CITY OF MADISON
TRAFFIC ENGINEERING

SCHOOL CROSSING PROTECTION CRITERIA

AUGUST 1990

Adopted as Policy on August 31, 1976, by Common Council by Amended Resolution #29,540
Amended on September 14, 1976, by Resolution #29,569
Amended on September 28, 1976, by Resolution #29,650
Amended on June 30, 1981, by Resolution #37,137
Amended on July 10, 1990, by Resolution #46,920

By
Traffic Engineering Division
Department of Public Works and Transportation
City of Madison, Wisconsin

INTRODUCTION

Concern is often expressed regarding the safety of children walking to and from school. During their early years, children are in the process of learning how to safely travel to and from school. Madison over the years has utilized several safety "tools" to help protect school-age pedestrians. School and school crossing locations are identified by uniform street signing and marking at strategic locations, and adult crossing guards have for several decades been used at crosswalks on busy streets where large numbers of children cross.

In the early 1960's, the Traffic Engineering Division reviewed the City's school crossing protection policies and investigated what criteria other cities were using to determine whether an adult crossing guard was needed. Criteria thought appropriate for Madison were developed and subsequently accepted as policy by the Common Council.

In 1975 the Common Council requested a reevaluation of the criteria to determine if it was still applicable. A subcommittee consisting of members of the Common Council, Board of Education, Transportation Commission, Madison Area Safety Council, and Parent Advisory group; persons with expertise in the area of safety engineering; and citizens, conducted an in-depth, lengthy review of the original 1962 criteria and recommended to the Council that only minor revisions be made. The criteria detail a method of analyzing traffic situations to determine the degree of hazard, provide a comparison of school crossings throughout the City, and recommend on the basis of need measures to be taken to reduce the hazards associated with school crossings.

The Common Council adopted the following criteria (as amended) as a policy guideline in September 1976 and amended it again in June 1981 and in July 1990

Background School Crossing Hazard Analysis Techniques

The Institute of Transportation Engineers (ITE) has developed recommended practices for school crossing protection in a step-by-step procedure (developed after existing Madison method development). The ITE method is being used by many cities to study whether additional protection is needed at school crossings. The City of Madison recognizes this method as an adequate procedure. However, because factors that the ITE method does not directly consider, such as speed of traffic, safety record of the crossing over the years, sight distance, etc., are felt relevant to the safety of the crossing, the City of Madison uses a more detailed method.

Both methods consider the availability of gaps in traffic as a crucial factor in analyzing whether a crossing needs additional protection. While the ITE method considers that adequate crossing gaps are available if they occur at least once a minute, the Madison method indicates that safe gaps occurring once every 1 ½ minutes is acceptable for small groups (25-30 children per hour), while more frequent safe crossing gaps (once every 30 seconds) are desirable for larger groups (over 100 children per hour).

The pre-1976 Madison method resulted in more adult guard protection being utilized than would be under the ITE method. Madison residents have accepted, and appear to expect, this higher level of protection. Thus, only minor revisions were made in 1976 and 1981 to the previous criteria.

THE ADOPTED CRITERIA 1990

The following factors are considered in analyzing school pedestrian crossings:

1. The number of elementary (grades K-5) school children crossing. At an intersection having a major through street and a minor street(s) controlled by "Stop" or "Yield" signs, the number of elementary school children crossing the major street approach during the peak crossing hour shall be used. When the intersection is signalized, the number of elementary school children in the most heavily used crosswalk during the peak-crossing hour shall be used. The total number of elementary school children crossing at an intersection shall be considered under Hazard Rating Factor 5 (Other Factors).

2. Vehicle Gap Availability. The criterion for this element shall be the *percentage of time* during the school crossing period when gaps adequate for a safe crossing are available. The safe crossing time shall be considered as the time necessary for an elementary school child to cross from one refuge point to another (usually from one curb to another) at a walking speed of 3.0 feet per second.

   At an intersection having a major through street and minor street streets controlled by "STOP" or "YIELD" signs, the gaps in traffic to be considered will be those for the traffic on the major street approaches. At signalized intersections, the gaps to be considered shall be those from turning movements, which conflict with the crosswalk used by the largest group of school children, and the gaps will be computed per hour of "GREEN" time. In this instance, the width of the roadway is equal to one-half of the roadway, since the children are "protected" on the other half by vehicles waiting for the green light on the cross street (except for right turns on red). Where a major street has a median strip at least ten feet in width, which can afford adequate pedestrian refuge, the major approaches shall be considered as separate one-way streets and the gaps used will be those of the heaviest traveled approach.

   Right turns on red that conflict with a crosswalk used by elementary students will be analyzed. There are both benefits and hazards to pedestrians from right turn on red, but if unusual hazards exist from right turns on red, prohibition of such turns will be posted.

3. Speed of Motor Vehicles. The criterion for this element shall be the 85th percentile speed observed on the major approaches. The 85th percentile speed is determined from a speed study made with a radar unit. It is the speed at which only 15 percent of the motorists were observed traveling faster than, or the speed below which 85 percent of the motorists travel.

4. Sight Distance. The criterion for this element shall be the ratio of the sight distance of a vehicle driver observing a three-foot high object in the crosswalk to design stopping distance. The following Design stopping distances (wet pavement), as recommended by the American Association of State Highway and Transportation Officials, shall be used:

25-30 mph	200 feet
30-35 mph	240 feet
35-40 mph	275 feet
40-45 mph	310 feet
45-50 mph	350 feet

5. Safety History. The main criterion for this element shall be the number of pedestrian accidents occurring at the study location, involving school children going to or coming from school, during the previous five-year period. For locations where two or more such accidents have occurred, the five-year limit shall not apply. In addition, a history of other accident types that could conflict with pedestrian crossing will be considered, especially if there is a history of accidents at times of the day when elementary school children generally need to cross. However, significant geometric or traffic control changes at the crossing location need to be considered.

6. Other Factors. Certain unique factors may exist at some locations which would tend to increase or decrease the hazard to school-age pedestrians. Such factors may include complex intersection and/or traffic signal design, existence of safer crossings nearby, the age of children crossing, a street which is used extensively by "foreign" traffic, the presence of stopped buses and other obstructions, and the volume of turning traffic not reflected in the gap availability criterion. In addition, the character of the street (i.e., arterial, local, etc.) will be considered and will be a factor in borderline situations. The uniformity of the hazards throughout the school year, and from morning to evening crossing periods, needs to be considered. Situations where few children desire to walk to school when the temperature drops in the fall need special consideration.

THE HAZARD RATING SYSTEM

Each crossing is analyzed with respect to the above factors. In order to compare the degree of hazard associated with each crossing, a *relative* point (or hazard) rating is assigned to each crossing. The *hazard rating* is the cumulative total of points assigned to the crossing based on each of the hazard factors. The higher the hazard rating, the more hazardous the crossing is, relatively speaking.

Hazard points will be assigned according to the following schedule:

1. SCHOOL CHILDREN CROSSING

Volume	Points	Volume	Points
0-12	0	50-74	20
20-29	4	75-99	24
30-34	8	100-124	28
35-39	12	125-149	32
40-49	16	150 & Over	36

2. VEHICLE GAP AVAILABILITY

% of Time when there are safe gaps	Points
Over 80%	0
70-79	4
60-69	8
55-59	12
50-54	16
45-49	20
40-44	24
30-39	28
20-29	32
Less than 20	36

3. VEHICLE SPEEDS

MPH	Points
0-25	0
26-30	2
31-35	4
36-40	6
41-45	8
Over 45	10

4. SIGHT DISTANCE

Ratio	Points
Over 2.0	0
1.5-2.0	1
1.0-1.5	5
Less than 1.0	

5. SAFETY HISTORY

Accidents	Points
a) School Crossing Types	
0	0
1	5
Each Additional	20
b) Other Types	0-5

6. OTHER FACTORS

	Points
Foreign traffic route	0 to +5
For each approach in excess of four	+5
For complex signal or crossing design	+5 to +10
For simple signal or crossing design	-5 to –10
Safer crossing one block out of way	-10
Large percentage of Grade K and Grade 1 students (over 40%)	0 to +5
An intersection of two arterial streets where the total weekday traffic approach volume exceeds 25,000 vehicles	+4
Children crossing multiple crosswalks at an intersection	0 to +10
Stopped buses and other obstructions	0 to +5
Volume of turning traffic not reflected in gap availability	0 to +5

INTERPRETATION OF HAZARD RATING

Using the hazard rating as a guide, the following measures are appropriate:

1. ***MARK AS A SCHOOL CROSSING*** when the hazard rating is *greater than 20* at a crossing used by *at least 25 elementary school children* during the peak crossing hour. The traffic engineer is authorized to mark such a crossing with appropriate warning signs and special crosswalk markings.

2. ***INSTALL FLASHING BEACONS*** if any one of the following conditions is met:

    a. The 85th percentile speed is in excess of 40 mph, measured at existing school crossing signs, which have been in place at least 30 days.

    b. The street crossed is a U.S. or State Trunk Highway on which a significant percentage of "foreign" drivers can be expected.

    c. The ratio of sight distance to safe stopping distance is less than 1.5.

    d. The hazard rating is greater than 30 at an unguarded location where at least 25 elementary students cross and the available safe crossing gaps are less than 50%.

3. ***RECOMMEND THE ASSIGNMENT OF AN ADULT GUARD*** when the hazard rating is *greater than 40 points* at a crossing used by *at least 25 elementary students* during the peak crossing hour. If the school has *only Grades K-2*, then recommend the assignment of an adult guard when the hazard rating is *greater than 30 points* at a crossing used by *at least 15 elementary students* during the peak crossing hour.

4. ***RECOMMEND THE DISCONTINUANCE OF ADULT GUARD PROTECTION*** at a crossing where the hazard rating falls *below 30 points* or if the number of school children crossing during the peak crossing hour is *less than 15*. At the intersection of two arterial streets where the total entering weekday traffic volume exceeds 25,000 vehicles, the total number of students crossing at the intersection will be used to compare to the minimum of 15 students required to retain an adult guard.

SCHOOL CROSSING STUDY PROCEDURE

In order to properly evaluate the hazard inherent in a given street crossing used by school children, certain data are necessary concerning the quantity and characteristics of the traffic at the location. The specific field studies include counts of school children crossing, traffic volumes, turning movements, measurement of traffic gaps, vehicle speeds, and physical conditions of the location.

Pedestrian counts are made during the peak school crossing periods (both morning and afternoon). The exact hours counted will vary depending upon school staring and dismissal times. Only elementary school children are counted. Crossing by single children may be tallied together, but groups should be noted by a numeral indicating the size of the group. Totals will be made by quarter hours.

Vehicular traffic turning movements and traffic gaps will be measured during the same periods as the pedestrian counts. Tabulations by fifteen-minute intervals are desired.

The count will be conducted on a warm, sunny day, if possible, during the Fall or Spring of the year. If doubt arises as to the accuracy and validity of the count, a second count will be made and the values resulting in the higher hazard rating will be used. The wintertime school pedestrian traffic will also be considered, especially in borderline situations.

Spot speeds of traffic approaching on the major approaches to the crossing are measured with a radar speed meter. These speed studies are generally taken approximately 250 feet in advance of the crossing. Speed studies are not necessary where the crossing is at a signalized intersection or where the approach is controlled by a stop sign. Historical speed studies in the area may be sufficient for estimating motor vehicle speeds. The 85^{th} percentile speed on each major approach is desired.

Physical conditions required include street width, length of crosswalk, and approach sight distance.

The street width is the curb-to-curb width or width of paved surface where shoulder construction is used. Width of median is also desired. Where there is considerable skew to the crosswalk or normal crossing path, the length of such crosswalk should be measured. Sight distance is the distance from the crossing at which the driver first receives a continuous view of a three-foot high object. This information is needed for all uncontrolled approaches.

As individual locations are called to the attention of the Traffic Engineering Division, studies will be made and the indicated measures taken or recommendations will be submitted to the agency responsible.

City of Madison

Traffic Engineering Division