



# Establishing Realistic Speed Limits

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**T**his publication updates the Setting Realistic Speed Limits booklet which was originally produced in the 1970s.

Technical references used to produce this booklet include:

- Transportation and Traffic Engineering Handbook
- Michigan Manual of Uniform Traffic Control Devices
- Michigan State Police Standards for Traffic Engineering Investigations
- Uniform Vehicle Code, National Committee on Uniform Laws and Ordinances
- “Speed Zoning on Texas Highways,” Texas Department of Highway and Public Transportation

# Introduction

The purpose of a speed limit is to provide for the safety of all highway users. To meet this purpose a speed limit must be acceptable to the public and be enforceable by police. This booklet provides background information regarding how this purpose is met through establishing realistic speed limits.

From a historical perspective, the imposition of speed limits became necessary because of changing times and conditions. In the early days of the automobile, the difference between rural and urban areas was well defined. Thus, it was simple to set speed limits—one for the open countryside and one for population centers.

With the spread of urbanization and the development of suburban communities, the situation changed. The differences between rural and urban areas became less clearly defined. During this same period, the number of motor vehicles and their speeds increased as did the number of miles traveled. A need developed for modified speed limits in these transitions between rural and urban areas.



# Types of Speed Limits

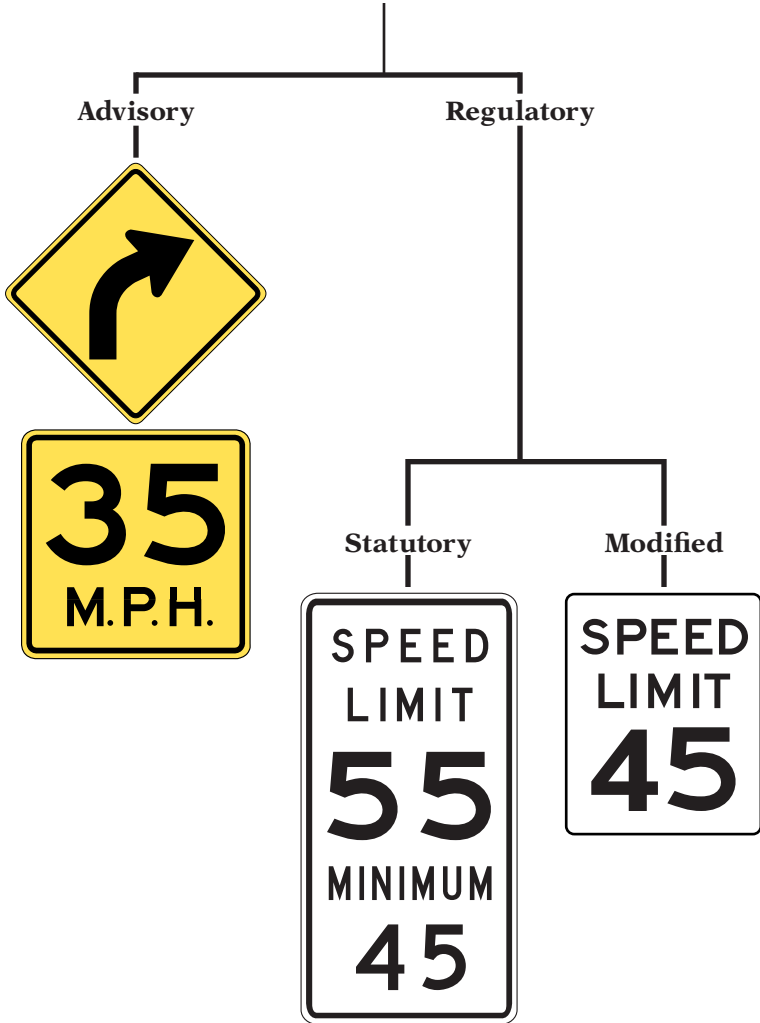
The basis of all speed limits predicated upon the nationally accepted principle that the majority of drivers are cautious, prudent and drive at speeds that are reasonable and proper, regardless of the posted speed limit. This “reasonable and proper” theme is part of the Basic Speed Law as set forth in the Michigan Vehicle Code. In part it reads:

*“A person driving a vehicle on a highway shall drive at a careful and prudent speed not greater than nor less than is reasonable and proper, having due regard to the traffic, surface, and width of the highway and of any other condition then existing. A person shall not drive a vehicle upon a highway at a speed greater than that which will permit a stop within the assured, clear distance ahead.” [Sec. 257.627]*

In other words, motorists must always drive at a speed which allows them to stop safely. The Basic Speed Law governs the speed of all drivers regardless of any posted speed limits. This is an important point because there are several types of speed limits.

The following chart shows the types of speed limits in use in Michigan:

Basic Speed Law



**Advisory** speed limits are recommended safe driving speeds to alert drivers of the maximum recommended speed through a curve or for other special roadway conditions. They are posted only in combination with an appropriate warning sign. *Advisory* speeds are not enforceable in Michigan courts except under the *Basic Speed Law* provisions.

**Regulatory** speed limits are enforceable and are categorized as either statutory or modified.

**Statutory** speed limits are set either as maximum/minimum speed limits or a *prima facie* restrictions. *Prima facie* is Latin for “on the face of it” and is the speed limit under most conditions. These limits are established by the legislature and apply throughout the State. An example of maximum/minimum speed limits is freeway limits. There are also maximum speed limits set for school buses, heavy trucks and other special vehicles. *Prima facie* restrictions are primarily for residential and business districts and city and village streets and highways.

**Modified** speed limits are utilized in areas requiring speed limits between the statutory maximum speed limits on state and country roadways and the 25 mph *prima facie* speed limits in business and residential areas. These *modified* speed limits are established by administrative action based upon a traffic engineering study. They can only be set by agencies having legal authority and jurisdiction over the respective roadway. These *modified* speed limits are often referred to as absolute speed limits and are not to be exceeded regardless of conditions.

The remainder of this booklet describes how modified speed limits are established and the responsibilities we all share in their implementation.

# Authority to Establish Speed Limits

The Michigan Department of Transportation and county road commissions working with the Michigan Department of State Police, are authorized to establish modified speed limits. Representatives from these agencies comprise a traffic survey team which consists of an engineer and a state police officer. They conduct studies and recommend speed limits on state and county roadways including those within cities and villages.



The speed limits on streets under the jurisdiction of cities and villages are determined solely by the local authorities.

The establishment or review of speed zones originates for a variety of reasons. These may be road construction, changes in land use, violations, crashes, or poor compliance with an established speed limit. A study may also be conducted following a spectacular traffic crash or through periodic reviews. Usually, speed zones are reviewed as a result of concerns expressed by interested citizens who live nearby or drive along the roads in question. Their concerns are referred to the traffic survey team for review.

Occasionally citizens or public officials under citizen pressure, request that a particular speed limit be imposed or that some other type of corrective action be taken. For example, the idea persists that simply posting lower speed limits in the community will reduce speeds and improve safety. Any decisions regarding speed limits must be based on facts and an objective analysis of the characteristics of the roadway.

Once a study begins, the person requesting the survey may be contacted for further input or clarification of the problem. If a group of persons is involved, the traffic survey team may conduct a public meeting to explain why a study is necessary, what types of data will be collected and how the speed limit evaluation will be conducted. The meeting also provides an opportunity for public comment on proposed speed study locations, crash experience and other factors which may have a significant impact on the evaluation. The traffic survey team also requests input and participation of local representatives in the process.

The traffic survey team then gathers all the information needed to analyze the roadway conditions. This includes: speed studies, traffic crash data, the driving environment, and other pertinent information.



# Speed Limit Survey

**B**efore discussing the gathering and analysis of the speed study data, there are some facts about driver behavior which are the basis of all traffic laws, including modified speed limits.

Driver behavior is an extension of societal attitudes. Most drivers respond to traffic regulations in a safe and reasonable manner as demonstrated by their consistently favorable driving records. Traffic laws which reflect the behavior of the majority of motorists are usually respected and obeyed. In order for any traffic law to be enforceable, voluntary compliance must be practiced by the vast majority of drivers so violators can be easily identified. Realistic speed limits reflect this fact and recognize that unreasonable restrictions encourage widespread violations and disrespect for the entire traffic control system. Arbitrary laws unnecessarily restrict drivers, encourage violations and lack public support.

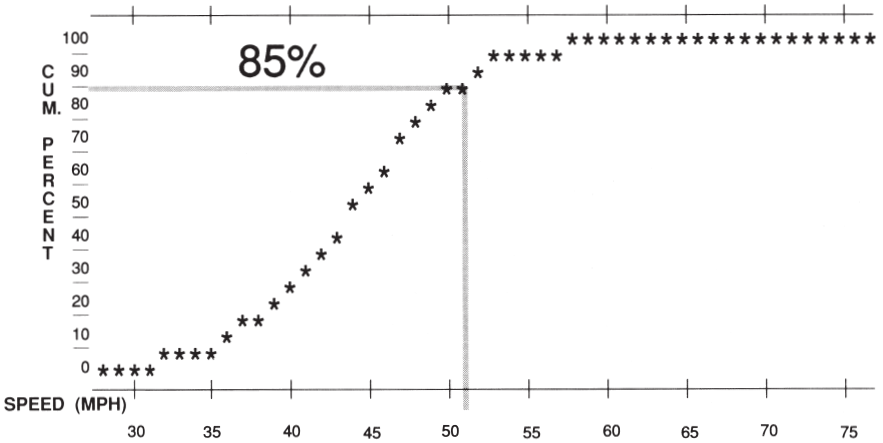
Posting unrealistically low speed limits may create a false sense of security. Actually, studies show that the driving environment, not the posted speed limit, is the main influence on motorists' speeds.

## ***Speed Studies***

Speed studies are taken during light to medium traffic conditions on a weekday. Rush hours and adverse weather conditions are avoided because they do not represent normal, free-flow traffic. Areas such as intersections, railroad tracks, or other

# Speed Distribution Graph

Figure 1



DIRECTION(S) . . . . . E-W  
 DATE . . . . . 01/10/91  
 TIME . . . . . 1:30 PM  
 POSTED SPEED LIMIT . . . . . 45

50TH PERCENTILE SPEED . . . . . 45  
 85TH PERCENTILE SPEED . . . . . 51  
 10 MPH PACE SPEED . . . . . 40 through 49  
 PERCENT IN PACE SPEED . . . . . 63.3  
 PERCENT OVER PACE SPEED . . . . . 18.8  
 PERCENT UNDER PACE SPEED . . . . . 17.9  
 RANGE OF SPEEDS . . . . . 28 to 61  
 VEHICLES OBSERVED . . . . . 218  
 AVERAGE SPEED . . . . . 44.6

SPEED	NO.	PCT.	CUM. PCT.
30	2	0.9	1.4
31	1	0.5	1.8
32	2	0.9	2.8
33	4	1.8	4.6
34	3	1.4	6.0
35	2	0.9	6.9
36	6	2.8	9.6
37	7	3.2	12.8
38	4	1.8	14.7
39	7	3.2	17.9
40	12	5.5	23.4
41	12	5.5	28.9
42	10	4.6	33.5
43	17	7.8	41.3
44	15	6.9	48.2
45	15	6.9	55.0
46	14	6.4	61.5
47	18	8.3	69.7
48	16	7.3	77.1
49	9	4.1	81.2
50	8	3.7	84.9
51	5	2.3	87.2
52	9	4.1	91.3
53	4	1.8	93.1
54	3	1.4	94.5
55	3	1.4	95.9
56	2	0.9	96.5
57	1	0.5	97.2
58	2	0.9	98.2
59	0	0.0	98.2
60	2	0.9	99.1
61	2	0.9	100.0

factors that will influence speed are avoided. Since modified speed limits are the maximum allowable speeds, the conditions under which speed studies are taken must be close to ideal.

The primary basis for establishing a proper, realistic speed limit is the nationally recognized method of using the 85th percentile speed. This is the speed at or below which 85% of the traffic moves. For example, if 85 of each 100 motor vehicles were recorded at 45 mph or under, then 45 mph is the 85th percentile speed.

Historically, before and after traffic engineering studies have shown that changing the posted speed limit does not significantly affect the 85th percentile speed. The driving environment, which includes other traffic on the road and roadway conditions, is the primary factor which influences the prevailing speed.

The driving environment is reflected by the 85th percentile speed. The majority of drivers, consciously or unconsciously, consider the factors in the driving environment and travel at a speed that is safe and comfortable regardless of the posted speed limit.

The speed data are collected by recording the speeds of free flowing motor vehicles using a radar or other speed measuring device. A representative sample of vehicular speeds is recorded and these speeds would include local residents who drive through the zone.

Use of the 85th percentile speed acknowledges that 15% of the drivers are traveling above a speed that is reasonable and proper. This is the 15% of motorists at which enforcement action is directed. Studies have shown that this is the group of motorists that cause many of the crashes and have the worst driving records.

There are other parameters used to evaluate speed data, such as the average, median and pace speeds. However, the 85th percentile speed is the most critical criterion in establishing realistic speed limits.

## ***Traffic Crash Data***

Contrary to popular belief, lower speed limits do not necessarily improve safety. The more uniform the speeds of vehicles in a traffic stream, the less chance there is for conflict and crashes. Posting speed limits lower or higher than what the majority of drivers are traveling produces two distinct groups of drivers: those attempting to observe the speed limit and those driving at a speed they feel is reasonable and prudent. These differences in speeds can result in increased crashes due to tailgating, improper passing, reckless driving, and weaving from lane to lane. However, the number of traffic crashes along any highway is related to numerous factors.

Regardless of the roadway involved, there is a statistical number of crashes that can be expected to occur no matter how safe a roadway is made. The traffic survey team determines if the number of crashes is unusually high by analyzing the crash rate for the section of roadway under study. A crash

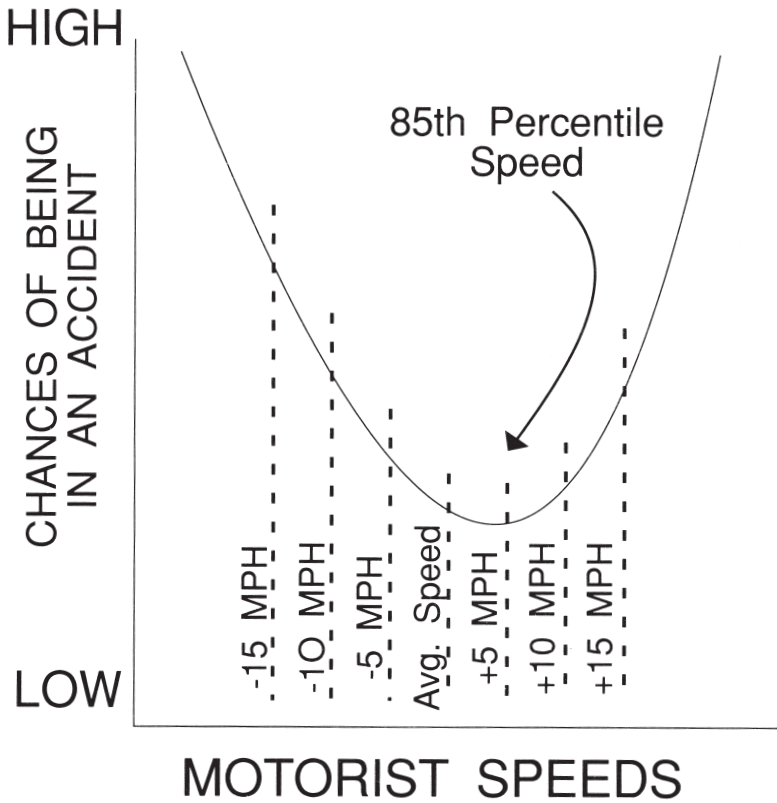


rate is based on the number of crashes and amount of traffic for a given segment of roadway. The traffic crash pattern is then taken into consideration when determining the speed limit.

Investigations of crashes reveal that in the majority of cases there was a clear violation of a traffic law or rule of good driving. A review of crash experience is an important component of any analysis of speed limits. Proper analysis and evaluation of these factors require the experience and expertise of the traffic survey team.

Studies have been conducted over the years to relate crashes to speed. Based on these studies and as illustrated in the graph, the lowest risk of being involved in a crash occurs at approximately the 85th percentile speed.

## Accident Involvement vs. Motorist Speeds



Source: "Speed Zoning on Texas Highways" State Department of Highways and Public Transportation, Austin, Texas, October 1990

Figure 2

## ***Driving Environment***

The design, physical condition, and use of a roadway has a profound effect on vehicle speeds because motorists vary their speeds depending on the driving environment. The traffic survey team considers significant items in the driving environment which are all reflected in the 85th percentile speed. For example these may include: traffic volumes, roadside development, roadway and shoulder widths, condition of the roadway, and the number of lanes, intersections, driveways, hills, curves, sidewalks, schools, parks, and any other factors recorded by the team.

The traffic survey team makes a personal inspection of the roadway to verify the accuracy of their data. They drive the roadway to determine if there are any hazards not readily apparent to the motoring public. Sometimes consideration is given to reduce a speed limit due to a certain condition. If a hazardous condition is found, an attempt should be made to



correct it. If it cannot be corrected, consideration should be given to posting an advisory speed control sign or, if several conditions are present, then the speed limit may be reduced. Of particular concern are hills and curves where vision is restricted. On long stretches of roadway, one or two hills or curves should not dictate the speed for the entire roadway. Motorists are warned of the reduced sight distance through the use of warning signs with advisory speed controls.

The number of changes in the speed limit along a given route should be minimized. With this in mind, the length of the speed zone should be a least one-half mile. Survey team members base their recommendation on the conditions that exist at the time of their evaluation and should not attempt to consider such things as future growth, anticipated enforcement, or concerns for something that hasn't happened.

Realistic speed limits provide for a uniform and orderly movement of traffic. There is a need for uniformity on all roadways especially where they carry large volumes of traffic through various roadside conditions or numerous adjoining communities.



## **Recommendation**

Once all the data have been collected and reviewed by the traffic survey team, the facts are analyzed and a recommendation is made. When the survey members agree that a modified speed zone should be established, their proposal is communicated to the requestor as well as any local units of government. If requested, a public presentation of their findings may be conducted. While local concurrence is desirable, it is not required by law. If the traffic survey team agrees that a modified speed limit is not justified, or if they cannot agree on a recommendation, the survey is concluded with no change in the existing speed limit.

The traffic survey team then submits a written report of their findings and recommendations to their respective agencies. When a modified speed limit is recommended, a Traffic Control Order is submitted to the respective road agency and the Director of the Michigan Department of State Police for their approval and signatures.

## **Posting Speed Limit Signs**

The modified speed limit becomes effective when the Traffic Control Order has been signed by both agencies, a copy of the order has been filed with the County Clerk and the signs have been installed. The *Michigan Manual of Uniform Traffic Control Devices* sets forth standards for installing speed limit signs and specifies the size, shape, color and location of the signs.

Signs should be installed at the start of a zone, beyond major intersections and at approximately one-half mile intervals. The speed limit is established in increments of 5 mph, as close as possible to the 85th percentile speed. “REDUCED SPEED AHEAD” signs may be posted to advise motorists of speed limit reductions. These signs are not normally required in urban areas where speeds are relatively low.

Generally the entire speed survey process from request to signs being posted takes anywhere from 3 to 9 months, depending on the complexity of the situation.



## Summary

**R**ealistic speed limits are important for safe highways. A few points to remember about realistic speed limits are that they:

- Represent maximum speeds under ideal conditions and when conditions change, drivers must accordingly reduce their speed;
- Reinforce the credibility and acceptance of all traffic control devices;
- Provide smooth, orderly flow of traffic, a major factor in preventing highway crashes;
- Offer an effective traffic enforcement tool for police by clearly separating the flagrant violator from the majority of drivers; and
- Are based on the 85th percentile speed which is the *most critical* criterion in establishing realistic speed limits.

Realistic speed limits provide for a uniform and orderly movement of traffic. Some of our roadways carry large volumes of traffic through various roadside conditions and through numerous adjoining communities. It is important to encourage smooth traffic flow, not only for safety, but for the convenience and economy of every motorist.

Speed limits are based upon driving speeds—yours, your neighbors, and a percentage of everyone traveling on a roadway. You have shown that you are concerned about speed limits just by taking the time to read this booklet. Please obey the speed limit, not only on your street but on all street and highways of our state.



The Office of Highway Safety Planning wishes to express thanks to the Traffic Engineering Enforcement Committee.



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