A Guide to Establishing Speed Limits in School Zones

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The purpose of this document is to assist in conducting the traffic investigation, identifying hazards and eliminating or reducing them.

**THIS INVESTIGATION IS REQUIRED FOR THE ESTABLISHMENT OF A LEGAL SCHOOL SPEED ZONE ACCORDING TO MINNESOTA STATUTES, SECTION 169.14, SUBDIVISION 5a.**

The school zone investigation set forth in this document constitutes the prescribed engineering and traffic investigation. As discussed above, this is a coordinated effort requiring several disciplines to accurately perform some of the duties described within this document.
INTRODUCTION

Ensuring the safety of students on public streets and highways is the responsibility of parents, law enforcement, school and government officials. Parents must provide day to day education and supervision in order to develop safe behavior by their children. Roadway engineers must provide a safe environment that minimizes vehicular-pedestrian crash probability. Enforcement officials must provide regular patrols to discourage unlawful behavior and provide training for crossing guards. School district personnel must communicate and coordinate safety programs (such as school patrols or safety education) with children and their parents. Typically the road authority provides the oversight in performing the traffic investigation described in these guidelines.

The responsibility to achieve pedestrian safety must be faced with the knowledge that, despite our best efforts, children and drivers will make mistakes bearing tragic consequences. When this occurs, conflicts between parents and officials may follow concerning the appropriate course of action to avoid reoccurrence of a similar tragedy.

In order to provide a safe environment for children, a traffic investigation should be conducted along school routes and in school zones. The desired results of such an investigation are effective pedestrian and traffic controls, and the creation of a sound school route plan.

SPEED LIMIT LEGISLATION

In 1975, the Legislature changed Minnesota Statutes by adding Subd. 5a to Section 169.14. This change enables local authorities to establish speed limits in school zones, an authority previously granted in 1937 solely to the Commissioner of Highways. Revisions to the legislation have been made through the years. This law gives additional responsibility and control of school zone safety to local authorities on those streets within their jurisdiction. In exercising this prerogative, it is important that local authorities not permit pressures and emotions to outweigh reason and judgment, since improper speed zones can actually decrease safety.
Definitions for some of the terms used within the law are on the next page.

Minnesota Statutes, Section 169.14, reads in part:

Subd. 5a. Speed zoning in school zone; surcharge.

(a) Local authorities may establish a school speed limit within a school zone of a public or non-public school upon the basis of an engineering and traffic investigation as prescribed by the commissioner of transportation. The establishment of a school speed limit on any trunk highway shall be with the consent of the commissioner of transportation. Such school speed limits shall be in effect when children are present, going to or leaving school during opening or closing hours or during school recess periods. The school speed limit shall not be lower than 15 miles per hour and shall not be more than 30 miles per hour below the established speed limit on an affected street or highway.

(b) The school speed limit shall be effective upon the erection of appropriate signs designating the speed and indicating the beginning and end of the reduced speed zone. Any speed in excess of such posted school speed limit is unlawful. All such signs shall be erected by the local authorities on those streets and highways under their respective jurisdictions and by the commissioner of transportation on trunk highways.

(c) For the purpose of this subdivision, "school zone" means that section of a street or highway which abuts the grounds of a school where children have access to the street or highway from the school property or where an established school crossing is located provided the school advance sign prescribed by the manual on uniform traffic control devices adopted by the commissioner of transportation pursuant to section 169.06 is in place. All signs erected by local authorities to designate speed limits in school zones shall conform to the Manual on Uniform Traffic Control Devices.

(d) Notwithstanding section 609.0331 or 609.101 or other law to the contrary, a person who violates a speed limit established under this subdivision is assessed an additional surcharge equal to the amount of the fine imposed for the violation, but not less than $25.
DEFINITIONS

". . . local authorities . . ." as defined in Section 169.011 Subd 38 means "every county, municipal and other local board or body having authority to adopt local police regulations under the constitution and laws of this state, . . ." School zone speed limits must be established by the appropriate city council or county board action, and cannot be established by school boards.

". . . upon the basis of an engineering and traffic investigation . . ." This document presents guidance on the preparation of the necessary engineering and traffic investigation.

". . . as prescribed by the commissioner of transportation . . ." is meant to ensure that motorists will encounter speed zones determined by valid methods applied uniformly statewide.

". . . the establishment of a school speed limit on any trunk highway shall be with the consent of the commissioner of transportation . . ." The commissioner retains authority on trunk highways that may be located in a school zone. If a school zone speed limit is desired on a trunk highway, the appropriate Minnesota Department of Transportation District Office should be contacted to coordinate the traffic investigation and provide guidance. If the school speed limit is on a local road but a trunk highway is part of a school route plan, the District Office will provide pertinent data to the local road authority as requested, in order for the local road authority to complete their investigation.

". . . Such school speed limits shall be in effect when children are present, going to or leaving school during opening or closing hours during school recess periods. . ." Because the reduced speed may only be necessary during these times, it is unreasonable to require drivers to reduce speeds during other times. The school zone limit is "part-time" and must be identified accordingly. Non-school time speed limits must be determined in accordance with Minnesota Statutes 169.14.

". . . the school speed limit shall not be lower than 15 MPH and shall not be more than 30 MPH below the established speed limit on the affected street or highway . . ." Limitations on the speed zone reductions are meant to preclude creation of hazardous conditions.

". . . school zone . . ." This is defined in MN statute 169.14 subd 5a and means the same in this document including any maximum distances defined in the MN Manual on Uniform Traffic Control Devices\(^1\) (MN MUTCD).
SCHOOL CHILD CRASH EXPERIENCE

Crashes on public roads cause billions of dollars in economic loses, sometimes tragic consequences for those injured and grief caused by fatal crashes. Statewide data summarized for three years (2005-2007) from MN Department of Public Safety Crash Facts\(^2\), showed that there was a total 248,063 crashes of which 5739 involved pedestrians and bicyclists. 21 children, ages 5-19, died and 2817 were injured in vehicle/pedestrian crashes. The same 3 year records for that age group revealed that 7 children died and 2839 were injured in vehicle/bicycle crashes. For 10 years from 1998 to 2007 the range of pedestrian fatalities (all ages annually) has a wide fluctuation from a low of 33 to a high of 56. Social and economic factors fluctuate, which impacts the number and exposure of pedestrians but what doesn't change is the vulnerability of this group. For 2007, nearly 4% of pedestrian crashes resulted in a death, compared to about one-half of 1% for all traffic crashes. Identification of the locations, the hazards, and nature of the child related crashes is necessary in dealing with the prevention of these traumatic crashes.

WHERE AND WHEN CRASHES OCCUR

MN crash data was filtered using Geographic Information System (GIS) technology, for crashes that involved school age pedestrians, occurred on a weekday, during school year times, and occurred on MN trunk highways from 1998 to 2000. There were 89 plotted crashes meeting this criteria. Of the 89, only 10 crashes occurred within 1,000 feet of a school. The data indicates that many crashes are happening on the streets that may be leading to school but fewer crashes close to the school.

Although crash data is subject to variability, such as busing or walking distance, it is apparent that a program designed to improve safety for the total school trip should emphasize factors that will also carry over to all streets used by the children.

WHO AND WHY CRASHES OCCUR

Further insights can be gathered from an analysis of circumstances contributing to school child/vehicle crashes. A review of comments made by witnesses and officers investigating the Minnesota crashes found that:

- many crashes occurred when the child dashed from behind or between parked cars.
- many occurred even though the vehicle was moving very slowly because of traffic delays, control devices or obstructed views.

Previous reports\(^3\) involved the determination of who was involved and found that:

- the typical pedestrian involved in a crash was young (K- 3rd grade) and had considerable difficulty understanding and properly using traffic control devices.
- the typical driver in the school area is a local resident driving to (or from) work. Further, "the driver has a child between the ages of five and nine and is aware of the school area - not because of signing, but because of familiarity with the area. "

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SPEED LIMIT INFLUENCE

Often, people's first answer to hazard reduction is to reduce the speed limit. However, lower speed zones are not the only solution to hazard reduction. It may not be an answer at all. Numerous studies show that the passive posting of a speed limit sign does not reduce the actual operating speed of drivers and can actually increase the risk of crashes.

The increase in crash risk stems from a mismatch between the posted speed limit and the operating speed. The speed limit sign has a legal value on it but most drivers are basing their travel speed on lane width, traffic volume, environment, etc. and reflects the driver's choice of what is safe and reasonable. Some motorists may travel at the posted value while others are choosing a different operating speed and this creates a large variation in travel speeds. The variation in these travel speeds makes it difficult for pedestrians to accurately gauge safe crossings. The pedestrian may perceive a safe crossing time based on the speed of one vehicle and not anticipate the higher speed of another approaching vehicle causing a misjudgment on the safe time to cross. Similar misjudgments happen to vehicle drivers trying to cross or enter the road. The larger the range of vehicle speeds, the more likely this will occur. When posted speed limits correspond more closely to operating speeds, the consistent vehicle travel speeds permit better judgment calls thereby improving the safety.

A 1990 Transportation Research Board (TRB) Record\(^4\) summarized that "on streets with normal speed limits of 35 mph, the 85th percentile speeds in zones with 25-mph school speed limits were lower than those in zones with 15- or 20-mph limits. Therefore, it was concluded that school speed limits lower than 25 mph should probably not be used on these streets." Minnesota has studied speed trends after changing posted speed limits and discovered similar results, that passive signing by itself does not achieve the desired speed reduction.

The legislation granting authority to establish school zone speed limits to local officials is not intended as an endorsement of blanket zoning or maximum reductions. Rather, many techniques should be considered. Other solutions include, but are not limited to: sidewalk construction, parking restrictions, crossing guard utilization, stop sign or signal placement and pedestrian re-routing. These measures are almost always more effective in reducing a pedestrian hazard. Effective safety results from the careful consideration of all possible solutions to a hazard. The school zone hazard inventory and the school route plan are of great value in determining appropriate actions in particular situations.
THE TRAFFIC AND ENGINEERING INVESTIGATION

The engineering and traffic investigation consists of:

1) Preparing a school route plan. See Figure 1
2) Conducting a school zone hazard evaluation
3) All hazards should be placed in a tabular listing with a recommended corrective action. See Figure 2.

SCHOOL ROUTE PLAN

The school route plan is most effective for schools serving kindergarten, elementary and middle school students. High school students generally have better skills in judging traffic hazards but a school route plan is still useful by encouraging those students to use protected crossings. The plan, developed jointly by the school, enforcement and traffic officials responsible for school pedestrian safety, consists of a map showing streets, the school, existing traffic controls, established school routes and established school crossings. An additional benefit of having a plan, is that it can be used to identify areas that may qualify for special grant money that is sometimes available for safety improvements.

The plan permits the orderly review of school area traffic control needs, and the coordination of school pedestrian safety education and engineering activities. The preparation of such a plan is vital to the effective analysis of a school zone, and is necessary in determining an appropriate solution to a hazardous school zone situation. The school route plan is the primary tool in this effort. Engineering officials can use the plan to prioritize maintenance of painting crosswalks, prioritize infrastructure improvements such as sidewalks, or prioritize sign replacement programs. Families can use the plan to ensure their children are using a safe route and can escort children to provide additional safety. School officials can use the plan to schedule locations for crossing guards. Police can use the plan to schedule locations at critical crosswalks where additional enforcement may be needed for pedestrian or traffic control.

The main objective in creating a school route plan is to minimize the number of streets crossed, maximize the safety of crossings and routes used by school children and utilize existing protected crossings. The number of crossings is minimized by concentrating students into larger groups as they approach the school. Students are directed along common routes which merge with other common routes until, near the school, all of the students are on very few routes.

The safety of the crossings is maximized by the effective use of vehicular and pedestrian controls. Often the simplest and most efficient way to reduce a pedestrian hazard is to utilize existing pedestrian facilities and vehicular traffic controls. The school route plan is the primary tool in this effort. Crossings can be chosen in such a way that existing stop signs, signals, crosswalks, and other traffic controls are used as much as possible. See Figure 1 for a sample school route plan taken from the MN MUTCD.¹
SCHOOL ZONE HAZARD EVALUATION

Since the preparation of a safe school route plan considers many factors, the hazards along alternative routes must be evaluated in light of what is present as well as what can be changed. The first step is to determine what hazards exist in the "informal" route established by the children. Next is a comparative evaluation of each route and all alternatives. Identified deficiencies or recommended improvements need to be documented and listed. A sample tabular listing is shown in Figure 2. Finally, the "formal" designation of the routes is made, with route changes being made to better utilize existing protections and with engineering changes being made to enhance the safety of the planned routes. The following information must be gathered and analyzed:

1) Roadway Information Needed

A basic feature of a hazard evaluation is an analysis of the roadway features which may cause or contribute to a hazardous situation.

The width of the road, the width of the shoulders and the number of traffic lanes should be determined and entered on a road log, see Figures 3 and 4 for examples. In the lower section of the road log, the roadway should be sketched and the dimensions clearly marked. When sketching the roadway, leave plenty of room to include fencing, sidewalks, bushes that restrict sight, etc. on your drawing.

Other roadway features which should be considered are the existence of curves, hills and nearby buildings which may cause a shortened sight distance. These features should also be recorded on the road log form.

What to do:

After reviewing the above characteristics, look at them critically to determine possible problems. Are the lanes narrow with no shoulders? Is the shoulder so narrow that children normally walking off the roadway are within a few feet of traffic? Is the street so wide that crossing the lanes of traffic will require a large time gap to cross?

If such problems exist they may be corrected by sidewalk construction, shoulder widening, median safety refuge or the rerouting of children away from that area. Other solutions may be discovered as each particular situation is analyzed.

Occasionally a sight distance restriction can be corrected by cutting back brush or leveling hills; but usually rerouting children to an area where they are seen better by motorists is a more effective method of correction. Any identified hazard should be put on the tabular listing form, with a recommended course of action.
2) Traffic Volumes Information Needed

Traffic volumes should be determined by manually counting vehicles during peak hours (tabulated by 5 or 15 minute periods) on an average school day, when children are going to and from school. Another acceptable but less accurate method would involve contacting the appropriate road authority and asking them for the traffic volumes on particular roads.

What to do:

Rerouting may be used to effectively increase vehicular control by directing children to intersections where control devices are already in place. This sort of solution works well and yet involves no substantial expense. A hazard due to children crossing high volume streets then may be corrected through the use of crossing guards or additional vehicular control. School routes should be crossing the lowest volume streets wherever possible. Any identified high volume roads that require the children to cross and need additional control should be put on the tabular listing form, with a recommended course of action.

3) Pedestrian Volumes Information Needed

Pedestrian volumes may be obtained either by counting pedestrians on an average school day, or by contacting school authorities who may have pedestrian volume information. Pedestrian volumes should be collected at critical intersections. The simplest method of counting pedestrians is to count them at a crossing, writing down the number in each group that crosses, along with the time of each crossing. The general age range of the pedestrians should also be recorded. Jaywalking or other unsafe behaviors should also be recorded since visible enforcement can encourage them to act more responsibly. If very wide roads need to be crossed, a more detailed pedestrian useable gap study may need to be conducted to determine an appropriate traffic control measure.

What to do:

High pedestrian volumes alone are not a problem. Research has shown that it is high traffic volumes that are more dangerous than high pedestrian volumes at crossings. It is safer, however, for a large pedestrian volume to be concentrated with an appropriate crossing treatment than to be spread out over an area. The primary method of concentrating pedestrians is the school route plan. Studies have shown that drivers respond favorably with increased care in driving when child pedestrians are visibly present; and if the school route plan is properly devised, children will be increasingly concentrated as they approach the school. Any identified high pedestrian volumes that are required to cross a road with no crossing treatment or crossing guards, should be put on the tabular listing form, with a recommended course of action.
4) Parking and Loading Zones Information Needed

Locations of parking and loading zones should be noted on the road log, map or sketch. Off street loading areas are desirable but even they should be evaluated by the transportation director for the school district. In loading and unloading zones, 2/3 of the fatal crashes are caused by the school bus striking the child. 6

**What to do:**

School bus loading zones and parking or stopping zones near entrances must be given careful attention. One of the greatest causes of child pedestrian crashes is children crossing between parked cars. Parking is a major sight distance limitation at crosswalks and intersections. In areas where children are not readily seen by motorists, no parking zones are an important feature of child safety. To improve both driver and pedestrian visibility, parking should be banned for at least 100 feet on the street where a hazardous situation has been noted. Where possible, loading zones should be off the street. Any identified sight restrictions caused by stopped cars or buses should be put on the tabular listing form with a recommended course of action.

5) Traffic Control Devices Information Needed

All traffic control devices such as school crossing signs, pavement markings, signals, school patrol locations, school zone warning signs, and speed limit signs should be precisely located on the road log for use in developing the school route plan. The condition and visibility of these control devices should be determined by driving through the area. A night time review should also be performed to determine the retroreflectivity of signs and condition of pavement markings. Minnesota winter nights are very long and may extend into the morning school start times or extracurricular activities after school. A night review is a good practice to evaluate if street lights would improve the visibility of major pedestrian crossings.

**What to do:**

Just as schools have rule books, traffic engineers have rules also. All traffic control devices must conform to the requirements of the current Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD). A typical sign placement diagram from Chapter 7 for a school area is shown on Figure 5. Signs which are hidden by vegetation or poles should be made visible. Sign placement locations and minimum sign panel heights should be checked with the specifications listed in the MN MUTCD. Pavement markings and signs should be replaced if worn out. Once the route plan has been developed, locations needing new or additional controls will be apparent. Locations that have crossing guards should have signs and crosswalk pavement markings. Intersections can also have supplemental stop bars if stop signs or signals are present. Pedestrian walk signals should be checked for adequate crossing time based upon the pedestrian counts in Step 3 above and the crossing length. If any night time pedestrian crashes have occurred, additional lower level street lights (not the typical high mast mounted type) should be considered. Non compliant devices, signs or locations should be put on the tabular listing form, with a recommended course of action.
6) Sidewalk Information Needed

Like the previous items, sidewalks should be marked on the road log and on the school route plan. Width and condition of the sidewalk should also be noted.

What to do:

Drivers need a safe place to drive and children need a safe place to walk. The installation of sidewalks along streets creates this safe area and can reduce the crash possibility. Intermittent gaps or broken sections in the sidewalk pathway system cause children to enter the road at unexpected locations. Sometimes construction of relatively little sidewalk can greatly improve safety. Proper maintenance of sidewalks in the winter is also important. If this is not feasible it may be better to reroute students to a route with better pedestrian facilities. Thus, sidewalks play an important part in devising a school route plan. Identified missing sections of sidewalk, poor condition, or new path locations should be put on the tabular listing form, with a recommended course of action.

7) Fencing Information Needed

Fencing should be shown on the road log.

What to do:

Like sidewalk, relatively little fencing can drastically alter walking patterns. Used along school grounds it can effectively prevent children from crossing mid-block. It also prevents bouncing balls from entering the street, with children focused on pursuit of the ball instead of crossing the street safely. Therefore, adding fencing along selected school routes and school playgrounds can be an important part of pedestrian protection and control. Proposed fence locations should be put on the tabular listing form.

8) Crash History Information Needed

If the area studied includes high crash locations, they should be identified with an indication of types of crashes and crash rates, such as crashes per year and/or severity rates.

What to do:

High crash locations demand intensive study and positive action. The nature and time of the crashes should be considered to determine whether they are school related and whether these crashes are truly impacting the pedestrian safety. Crashes should be analyzed in light of the previously mentioned items in this investigation so that possible solutions such as sidewalk or fencing placement, traffic control device installations, etc. may be discovered to prevent reoc-
curring type crashes. If hazards cannot be eliminated by proper use of standard control
devices, reroute children away from the area. If a pattern of crashes is discovered, a recom-
mended course of action should be put on the tabular listing form. While vehicle-to-vehicle
type crashes don't directly impact pedestrian safety, if they are occurring at the school
entrance they can be disrupting to traffic and pedestrians. The road authority should become
involved for appropriate solutions.

9) Speed Zones Information needed

In place speed limit signs should be recorded on the area map or road log. If normal zones
other than the typical 30 or 55 are inplace, verification should be made that these were author-
ized by the Mn/DOT Commissioner and are legally established speed limits.

What to do:

Determination of appropriate school speed limits
should be made after all of the inventory data have
been analyzed and appropriate corrective measures
have been taken. If possible, a speed check should
be performed to check current operating speeds of
motorists to determine the present compliance rates
for the normal speed limit and verify if the normal
speed limit is correct.

Stopping sight distance calculations should be made
by a qualified engineering professional. American
Association of State Highway and Transportation
Officials (AASHTO) road design guidelines recommend using an object height of 2 feet and
a driver eye height of 3.5 feet for calculating the stopping sight distance. If a sight restriction
exists, and the stopping sight distance will be used as the determining factor in setting the
school speed limit, a tighter specification may be appropriate. A small object such as a base-
ball should be placed on the centerline and distances calculated using the normal driver eye
height of 3.5 feet. Speed values calculated by using this more restrictive object height, would
justify a lower school speed limit thereby giving drivers improved reaction times for hazards
such as children chasing a ball. For other cases, if all the hazards have been identified and cor-
rected, and a lower speed limit is still necessary to improve sight distance or reaction times,
then a slower school speed limit may be warranted.

Proper speed zoning can reduce vehicular speed differentials, provide basis for enforcement,
increase driver respect for speed zoning, and decrease the crash potential. TRB research\(^7\)
yielded some information about placement of the speed zone. The minimum speed in a school
zone typically occurred between the initial15 and 30 percent of the school zone length.
Regardless of the length of the school zone or the school speed limit, drivers tended to achieve
their minimum speed within the first 350 feet for low-speed sites and within 800 feet for high-
er-speed sites. The minimum speed in a speed zone always occurred in the first half of the
school zone but was rarely maintained into the second half of the zone.
Even though law permits as much as a 30 MPH reduction in school zones, this data and similar research confirms that effective school zone speed limits should only be approximately 10 to 15 MPH below the normal value unless very unusual conditions are present. Also the zone should be equally spaced on either side of a marked crosswalk if there is one. The speed limit selected must be based on a common sense evaluation of the hazard potential and must be reasonable to gain voluntary driver acceptance. If larger reductions in speed are absolutely required, then a serious commitment from enforcement should be obtained to ensure compliance.

Improper speed zoning may increase crash potential by increasing the vehicular speed differentials, decreasing driver's respect for speed limits, misleading pedestrians as to true vehicular speed, leaving the actual speed virtually unchanged, making the majority of drivers 'speeders', and creating enforcement problems.

After these guidelines have been followed, the school speed limit signs can be erected by the local road authority on local roads or by the commissioner of transportation on trunk highways. Signs shall be erected in accordance with the MN MUTCD. A courtesy copy of the enabling resolution and backup data can be sent to the State Traffic Engineer at Mn/DOT if desired.

**Summary**

The hazard evaluation process enables you to determine which routes can be made the safest with the least cost and most assurance that they will be used. The school route plan should be reevaluated whenever changes in traffic or pedestrian patterns occur, when control devices change or when the route environment changes. If the physical hazards cannot be eliminated or minimized, alternatives such as busing, hired police control, intelligent transportation system or another innovative solution should be considered. Providing a safe environment for walking students is a key first step in establishing safety but it still requires educating the student pedestrians about safe and responsible actions and this is discussed later.
TRAFFIC CALMING METHODS

As indicated before, the erection of passive signs may not achieve the desired speed reductions. Recent technological and innovative design improvements have resulted in methods and devices that are more effective in increasing the driver's awareness, improving pedestrian safety, gaining compliance to reduced speed limits and providing proactive safety solutions. This collection of new tools is collectively called traffic calming and is functional in both residential settings and school areas.

One of the innovative designs is nicknamed a "bump out ". This design bumps out the curb section towards the centerline at the intersection, thus eliminating parking near the intersection. It narrows the road down to the normal thru lanes. This has some positive impacts to safety. It aids the driver in his sight lines of waiting pedestrians who desire to cross and it provides a shorter distance for the pedestrian to cross, thus reducing their exposure time on the street. It also gives the perception of a narrower road which causes the driver to slow down. Several different designs exist and it is important to coordinate with maintenance forces to develop a compatible bump out for the region.

Technology has produced changeable message signs which can change speed limit values based upon time of day or remote activation. These signs can display normal speed limits for the usual conditions and then display a new value for the planned event such as school release. This causes less confusion to the driver about what value he should be driving since only one value will be displayed at a time. Police are more confident about strict enforcement since there is no confusion.

Another new technology is radar activated speed message signs. As drivers approach these signs, a radar unit activates the display on the sign giving the driver his approach speed. This is immediate information about the driver's compliance to the desired speed limit. Several studies confirm that drivers slow down in an attempt to reach the posted speed as they pass the sign. As mentioned before, reasonable values must be used in the reduced zone or even these devices will not have the desired effect.

Other traffic calming techniques exist such as raised pedestrian crossings, speed tables (or benches), and median planters and each has its pros and cons. Bump outs and speed tables can have negative consequences for bicycle traffic so each road needs to be evaluated for its function. The Institute of Transportation Engineers (ITE) maintains a library of traffic calming solutions at http://www.ite.org/traffic/. Passive speed signs may not achieve the desired effect but combined with a traffic calming technique, speed reductions can improve. The road authority should analyze the appropriate treatment for its effectiveness on the proposed roadway.
SAFETY EDUCATION

Once the hazard inventory has been conducted and the route plan has been created, recommended changes in pedestrian and traffic control should be implemented. The implementation of the recommendations involves not only practical activity such as constructing sidewalks or installing signs, but also the educational activity of teaching students safety consciousness.

It was noted earlier in this report that children are rarely involved in crashes while crossing properly at an intersection. Rather, most child pedestrian crashes occur when the child is crossing mid-block or running from behind parked cars. Physical changes in the child's walking environment will provide a safe route but they need to be accompanied by an effective educational effort to prevent erratic or unsafe behavior by the child.

Children must be aware of the routes they should take to and from school, and a simplified school route plan (see Figure 1) should be sent home with each child. Crossing guards should inform transportation directors or school officials of children seen disregarding their route. All schools have a fire plan of which the students are carefully informed and allowed to practice, yet students are involved in crashes every year because their walking routes are ill-defined or poorly controlled. Certainly traffic safety deserves a good deal of educational time - time that will benefit the students not only when they going to or from school, but whenever they are near a roadway.

A good deal of general traffic safety should be taught, as well as information on proper routes. The internet contains curriculum guides, lesson plans, bike rodeo planning, walking school buses, school safety patrols and much more information on pedestrian safety. These are sponsored by national, state, local agencies and auto clubs such as AAA and are meant so that children, especially those in the earlier grades, are given the advantage of traffic safety knowledge. Such instruction is an integral part of a pedestrian hazard reduction program.
SPECIAL SITUATIONS

The language in the law specifically states that the school speed limits shall be in effect when children are present. The reduced school zone speed limits improve the reaction time for the driver and reduce the speed of vehicles so that children have time to make better judgments about crossing. Sometimes though, reduced speed limits near a school entrance can provide additional safety even though no children may be walking to school. Schools in rural locations may not have a walking population but they do experience traffic conflicts caused by buses and parents all arriving in a short time frame to drop off or pick up children. These entrances may be on high speed arterial type roads and the intense traffic at an isolated location may be unexpected by the driver.

Typically, these traffic problems can be resolved by traditional traffic engineering solutions such as turn lanes, advance signing or a traffic control device. Very high volumes of traffic may even warrant a signal. It is imperative to involve engineering professionals to evaluate the alternatives at these unique locations and determine the correct solution. Reducing the speed limit is only one of many tools available.

Since children are not present, and these roads may be high speed, a flashing beacon with the supplemental plaque WHEN FLASHING (S4-4P) is an appropriate treatment for the school speed limit. The beacon should only flash during the intense traffic periods at the beginning and end of the school day. Experienced engineering professionals should evaluate the traffic pattern and determine these time frames.
Figure 1

MN MUTCD, Figure 7A-1. Example of School Route Plan Map
Sample

Tabular Listing of Safety Issues for Obama Elementary School

<table>
<thead>
<tr>
<th>Problem Number</th>
<th>Location</th>
<th>Description</th>
<th>Extent</th>
<th>Posted Speed</th>
<th>Traffic Volume</th>
<th>Number of Students Affected</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>On Ford St. between Lincoln Rd. and Victoria Rd.</td>
<td>Sidewalk broken with missing sections</td>
<td>440 feet, children walking in the street</td>
<td>30 MPH</td>
<td>150 vph during school walking time - 7-8 AM : 3-4 PM</td>
<td>30 students, elementary age</td>
<td>Advise city public works to replace sidewalk.</td>
</tr>
<tr>
<td>#2</td>
<td>Chrysler Ave. intersection with Ford St.</td>
<td>Chrysler Ave. is a 5-lane road</td>
<td>Very wide, 66 feet. with no supervision.</td>
<td>35 MPH</td>
<td>400 vph during school opening and closing hours</td>
<td>50 Elementary children crossing</td>
<td>School District needs to provide adult crossing guard</td>
</tr>
<tr>
<td>#3</td>
<td>State Trunk Highway Route 66</td>
<td>School Advance Sign S1-1 is completely dark at night</td>
<td>MN MUTCD requires sign to be reflective at night</td>
<td>40 MPH</td>
<td>AADT 3000</td>
<td>Many - This is primary bus entrance and student pick up area for extracurricular activities.</td>
<td>Advise state transportation department to replace non-retroreflective sign to improve drivers’ awareness of approaching school bus and student loading zone.</td>
</tr>
<tr>
<td>#4</td>
<td>County Road 77 and Ford St.</td>
<td>Crosswalk at intersection.</td>
<td>Crosswalk markings are nearly worn off where there are student crossing guards</td>
<td>30 MPH</td>
<td>300 vph during school opening and closing hours</td>
<td>80 elementary and middle school students</td>
<td>Contact the county engineer to repaint crosswalk or consider more durable pavement markings.</td>
</tr>
</tbody>
</table>
Figure 3

ROAD LOG (A)

ROAD  62nd Ave North
CITY  New Hills
COUNTY  Blue Earth
FROM  CSAH 18
DATE  5-3-2005
PROCESSED BY  E. Brown
SHEET 1 of 4 SHEETS
TO  CSAH 8 (W. Broadway)

LEGEND:

SIGN
R  RESIDENCE
ENTRANCE

NO SIGHT RESTRICTIONS

SUNNY ST. N.  1.125

VIRGINIA ST. N.

6' BITUMINOUS SHOULDER  1.085
WITH CURB & GUTTER

6' GRAVEL SHOULDER

XYLON ST. N.

6' BITUMINOUS SHOULDER  0.970
WITH CURB & GUTTER

ZEALAND ST. N.

BOONE ST. N.

0.762

0.695

0.855

0.838

0.805

0.780

0.725

0.675

0.665
### ROAD LOG (B)

**DATE** 5-3-2008  
**ROAD** 62nd Ave North

**PROCESSED BY** E. Brown  
**APPROX. LENGTH OF ZONE** 0.3 miles

<table>
<thead>
<tr>
<th>ROADWAY:</th>
<th>SHOULDER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>Bituminous</td>
</tr>
<tr>
<td>WIDTH</td>
<td>24'</td>
</tr>
<tr>
<td>CONDITION</td>
<td>Fair</td>
</tr>
</tbody>
</table>

**PRESENT SPEED LIMIT** 30 mph

**SIGHT DISTANCE RESTRICTIONS** None

**SIDEWALK** 3 ft  
**CONDITION** Good

**VEHICULAR VOLUMES** 2575 AADT

**PEDESTRIAN VOLUMES** 125 school children cross at school crossing.

**ACCIDENT EXPERIENCE:**

**STUDY PERIOD** 2002-2004

**NUMBER OF CRASHES** 6

**NUMBER OF PEDESTRIAN CRASHES** 0

**LAND USE** Residential, School

**CROSS TRAFFIC** at Zealand St. AADT 500, Boone St. AADT 350, Xylon St AADT 200, Sunny St AADT 250, Virginia St. AADT 300

**General Comments:**

Recommend restricting parking adjacent to school on both sides of 62nd Ave North.
NOTE: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)

End School Zone

End School Zone

End School Zone

SCHOOL

SCHOOL

SCHOOL

SCHOOL

MN MUTCD, Figure 7B-5. Examples of Signing for a School Zone with a School Speed Limit and a School Crossing
PHOTO CREDITS

Speed Display Sign picture - from [www.walkinginfo.org](http://www.walkinginfo.org) - photographer Dan Burden, downloaded Aug 1, 2009


Pavement Marking, Broken Sidewalk and Parked Car pictures from [www.safekids.org/walk/usa.html](http://www.safekids.org/walk/usa.html) - photographer names not listed for security, downloaded Aug 1, 2009


BIBLIOGRAPHY


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4) School Speed Limits and Speed in School Zones, TRB Record # 1254, McCoy, P T, Heimann, J E, 1990

5) Manual of Transportation Engineering Studies, Institute of Transportation Engineers, Jan 2000
