OFFICE OF MAINTENANCE

ESTABLISHMENT OF SPEED ZONES

ON

PRIMARY HIGHWAYS

Introduction

Establishment of speed limits on highways and streets in Iowa is often a misunderstood process resulting in considerable disagreement between involved parties on limits that ought to be posted. In dealing with a wide variety of individuals on this subject, it is apparent that many are of the view that speed limits can be set by subjective opinions supported with little or no factual data. To the contrary, establishment of speed limits should be done on the basis of a traffic engineering study in accordance with principles and procedures that have been developed and proven through research and practice over many years. The purpose of this paper is to provide some insight into the methods used by the Iowa Department of Transportation in setting speed limits on the Primary Highway System.

Code Provisions

Requirements and authority for establishment of speed limits are contained in Section 321.285 of the Code of Iowa. In the absence of specific speed studies, statutory speed limits are provided which can be posted for various types of areas or districts. These Code provisions are as follows.

> "The following shall be the lawful speed except as hereinbefore or hereinafter modified, and any speed in excess thereof shall be unlawful.

1. 20 MPH in any business district.
2. 25 MPH in any residence or school district.
3. 45 MPH in any suburban district.
4. 55 MPH in any rural district."

Definitions of business district, residence district, school district and suburban district are given in Section 321.1 of the Code.

Authority for the Department of Transportation to alter statutory speed limits is given in Section 321.290 of the Code. It is entitled "Speed Restrictions" and reads as follows.

> "Whenever the Department shall determine on the basis of an engineering and traffic investigation that any speed limit hereinbefore set forth is greater or less than is reasonable or safe under the conditions found to exist at any intersection or other place or upon any part of the Primary Road System or upon any part of a Primary Road Extension, said Department shall determine and declare a reasonable and safe speed limit thereat which shall be effective when appropriate signs giving notice thereof are erected at such intersection or other place or part of the highway."

The majority of speed limits set on Primary Highway Extensions within the corporate limits of cities are not statutory, but are altered speed limits established by an engineering and traffic investigation as provided for in the latter section of the Code. The remainder of this paper will be devoted to explaining the rationale and procedures which are followed in making speed studies and recommendations.

General Principles

Many years of experience by traffic engineers working with speed zoning theories have provided several basic principles which are known to be true. They are as follows.

1. The majority of drivers will drive at a reasonable and safe speed.
2. Drivers will pay little attention to the posted limits and will operate by conditions they observe rather than by their speedometer.
3. Many of the present posted limits are ineffective because they are unreasonable and their removal would have virtually no effect on traffic.
4. The raising or lowering of speed limits does not in itself generate higher or lower speeds proportional to the posting.
5. Studies indicate that accidents do not increase with an increase in the speed limit to a reasonable speed.

Particular attention is directed to Principle 4. Generally, laymen believe that lowering the posted speed limit will result in an equivalent reduction in vehicular operating speeds. Countless studies have proven this belief to be false. In some cases, raising an abnormally low speed limit will consolidate the speed pattern and as a rule will result in better uniformity of traffic flow.

Establishment of reasonably proper speed limits can result in a number of important benefits. They are as follows.

1. Proper speed limits aid law enforcement by enabling the enforcement activities to be directed to the small portion of

unsafe drivers without persecuting the normal law abiding motorist.

2. Proper speed limits can reduce the top speed through an area.
3. Proper speed limits tend to bring a larger percentage of traffic within the "pace", which gives a more uniform speed pattern, and thus increases safety as many accidents may be attributed to speed differentials between vehicles.
4. Proper speed limits can inform the motorist of the actual speeds traveled in the area rather than misleading them as lower speed limits would when the majority of speeds are actually faster.
5. Speed zones with realistic speed limits are appealing to the motorist because they look upon them as a guide to the proper, safe speed, taking away uncertainty of mind and reducing driver tension.

For speed limits to be effective, they must be reasonable so that the majority of drivers will observe them. Periodic reevaluation of speed limits is necessary to keep up with changes in the factors which affect safe vehicle speeds. Since speed control is such an important element in traffic movements and regulations, speed zoning should always be done on the basis of a traffic engineering survey. It should improve traffic operations, encourage better and more uniform driving practices and increase safety of traffic movements. It should never be applied merely for restrictive purposes.

Speed Zoning Methodology

When an investigation discloses that a speed zone differing from statutory limits should be established, the following procedure is used in making an engineering study. Data is collected by on site observations, an

analysis is made and recommendations are prepared. Three commonly used factors generated from field data are as follows.

1. The 85th percentile speed

   This is defined as the speed at or below which 85% of the vehicles are traveling. Stated another way, 15% of the vehicles travel at a speed in excess of the 85th percentile speed. This factor is almost universally used by traffic engineers as a primary basis for selecting speed limits.

2. Limits of the Pace

   The pace is defined as the 10 MPH range in which more vehicles are traveling than any other like range of speed. Uniformity of speed is desirable for safety reasons and for smooth traffic flow. When speed differentials increase, there is more likelihood of accidents occurring. Establishment of the posted speed near the upper limit of the pace results in the most desirable concentration of traffic flow speeds.

3. Average Test Runs

   In making any speed limit recommendation, test runs are always made to verify prevailing speeds, examine physical characteristics of the road or street, evaluate the nature and extent of roadside development influencing speed and establish preliminary judgements on where speed limit changes should occur.

In addition to these three basic factors, other elements available in refining a speed limit study include street classification, number of access points per unit of length (block or mile), curves per unit of length, number and width of lanes, median type and width, shoulder type and width, pedestrian

activity including age, volume and availability of sidewalks, parking activity and accidents. Adjustments are made to the speed limits resulting from the three basic factors in accordance with tables available for each of the above modifiers. This can result in either an increase or decrease in the recommended speed limit.

Both the 85th percentile speed and the pace are determined from radar data taken on the street or highway under study. Observation points are selected which provide data at key locations within the study area. Normally, this is at 2-4 block intervals in built up urban areas and at greater intervals in suburban areas. If local authorities are enforcing speeds, data collection is suspended. The radar unit and operator are concealed if possible in order to obtain an unbiased sample. If detected for any reason, data collection is temporarily suspended or ceased. Observations from a calibrated radar unit are recorded on free flow vehicles only. Traffic flow which is impeded for one of several reasons is not included in the record. A minimum of 200 observations or 4 hours of data collection, whichever comes first, are taken at each site. Each observation, which is accurate to the nearest 1-2 MPH, is recorded on a tally sheet. This raw data is then forwarded to the Central Office for reduction and analysis.

A computer program is used to convert the field radar data into factors needed for establishment of speed limits. The program output contains the 85th percentile speed, the median or average speed, and cumulative percentages exceeding given speeds over the entire range of observations. The latter is used to determine the 10 MPH pace.

Using the above data along with field observations from average test runs, the staff prepares recommendations on the numerical values of posted speed limits and the points along the street or highway where the speed limit

is to change. Normally, zones are at least 800 ft. in length and adjustments upward or downward in recommended speed limits are made in 5 MPH or greater increments.

Review and Implementation

Recommended speed limits along with supporting data are transmitted to the District Office for review with City Officials. An attempt is made to explain the basis and procedures used in arriving at the recommendations being proposed. Differences of opinion are discussed in an effort to reach an agreement on speed limits. Since the procedure is not an exact science, there is some room for compromise and adjustment within good engineering judgement and practice. Unreasonable demands for speed limits substantially different than those recommended defeat the purpose of making an engineering study and violate the concepts and rules mentioned earlier in this paper. If City Officials agree with the original recommendation or acceptable alternatives, new speed limits are formally established by Commission Order. Subject to the Commission Order, the City Council normally passes an Ordinance which makes the speed limits locally enforceable. Signs are posted defining the limits of each zone to complete the process.

Summary

In summary, the Department of Transportation speed zoning process is conducted in accordance with the Code of Iowa. Principles and procedures which have been validated by research and practice are used. Speed zoning recommendations are based on factual data collected for the street or highway under study. Trained and experienced personnel are used in evaluation of the data and development of recommendations. Efforts are made to establish proper speed limits which will provide a reasonable degree of safety for both

residents and motorists and at the same time be respected and observed by the majority of the traveling public.