



U.S. Department
of Transportation
**Federal Highway
Administration**

Memorandum

Subject: **INFORMATION:** Relationship between
Design Speed and Posted Speed

Date: October 7, 2015

In Reply Refer To:
HIPA-20

From: 
Thomas D. Everett
Director, Office of Program Administration

To: Director of Field Services
Division Administrators
Director of Technical Services
Federal Lands Highway Division Engineers

This memorandum is intended to clarify the Federal Highway Administration's position on the relationship between design speed and posted speed in response to several questions we have received. Selection of a posted speed is an operational decision for which the owner and operator of the facility is responsible. Anticipated operating and posted speeds should be considered in the selection of the design speed, but there is no regulation establishing a more direct relationship.

Background

A Federal Highway Administration (FHWA) memorandum dated April 15, 1985, from E. Dean Carlson established the thirteen controlling criteria for design, and included the following statement: "Design speed is to be selected to equal or exceed the posted or regulatory speed limit of the completed facility." Subsequent memoranda sought to clarify this statement and recognized that the selection of a posted speed is an operational decision for which the State highway agency is responsible. As noted by Joseph S. Toole in the foreword to FHWA's *Speed Concepts Informational Guide* (2009)¹, "designers of highways use a designated design speed to establish design features; operators set speed limits deemed safe for the particular type of road; but drivers select their speed based on their individual perception of safety. Quite frequently, these speed measures are not compatible and their values relative to each other can vary." This informational guide described the concept of "inferred design speed" and defined that term as the maximum speed for which all critical design-speed-related criteria are met at a particular location. In other words, for a given set of roadway characteristics, one is able to infer the design speed met by that roadway section.

¹ http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwas10001/

In 2001, the American Association of State Highway and Transportation Officials revised the definition of design speed in the Green Book, removing the language suggesting that design speed was related to the maximum safe speed that could be traveled on a roadway. Since 2001, the Green Book has defined design speed as the following: “Design speed is a selected speed used to determine the various geometric design features of the roadway.” The Green Book guidance on designating design speed does not address posted speed limits. The Green Book recommends that topography, anticipated operating speed, adjacent land use, and functional classification be considered. The ability to accurately predict speeds on all road and street types does not exist. Similarly, there is no reliable guidance on how to attain specific operating speed characteristics (e.g., mean, 85th percentile, speed deviation) and speed relationships (e.g., between 85th percentile and design speeds) during the geometric design process. Anticipated operating and posted speeds should be considered in the selection of the design speed, but there is no regulation establishing a more direct relationship.

The results of a 2003 National Cooperative Highway Research Program (NCHRP) project examining the relationship between design speed, posted speed, and operating speed concluded in NCHRP Report 504 that “while a relationship between operating speed and posted speed limit can be defined, a relationship of design speed to either operating speed or posted speed cannot be defined with the same level of confidence.” The research also found that design speed appears to have minimal impact on operating speeds unless a tight horizontal radius or a vertical curve with a low K-value is present. Large variance in operating speed was found for a given inferred design speed on rural two-lane highways. It also concluded that when posted speed exceeds design speed, liability concerns may arise even though drivers can safely exceed the design speed.

Current Guidance

Posted speeds should be established based on statutory limits unless an engineering study has been performed in accordance with established traffic engineering practices.² There are many resources available to assist State and local highway agencies in determining appropriate speed limits. The FHWA has developed USLIMITS2³, a web-based tool applicable to all types of roads ranging from rural local roads and residential streets to urban freeways. Variable speed limits may be appropriate in some locations, allowing for adjustments to be made under changing weather or traffic conditions. In the rural environment, the Design Consistency Module of the Interactive Highway Safety Design Model⁴ can be used to estimate the 85th percentile speeds on a given alignment, allowing the designer to look for deviations between design and likely operating speeds, and make adjustments to improve the safety and operation of the facility. In urban areas, the design of the street should generally be such that it limits the maximum speed at which drivers can operate comfortably, as needed to balance the needs of all users. For additional information regarding setting speed limits, including variable speed limits, and advisory speeds, please visit http://safety.fhwa.dot.gov/speedmgmt/ref_mats/.

² Manual on Uniform Traffic Control Devices, Section 2B.13

³ <http://safety.fhwa.dot.gov/uslimits/>

⁴ <http://www.fhwa.dot.gov/research/tfhrc/projects/safety/comprehensive/ihsdm/dcmweb.cfm>

Selection of a posted speed is an operational decision for which the owner and operator of the facility is responsible. Inferred design speeds less than the posted speed limit do not necessarily present an unsafe operating condition. If a State legislature or highway agency establishes a speed limit greater than a roadway's inferred design speed, FHWA recommends that a safety analysis be performed to determine the need for appropriate warning or informational signs such as advisory speeds on curves or other mitigation measures prior to posting the speed limit.

Should you have any questions, please contact Michael Matzke at (202) 366-4658 or Elizabeth Hilton at (512) 536-5970.