the average speed of traffic. Crash involvement has also been associated with the speed of travel, at least on certain road types. For example, single-vehicle crash involvement rates on nonlimited-access rural roads have been shown to rise with travel speed.

The primary purpose of speed limits is to enhance safety by reducing the risks imposed by drivers' speed choices; the objective is to reduce both the probability and the severity of crashes. Speed limits also have a coordinating function. Here the intent is to reduce speed differentials among drivers using the same road at the same time, thus reducing the potential for vehicle conflicts. Speed limits also provide the basis for enforcement and sanctions for those who drive at speeds that are excessive for conditions and endanger others.

Role of Enforcement and Sanctions

Managing speed through speed limits requires a system of speed laws, a process for establishing reasonable speed limits, enforcement, sanctions, and public education, ideally all working together. Enforcement is an integral part of such a system. Even if reasonable speed limits are established through legislation or engineering studies and most drivers comply within a small tolerance, enforcement is still necessary to ensure the conformity of a minority of drivers who will obey traffic regulations only if they perceive a credible threat of detection and punishment for noncompliance.

The main difficulty with the traditional approach to speed enforcement—radar enforcement using a mobile or stationary police vehicle—is its short-lived temporal and spatial effect on deterrence of speeding. Maintaining the deterrence effect requires a level of enforcement intensity and expense that has proven difficult to sustain because of competing enforcement priorities and limited resources.

Traffic court judges are important participants in effective speed enforcement. Judges may overturn speeding violations if they believe the speed limits are unreasonable or reduce fines if they believe the sanctions are too harsh. Police may

have less incentive to enforce speed limits if judges are lenient in their treatment of speeding offenses and routinely dismiss speeding citations. Thus it is important that traffic court judges as well as police and motorists perceive established speed limits as reasonable and enforceable.

Guidance on Speed Limits

The report *Managing Speed: Review of Current Practice for Setting and Enforcing Speed Limits* was prepared by the Transportation Research Board's Committee for Guidance on Setting and Enforcing Speed Limits. The primary focus of the report is on the effects of speed limit policies on safety, rather than on travel time, energy consumption, or environmental pollution. The guidance provided is summarized below.

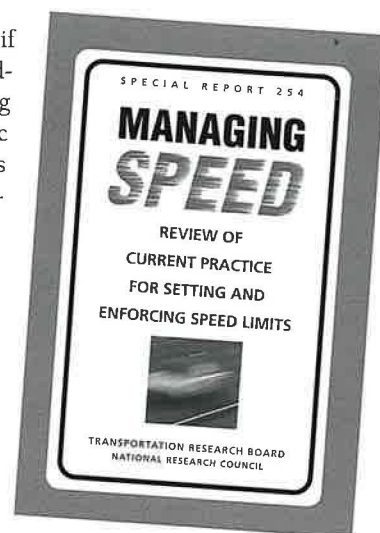
General Approach

The current general approach—legislated speed limits and administratively established speed zones—is sound. This approach balances the desirability of uniform speed limits (legislated limits for broad road classes) with the need for exceptions (speed zones) to reflect local differences. The practice of establishing speed limits to reflect a reasonable balance between travel speed and risk under favorable operating conditions is also sensible.

Determining Appropriate Limits

Decisions about legislated speed limits reflect trade-offs and judgments about the relative importance of safety, travel time, and feasibility of enforcement. Legislators should consult with traffic engineers, law enforcement officials, judges, public health officials, and the general public in their deliberations. In addition to safety, final selection of a speed limit should meet the requirements of enforceability and acceptance by the community at large. Provision should be made to monitor driving speeds and crash experience, and the established limit should be reviewed periodically because road conditions, vehicle safety features, driving attitudes, and behavior change over time.

Appropriate speed limits in speed zones should be determined on the basis of an engineering study. Traffic engineers normally conduct such a study. Consultation with law enforcement officials should be standard practice, and elected officials and citizens groups may also become involved if community concerns about driving speeds have been raised. Speed zones should be reviewed periodically—with greater frequency where conditions are changing



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rapidly, such as in developing suburban areas—to determine whether a change in speed limits or the boundaries of the speed zone is warranted.

Methods of Setting Speed Limits

Legislated Limits

The strong link between speed and crash severity supports the need for setting maximum limits on high-speed roads (e.g., Interstate highways, freeways, high-speed rural multi- or two-lane roads). The committee refrained from recommending a specific numerical limit, however. Road conditions vary too widely to justify a “one-size-fits-all” approach. Roads, even those in the same class, are not all built to the same design standards, nor are traffic volumes uniform.

In determining appropriate speed limits for each road type, decision makers should take into account both the likely risks imposed on others by the speed choices of individual drivers and the availability of information on which drivers can base appropriate speed choices. As noted above, enforcement practicality should also be considered. Moreover, decision makers should request technical information on the following four factors to help guide their determination of appropriate legislated speed limits for a specific road class:

- ◆ Design speed, that is, the design speed of a major portion of the road, not of its most critical design features (e.g., a sharp curve).
- ◆ Vehicle operating speed, measured as a range of 85th-percentile speeds taken from spot-speed surveys of free-flowing vehicles at representative locations along the highway.
- ◆ Safety experience, that is, crash frequencies and outcomes.
- ◆ Enforcement experience, that is, existing speed tolerance (defined as allowance for driving above the posted speed limit) and level of enforcement.

The weight given to these factors, particularly those related to speed, depends on the type of road. For example, vehicle operating speeds, determined from data gathered in spot surveys of free-flowing traffic, are often a major factor in setting speed limits on rural Interstate highways. Drivers typically can anticipate appropriate driving speeds because these highways are usually built to the highest design standards, access is limited, and roadside activity is minimal. The risks imposed on other road users are apt to be small where traffic is uncongested, and pedestrians and bicyclists are not present. Additionally, maintaining high levels of enforcement is difficult on long stretches of rural Interstate highways.

On urban residential streets, driver misjudg-

ment about appropriate speeds poses high risks to vulnerable road users. On the other hand, when neighborhood pressures result in setting very low speed limits, often those limits are not strictly enforced and compliance is poor, even by some neighborhood residents. On residential streets where low speeds are desirable but strict enforcement is impractical, alternatives such as traffic calming measures (e.g., speed humps, raised intersections) should be considered.

Limits in Speed Zones

In many speed zones, it is common practice to establish the limit near the 85th-percentile speed, that is, the speed at or below which 85 percent of drivers travel in free-flow conditions at representative locations on the street or roadway section. This approach can be desirable on some roads, enabling police to focus their enforcement efforts on the most dangerous speed outliers. Moreover, the speeds thus established are generally at the upper bound of a range at which crash involvement rates are lowest—at least on certain road types, according to some studies that have examined the relationship between speed and crash probability.

On the other hand, setting the limit primarily on the basis of the 85th-percentile speed is not appropriate for all roads. This approach is inappropriate, for example, for urban roads with a mix of road users and with high traffic volumes and levels of roadside development. In such cases, traffic engineers should consider an expert-system approach (elaborated in the report), which offers a systematic and consistent method for determining the limits in speed zones on such roads.

Differential Limits

No conclusive evidence could be found to support or reject the use of differential speed limits for passenger cars and heavy trucks or for daytime and nighttime. More research and evaluation of the effects of differential limits on driving speeds and safety outcomes is needed.

Variable Limits

Technology is available to support speed limits that change with conditions. More experimentation and evaluation are needed, however, to determine the effectiveness of this technology from the perspectives of safety and traffic efficiency and to identify where variable speed limits can be applied most usefully. Once the effectiveness of variable speed limits has been established more clearly, their broader application should be considered on urban Interstate highways, where variable limits

are well suited to addressing temporal changes in traffic volumes, speed, and density.

Enforcement and Other Speed Management Strategies

Policymakers can affect the level of enforcement of speed limits through resource allocation, but they must recognize that if drivers believe a limit is unreasonable, enforcement will be difficult and expensive. In the near term, speed limits should be set at levels that are largely self-enforcing or at the lowest speed the police are able to enforce. Strategic deployment of traditional enforcement methods where and when speed-related incidents are most common or where road conditions are most hazardous can help focus resources on potential problems. The relative infrequency of crashes, however, can make it difficult to show systematic safety improvements due to targeted enforcement strategies.

Police can improve compliance by combining enforcement initiatives with high-profile public information campaigns. Publicity must be followed up by enforcement, however, if the approach is to be successful in deterring speeding.

Automated enforcement, particularly photo radar, can be used to complement traditional enforcement methods, but photo radar is controversial. Its successful introduction requires adoption of legal changes (e.g., resolution of constitutional privacy issues and vehicle owner versus driver liability) and the provision of both funding and public education. The technology should be deployed selectively at first—at locations that are hazardous and difficult to patrol with traditional methods and where speeding is a problem—to ensure essential public support.

It is also important to note that speed limits alone will not be effective in all situations. Keeping driving speeds at desired levels in urban areas poses a particular challenge. As noted above, traffic calming can be used judiciously on residential

streets, but requires community as well as resident support to be successful. Systemwide effects must also be considered so that the traffic and safety problems of one area will not simply migrate to other streets. The approach of redesigning roads to achieve greater congruity between driver perceptions of appropriate travel speeds and cues provided by the road itself (e.g., narrowing lanes) holds promise. Because of the size of the U.S. road network, however, road redesign is a long-term strategy, and more understanding of the overall safety benefits of alternative designs is needed.

Concluding Comments

Most states chose to raise speed limits on major highways following repeal of the NMSL. The committee urges that the effects of those decisions on driving speeds and on safety outcomes in particular be closely monitored. Efforts to mitigate any adverse safety effects through enforcement should be redoubled, and initiatives to promote safety belt use and reduce the incidence of driving while intoxicated—measures with large and proven safety benefits—should be continued. In the future, technological advances may offer additional methods for the control of driving speeds on all types of roads. The issue of appropriate driving speeds, however, will persist as long as there are individual drivers making choices about risk and time efficiency. Ultimately, decisions about appropriate speed limits depend on judgments about society's tolerance for risk, valuation of time, and willingness to police itself. These judgments, in turn, should be reviewed periodically in the light of changes in vehicles and highway conditions, as well as shifts in public perceptions of safety and attitudes toward risk.

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