PART 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

TABLE OF CONTENTS

Chapter 7A. GENERAL Page

Section 7A.1 Need for Standards 7A-1
7A.2 School Routes and Established School Crossings 7A-1
7A.3 School Crossing Control Criteria 7A-3
7A.4 Scope 7A-3

Chapter 7B. SIGNS

Section 7B.1 Size of School Signs 7B-1
7B.2 Illumination and Reflectorization 7B-1
7B.3 Position of Signs 7B-1
7B.4 Height of Signs 7B-1
7B.5 Installation of Signs. 7B-1
7B.6 Lettering. 7B-1
7B.7 Sign Color for School Warning Signs. 7B-1
7B.8 School Sign (S1-1) and Plaques 7B-3
7B.9 School Zone Sign (S1-1) and Plaques (S4-3P, S4-7P) and END SCHOOL ZONE Sign (S5-2). 7B-3
7B.10 Higher Fines Zone Signs (R2-10, R2-11) and Plaques. 7B-5
7B.11 School Advance Crossing Assembly. 7B-5
7B.12 School Crossing Assembly 7B-6
7B.13 School Bus Stop Ahead Sign (S3-1) 7B-9
7B.13.1 SCHOOL BUS LOADING AREA Sign (S3-X1). 7B-9
7B.14 SCHOOL BUS TURN AROUND AHEAD Sign (S3-2a) 7B-9
7B.15 School Speed Limit Assembly (S4-1P, S4-2P, S4-3P, S4-4P, S4-6P, S5-1) and10 END SCHOOL SPEED LIMIT Sign (S5-3). 7B-10
7B.16 Reduced Speed School Zone Ahead Sign (S4-5, S4-5a) 7B-11
7B.17 Parking and Stopping Signs (R7 and R8 Series) 7B-11

Chapter 7C. MARKINGS

Section 7C.1 Functions and Limitations. 7C-1
7C.2 Crosswalk Markings 7C-1
7C.3 Pavement Word and Symbol Markings. 7C-1

Chapter 7D. CROSSING SUPERVISION

Section 7D.1 Types of Crossing Supervision 7D-1
7D.2 Adult Crossing Guards 7D-1
7D.3 Qualifications of Adult Crossing Guards 7D-1
7D.4 Uniform of Adult Crossing Guards. 7D-1
7D.5 Operating Procedures for Adult Crossing Guards. 7D-1

Chapter 7E. SPEED LIMITS IN SCHOOL ZONES

Section 7E.1 Establishing Speed Limits in School Zones 7E-a

MN Rev. 2
MN Rev. 1

FIGURES

Figure 7A-1 Example of School Route Plan Map 7A-2
Figure 7B-1 This figure has been deleted
Figure 7B-2 This figure has been deleted
Figure 7B-3 Example of Signing for a Higher Fines School Zone with a School Speed Limit. 7B-4
Figure 7B-4 Example of Signing for a School Crossing Outside of a School Zone 7B-7
Figure 7B-5 Example of Signing for a School Zone
with a School Speed Limit and a School Crossing 7B-8
Figure 7B-6 This figure has been deleted
Figure 7C-1 Two-Lane Pavement Marking of "SCHOOL" 7C-1

TABLES

Table 7B-1 School Area Sign and Plaque Sizes. 7B-2

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

7A. General

7A.1 Need for Standards

SUPPORT:

Regardless of the school location, the best way to achieve effective traffic control is through the uniform application of realistic policies, practices, and standards developed through engineering judgment and/or studies.

Pedestrian safety depends upon public understanding of accepted methods for efficient traffic control. This principle is especially important in the control of pedestrians, bicycles, and other vehicles in the vicinity of schools. Neither pedestrians on their way to or from school nor other road users can be expected to move safely in school areas unless they understand both the need for traffic controls and how these controls function for their benefit.

Procedures and devices that are not uniform might cause confusion among pedestrians and other road users, prompt wrong decisions, and contribute to crashes. To achieve uniformity of traffic control in school areas, comparable traffic situations need to be treated in a consistent manner. Each traffic control device and control method described in Part 7 fulfills a specific function related to specific traffic conditions.

A uniform approach to school area traffic controls assures the use of similar controls for similar situations, which promotes appropriate and uniform behavior on the part of motorists, pedestrians, and bicyclists.

A school traffic control plan permits the orderly review of school area traffic control needs, and the coordination of school/pedestrian safety education and engineering measures. Engineering measures alone do not always result in the intended change in student and road user behavior.

GUIDANCE:

A school route plan for each school serving elementary to high school students should be prepared in order to develop uniformity in the use of school area traffic controls and to serve as the basis for a school traffic control plan for each school.

The school route plan, developed in a systematic manner by the school, law enforcement, and traffic officials responsible for school pedestrian safety, should consist of a map showing streets, the school, existing traffic controls, established school walk routes, and established school crossings. A typical school route plan map is shown in Figure 7A-1.

The type(s) of school area traffic control devices used, either warning or regulatory, should be related to the volume and speed of vehicular traffic, street width, and the number and age of the students using the crossing.

School area traffic control devices should be included in a school traffic control plan.

SUPPORT:

Reduced speed limit signs for school areas and crossings are included in this Manual solely for the purpose of standardizing signing for these zones and not as an endorsement of mandatory reduced speed zones.

"School" and "school zone" are defined in Section 1A.13.

7A.2 School Routes and Established School Crossings

SUPPORT:

To establish a safer route to and from school for schoolchildren, the application of planning criterion for school walk routes might make it necessary for children to walk an indirect route to an established school crossing located where there is existing traffic control and to avoid the use of a direct crossing where there is no existing traffic control.

GUIDANCE:

School walk routes should be planned to take advantage of existing traffic controls.

The following factors should be considered when determining the feasibility of requiring children to walk a longer distance to a crossing with existing traffic control:

A. The availability of adequate sidewalks or other pedestrian walkways to and from the location with existing control;
B. The number of students using the crossing;
C. The age levels of the students using the crossing; and
D. The total extra walking distance.

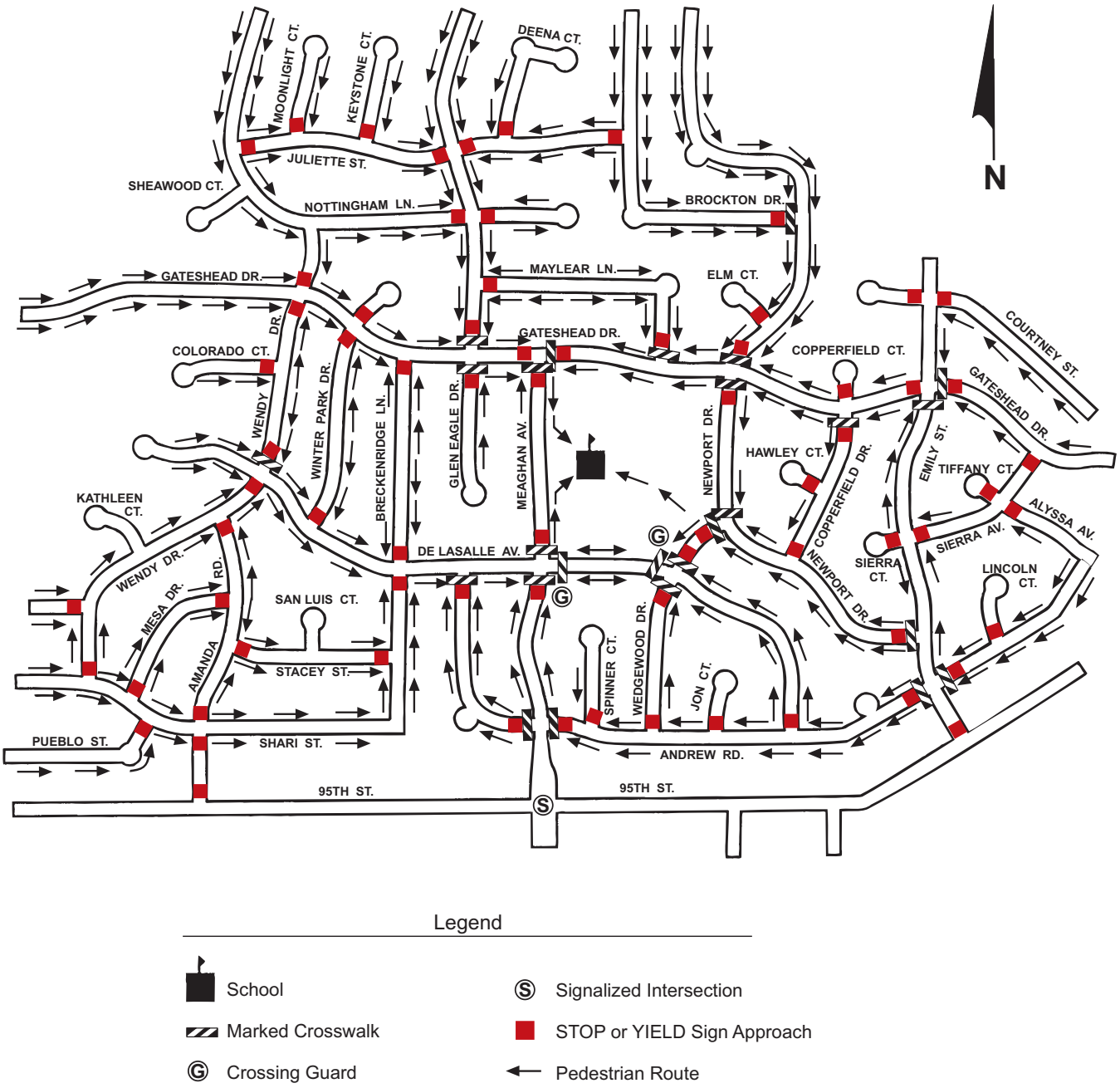

Figure 7A-1. Example of School Route Plan Map

7A.3 School Crossing Control Criteria

SUPPORT:

The frequency of gaps in the traffic stream that are sufficient for student crossing is different at each crossing location.. When the delay between the occurrences of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap. In these instances, the creation of sufficient gaps needs to be considered to accommodate the crossing demand.

A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in "Traffic Control Devices Handbook" (see Section 1A.11).

7A.4 Scope

STANDARD:

Part 7 sets forth basic principles and prescribes standards that shall be followed in the design, application, installation, and maintenance of all traffic control devices (including signs, signals, and markings) and other controls (including adult crossing guards) required for the special pedestrian conditions in school areas.

SUPPORT:

Sections 1A.1 and 1A.8 contain information regarding unauthorized devices and messages. Sections 1A.2 and 1A.7 contain information regarding the application of standards. Section 1A.5 contains information regarding the maintenance of traffic control devices. Section 1A.8 contains information regarding placement authority for traffic control devices. Section 1A.9 contains information regarding engineering studies and the assistance that is available to jurisdictions that do not have engineers on their staffs who are trained and/or experienced in traffic control devices.

Provisions contained in Chapter 2A and Section 2B.6 are applicable in school areas.

Part 3 contains provisions regarding pavement markings that are applicable in school areas.

Part 4 contains provisions regarding highway traffic signals that are applicable in school areas. The School Crossing signal warrant is described in Section 4C.6.

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

7B. Signs

7B.1 Size of School Signs

STANDARD:

Detailed drawings of the standard signs illustrated in this Manual can be found in the Minnesota Standard Signs Manual (see Map & Manual Sales Unit, page ii). Other questions regarding signs and their usage can be referred to the Office of Traffic, Safety and Technology (see page ii). The size of signs to be used in school areas shall be as shown in Table 7B-1 and Appendix C of this Manual.

The Conventional Road sign size shall be used on public roads, streets, and highways unless engineering judgment determines that a Minimum or Oversized sign size would be more appropriate.

The Minimum sign size shall be used only where traffic volumes are low and speeds are 30 mph or lower, as determined by engineering judgment.

The Oversized sign size shall be used on expressways.

GUIDANCE:

The Oversized sign sizes should be used on roadways that have four or more lanes with posted speed limits of 40 mph or higher.

OPTION:

The sizes in the Oversized column may also be used at other locations that require increased emphasis, improved recognition, or increased legibility.

Signs and plaques larger than those shown in Table 7B-1 and Appendix C of this Manual may be used (see Section 2A.11).

7B.2 Illumination and Reflectorization

STANDARD:

The signs used for school area traffic control shall be retroreflectorized or illuminated.

7B.3 Position of Signs

SUPPORT:

Sections 2A.16 and 2A.17 contain provisions regarding the placements and locations of signs. MN Rev. 1

Section 2A.19 contains provisions regarding the lateral offsets of signs.

OPTION:

In-roadway signs for school traffic control areas may be used consistent with the requirements of Sections 2B.12, 7B.11, and 7B.12.

7B.4 Height of Signs MN Rev. 1

SUPPORT:

Section 2A.18 contains provisions regarding the mounting height of signs.

7B.5 Installation of Signs

SUPPORT:

Section 2A.16 contains provisions regarding the installation of signs.

7B.6 Lettering

SUPPORT:

The Federal Highway Administration's "Standard Highway Signs and Markings" book contains information regarding sign lettering.

7B.7 Sign Color for School Warning Signs

STANDARD:

School warning signs, including the "SCHOOL" portion of the School Speed Limit (S5-1) sign and including any supplemental plaques used in association with these warning signs, shall have a fluorescent yellow-green background with a black legend and border unless otherwise provided in this Manual for a specific sign.

When the fluorescent yellow-green background color is used, a systematic approach featuring one background color within a zone or area shall be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area is not allowed.

Sign	Sign Designation	Section	Conventional Road	Minimum	Oversized
School	S1-1	7B.8	36 x 36	30 x 30	48 x 48
School Bus Stop Ahead	S3-1	7B.13	36 x 36	30 x 30	48 x 48
School Bus Turn Around	S3-2a	7B.14	36 x 36	30 x 30	48 x 48
Reduced School Speed Limit Ahead	S4-5, S4-5a	7B.16	36 x 36	30 x 30	48 x 48
School Speed Limit XX When Flashing	S5-1	7B.15	24 x 48	---	36 x 72
End School Zone	S5-2	7B.9	24 x 30	---	36 x 48
End School Speed Limit	S5-3	7B.15	24 x 30	---	36 x 48
In-Street Ped Crossing	R1-6a, R1-6c	7B.11, 7B.12	12 x 36	---	---
Speed Limit (School Use)	R2-1	7B.15	24 x 30	---	36 x 48
Begin Higher Fines Zone	R2-10	7B.10	24 x 30	---	36 x 48
End Higher Fines Zone	R2-11	7B.10	24 x 30	---	36 x 48

MN Rev. 3

Plaque	Sign Designation	Section	Conventional Road	Minimum	Oversized
XXX to XXX AM XXX to XXX PM	S4-1P	7B.15	24 x 10	--- ---	36 x 18
When Children Are Present	S4-2P	7B.15	24 x 10	---	36 x 18
School	S4-3P	7B.9, 7B.15	24 x 8	---	36 x 12
When Flashing	S4-4P	7B.15	24 x 10	---	36 x 18
Mon-Fri	S4-6P	7B.15	24 x 10	---	36 x 18
All Year	S4-7P	7B.9	24 x 12	---	36 x 18
Fines Higher	R-2-6P	7B.10	24 x 18	---	36 x 24
XX Feet	W16-2P	7B.8	24 x 18	---	30 x 24
XX FT	W16-2aP	7B.8	24 x 12	---	30 x 18
Turn Arrow	W16-5P	7B.8, 7B.9, 7B.11	24 x 12	---	30 x 18
Advance Turn Arrow	W16-6P	7B.8, 7B.9, 7B.11	24 x 12	---	30 x 18
Diagonal Arrow	W16-7P	7B.12	24 x 12	---	30 x 18
Diagonal Arrow (optional size)	W16-7P	7B.12	21 x 15	---	---
Ahead	W16-9P	7B.11	24 x 12	---	30 x 18

MN Rev. 3

MN Rev. 2

Notes: 1. Larger signs may be used when appropriate.
2. Dimensions are shown in inches and are shown as width x height.
3. Minimum sizes for multi-;ane conventional roads shall be as shown in the Conventional Roads column.that face shared-use paths and pedestrian facilities.

Table 7B-1. School Area Sign and Plaque Sizes

7B.8 School Signs (S1-1) and Plaques

S1-1

SUPPORT:

Many state and local jurisdictions advise road users that they are approaching a school that is adjacent to a highway even though no school crossing is involved and the speed limit remains unchanged. Additionally, some jurisdictions designate school zones that have a unique legal standing in that fines for speeding or other traffic violations within designated school zones are increased or special enforcement techniques are used. It is important and sometimes legally necessary to mark the beginning and end points of these designated school zones so that the road user is given proper notice.

The School (S1-1) sign has the following four applications:

A. School Area - the S1-1 sign can be used to warn road users that they are approaching a school area that might include school buildings or grounds, a school crossing, or school related activity adjacent to the highway.
B. School Zone - the S1-1 sign can be used to identify the location of the beginning of a designated school zone (see Section 7B.9).
C. School Advance Crossing - if combined with an AHEAD (W16-9P) plaque or an XX FEET (W16-2P or W16-2aP) plaque to comprise the School Advance Crossing assembly, the S1-1 sign can be used to warn road users that they are approaching a crossing where schoolchildren cross the roadway (see Section 7B.11).
D. School Crossing - if combined with a diagonal downward pointing arrow (W16-7P) plaque to comprise the School Crossing assembly, the S1-1 sign can be used to warn approaching road users of the location of a crossing where schoolchildren cross the roadway (see Section 7B.12).

OPTION:

If a school area is located on a cross street in close proximity to the intersection, a School (S1-1) sign with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or highway to warn road users making a turn onto the cross street that they will encounter a school area soon after making the turn.

7B.9 School Zone Sign (S1-1) and Plaques (S4-3P, S4-7P) and END SCHOOL ZONE Sign (S5-2)

S1-1

S4-7P

S4-3P

OR

W16-5P
optional

OR

W16-6P
optional

STANDARD:

If a school zone has been designated under State or local statute, a School (S1-1) sign shall be installed to identify the beginning point(s) of the designated school zone (see Figure 7B-3).

OPTION:

A School Zone (S1-1) sign may be supplemented with a SCHOOL (S4-3P) plaque.

A School Zone (S1-1) sign may be supplemented with an ALL YEAR (S4-7P) plaque if the school operates on a 12-month schedule.

The downstream end of a designated school zone may be identified with an END SCHOOL ZONE (S5-2) sign (see Figure 7B-3).

If a school zone is located on a cross street in close proximity to the intersection, a School Zone (S1-1) sign with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or highway to warn road users making a turn onto the cross street that they will encounter a school zone soon after making the turn.

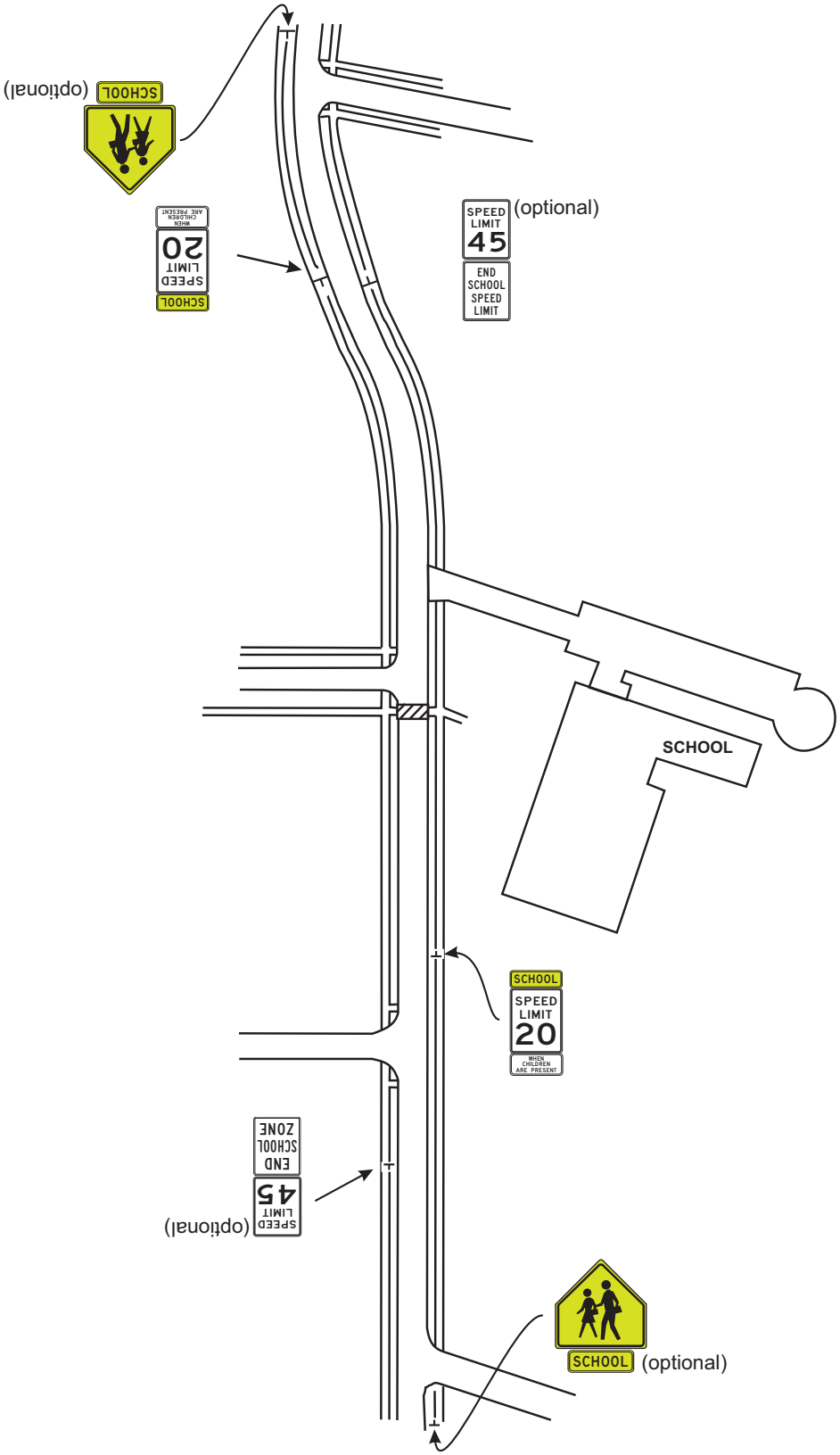

Figure 7B-3. Example of Signing for a Higher Fines School Zone with a School Speed Limit

7B.10 Higher Fines Zone Signs (R2-10, R2-11) and Plaques

R2-10 R2-11

R2-6P R2-6aP R2-6bP

GUIDANCE:

Where increased fines are imposed for traffic violations within a designated school zone, a BEGIN HIGHER FINES ZONE (R2-10) sign or a FINES HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or $XX FINE (R2-6bP) plaque (see Figure 2B-3) should be installed as a supplement to the School Zone (S1-1) sign to identify the beginning point of the higher fines zone (see Figures 7B-2 and 7B-3).

OPTION:

Where appropriate, one of the following plaques may be mounted below the sign that identifies the beginning point of the higher fines zone:

A. An S4-1P plaque (see Section 7B-15) specifying the times that the higher fines are in effect,
B. A WHEN CHILDREN ARE PRESENT (S4-2P) plaque (see Section 7B-15), or
C. A WHEN FLASHING (S4-4P) plaque (see Section 7B-15) if used in conjunction with a yellow flashing beacon.

STANDARD:

Where a BEGIN HIGHER FINES ZONE (R2-10) sign or a FINES HIGHER (R2-6P) plaque supplementing a School Zone (S1-1) sign is posted to notify road users of increased fines for traffic violations, an END HIGHER FINES ZONE (R2-11) sign or an END SCHOOL ZONE (S5-2) sign shall be installed at the downstream end of the zone to notify road users of the termination of the increased fines zone (see Figures 7B-2 and 7B-3).

SUPPORT:

The FINES HIGHER plaque may be used when both the beginning and the ending of a school speed zone are signed.

Minnesota Statute 169.14, subd. 5a (d) states:

" ... 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."

7B.11 School Advance Crossing Assembly

S1-1

W16-9P

OR

W16-2aP

OR

W16-2P

OR

W16-5P
optional

OR

W16-6P
optional

STANDARD:

The School Advance Crossing assembly shall consist of a School (S1-1) sign supplemented with an AHEAD (W16-9P) plaque or an XX FEET (W16-2P or W16-2aP) plaque.

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Except as provided in paragraph one of the following Option, a School Advance Crossing assembly shall be used in advance (see Table 2C-4 for advance placement guidelines) of the first School Crossing assembly (see Section 7B.12) that is encountered in each direction as traffic approaches a school crosswalk (see Figure 7B-4).

OPTION:

The School Advance Crossing assembly may be omitted (see Figure 7B-5) where a School Zone (S1-1) sign (see Section 7B.9) is installed to identify the beginning of a school zone in advance of the School Crossing assembly.

If a school crosswalk is located on a cross street in close proximity to an intersection, a School Advance Crossing assembly with a supplemental arrow (W16-5P or W16-6P) plaque may be installed on each approach of the street or highway to warn road users making a turn onto the cross street that they will encounter a school crosswalk soon after making the turn.

7B.12 School Crossing Assembly

S1-1

W16-7P

STANDARD:

If used, the School Crossing assembly shall be installed at the school crossing (see Figures 7B-4 and 7B-5), or as close to it as possible, and shall consist of a School (S1-1) sign supplemented with a diagonal downward pointing arrow (W16-7P) plaque to show the location of the crossing.

The School Crossing assembly shall not be used at crossings other than those adjacent to schools and those on established school pedestrian routes.

The School Crossing assembly shall not be installed on approaches controlled by a STOP or YIELD sign or a traffic signal.

S4-3P

R1-6a

OR

R1-6c

OPTION:

The In-Street Pedestrian Crossing (R1-6a or R6-c) sign (see Section 2B.12) or the In-Street Schoolchildren Crossing (R1-6b or R1-6c) sign may be used at unsignalized school crossings. If used at a school crossing, a 12 x 4-inch SCHOOL (S4-3P) plaque may be mounted above the sign. The STATE LAW legend on the R1-6 series signs may be omitted.

The Overhead Pedestrian Crossing (R1-9 or R1-9a) sign (see Section 2B.12) may be modified to replace the standard pedestrian symbol with the standard schoolchildren symbol and may be used at unsignalized school crossings. The STATE LAW legend on the R1-9 series signs may be omitted.

STANDARD:

If an In-Street Pedestrian Crossing sign or an In-Street Schoolchildren Crossing sign is placed in the roadway, the sign support shall comply with the mounting height and breakaway special mounting support requirements for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12).

The In-Street Pedestrian Crossing sign, the In-Street Schoolchildren Crossing sign, and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.

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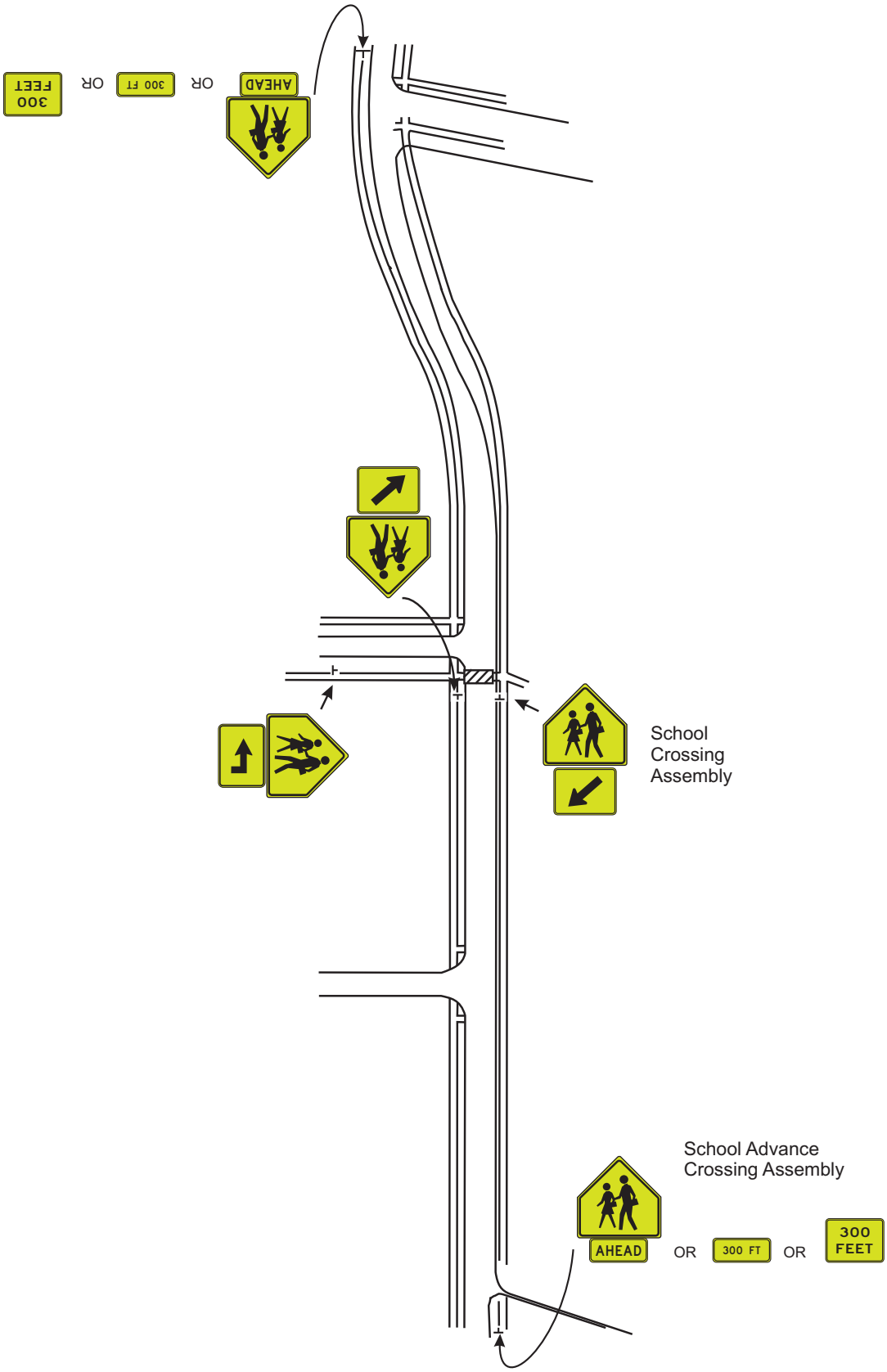


Figure 7B-4. Example of Signing for a School Crossing outside of a School Zone

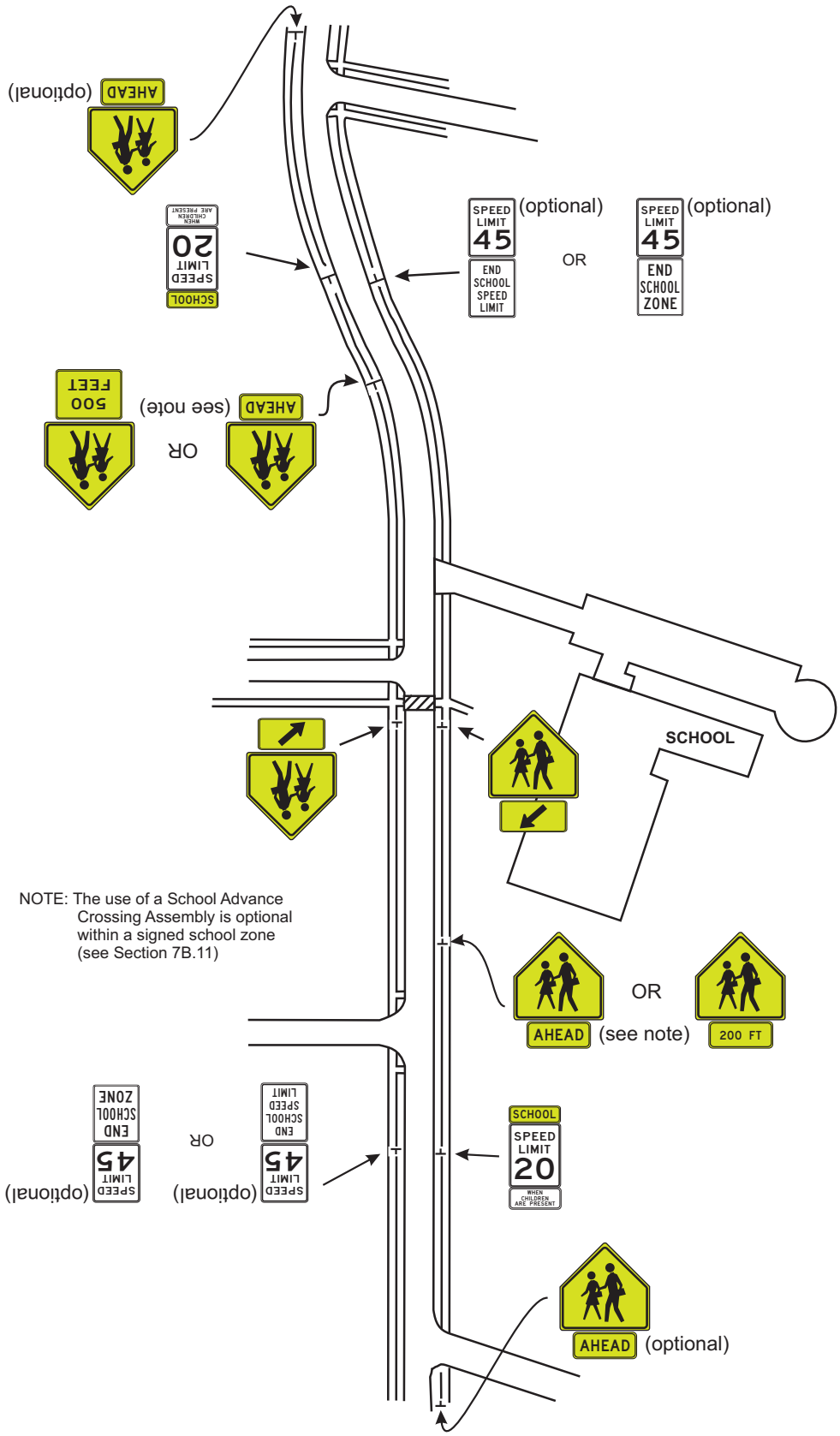


Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

7B.13 School Bus Stop Ahead Sign (S3-1)

S3-1

MN Rev. 1

STANDARD:

The School Bus Stop Ahead (S3-1) sign shall be installed in advance of locations where a school bus, when stopped to pick up or discharge passengers, is not visible to road users for an adequate distance and where there is no opportunity to relocate the school bus stop to provide adequate sight distance. See Table 2C-4 for adequate sight distances.

MN Rev. 1

7B.13.1 SCHOOL BUS LOADING AREA Sign (S3-X1)

S3-X1

STANDARD:

The School Bus Loading Area sign shall be used to clearly identify an area to both motorists and bus drivers. It shall be used when there is sufficient turnout width or turnout space available to accommodate such a loading area, and the local school authorities have requested the loading area. This loading area shall not be located within a designated and marked left or right turn lane nor in such a position as obstruct the view of other motorists or to create a hazard on the roadway. The sign shall be installed at the beginning of the loading area.

The following are criteria for the establishment of a school bus loading area:

1. Roadway shoulders must be wide enough to accommodate the full width of the bus.
2. There must be sufficient space beside the bus for passengers to stand safely during loading and unloading.
3. No loading area shall be established adjacent to an obstruction such as guardrail, culvert, mailboxes, etc.
4. No loading area shall be permitted in a designated and marked turn lane.
5. No loading area shall be located such that passengers are required to cross the roadway on the way to or from the bus.
6. The local school districts shall keep the appropriate road authority informed about plans to add or delete loading areas.

SUPPORT:

Refer to Minnesota Statue 169.443 and 169.444 for requirements associated with the use of this sign.

7B.14 SCHOOL BUS TURN AROUND Sign (S3-2a)

MN Rev. 1

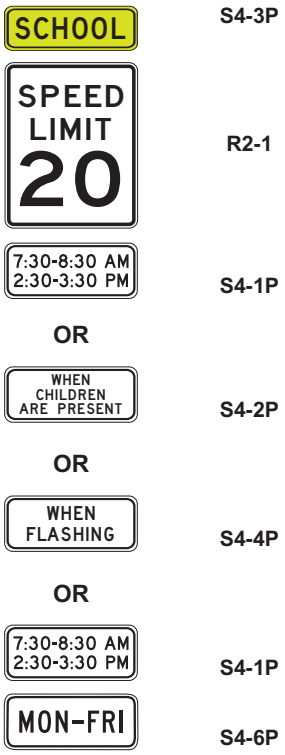
S3-2a

OPTION:

The SCHOOL BUS TURN AROUND (S3-2a) sign may be installed in advance of locations where a school bus turns around on a roadway at a location not visible to approaching road users for a distance as determined by the "0" column under Condition B of Table 2C-4, and where there is no opportunity to relocate the school bus turn around to provide the distance provided in Table 2C-4.

MN Rev. 2

7B.15 School Speed Limit Assembly (S4-1, S4-2, S4-3P, S4-4, S4-6, S5-1) and END SCHOOL SPEED LIMIT Sign (S5-3)



STANDARD:

A School Speed Limit assembly or a School Speed Limit (S5-1) sign shall be used to indicate the speed limit where a reduced school speed limit zone has been established based upon an engineering study or where a reduced school speed limit is specified for such areas by statute. The School Speed Limit assembly or School Speed Limit sign shall be placed at or as near as practical to the point where the reduced school speed limit zone begins (see Figures 7B-3 and 7B-5). It shall be used in conjunction with the School Advance Warning sign (see Section 7B.8).

If a reduced school speed limit zone has been established, a School (S1-1) sign shall be installed in advance (see Table 2C-4 for advance placement guidelines) of the first School Speed Limit sign assembly or S5-1 sign that is encountered in each direction as traffic approaches the reduced school speed limit zone (see Figures 7B-3 and 7B-5).

GUIDANCE:

Where increased fines are imposed for traffic violations within a reduced school speed limit zone, a FINES HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or $XX FINE (R2-6bP) plaque (see Figure 2B-3) should be installed as a supplement to the reduced school speed limit sign to notify road users.

STANDARD:

Except as provided in paragraph one of the following Option, the downstream end of an authorized and posted reduced school speed limit zone shall be identified with an END SCHOOL SPEED LIMIT (S5-3) sign (see Figure 7B-5).

OPTION:

If a reduced school speed limit zone ends at the same point as a higher fines zone, an END SCHOOL ZONE (S5-2) sign may be used instead of a combination of an END HIGHER FINES ZONE (R2-11) sign and an END SCHOOL SPEED LIMIT (S5-3) sign.

A standard Speed Limit sign showing the speed limit for the section of highway that is downstream from the authorized and posted reduced school speed limit zone may be mounted on the same post above the END SCHOOL SPEED LIMIT (S5-3) sign or the END SCHOOL ZONE (S5-2) sign.

GUIDANCE:

The beginning point of a reduced school speed limit zone should be at least 200 feet in advance of a school crossing, or other school related activities; however, this 200-foot distance should be increased if the reduced school speed limit is 30 mph or higher.

STANDARD:

The School Speed Limit Assembly shall be either a fixed-message sign assembly or a changeable message sign.

The fixed-message School Speed Limit assembly shall consist of a top plaque (S4-3P) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1P, S4-2P, S4-4P, or S4-6P) indicating the specific periods of the day and/or days of the week that the special school speed limit is in effect.

OPTION:

Changeable message signs (see Chapter 2L and Section 6F.60) may be used to inform drivers of the school speed limit. If the sign is internally illuminated, it may have a white legend on a black background. Changeable message signs with flashing beacons may be used for situations, where greater emphasis of the special school speed limit is needed.

GUIDANCE:

Even though it might not always be practical because of special features to make changeable message signs conform in all respects to the standards in this Manual for fixed-message signs, during the periods that the school speed limit is in effect, their basic shape, message, legend layout, and colors should comply with the standards for fixed-message signs.

A confirmation light or device to indicate that the speed limit message is in operation should be considered for inclusion on the back of the changeable message sign.

If supplemental plaques S4-1P or S4-2P are used to indicate the periods during which the school speed limit is in effect, considerations should be given to increasing the sign sizes to provide improved legibility. Section 2A.13, Table 7B-1, and Appendix C provides guidance regarding larger signs.

STANDARD:

Fluorescent yellow-green pixels shall be used when the "SCHOOL" message is displayed on a changeable message sign for a school speed limit.

OPTION:

Changeable message signs may use blank-out messages or other methods in order to display the school speed limit only during the periods it applies.

A Speed Limit Sign Beacon (see Section 4L.4) also may be used, with a WHEN FLASHING legend, to identify the periods that the school speed limit is in effect.

SUPPORT:

Under the provisions of Minnesota Statutes, Section 169.14, Subd. 5a, the Minnesota Department of Transportation has developed the publication "A Guide to Establishing Speed Limits in School Zones" describing the procedures for establishing school speed limits in Minnesota (see Chapter 7E).

MN Rev. 1

7B.16 Reduced School Speed Limit Ahead Sign (S4-5, S4-5a)

S4-5

S4-5a

GUIDANCE:

A Reduced School Speed Limit Ahead (S4-5, S4-5a) sign should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates

STANDARD:

If used, the Reduced School Speed Limit Ahead sign shall be followed by a School Speed Limit sign or a School Speed Limit assembly.

The speed limit displayed on the Reduced School Speed Limit Ahead sign shall be identical to the speed limit displayed on the subsequent School Speed Limit sign or School Speed Limit assembly.

7B.17 Parking and Stopping Signs (R7 and R8 Series)

MN Rev. 1

OPTION:

Parking and stopping regulatory signs may be used to prevent parked or waiting vehicles from blocking pedestrians' views, and drivers' views of pedestrians, and to control vehicles as a part of the school traffic plan.

SUPPORT:

Parking signs and other signs governing the stopping and standing of vehicles in school areas cover a wide variety of regulations. Typical examples of regulations are as follows:

A. No Parking 8:00 AM to 5:00 PM School Days Only;
B. No Stopping 8:00 AM to 5:00 PM School Days Only;
C. 5 Min Loading 8:00 AM to 5:00 PM School Days Only; and
D. No Standing 8:00 AM to 5:00 PM School Days Only.

Sections 2B.46, 2B.47, and 2B.48 contain information regarding the signing of parking regulations in school zone areas.

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

7C. Markings

7C.1 Functions and Limitations

SUPPORT:

Markings have definite and important functions in a proper scheme of school area traffic control. In some cases, they are used to supplement the regulations or warnings provided by other devices, such as traffic signs or signals. In other instances, they are used alone and produce results that cannot be obtained by the use of any other device. In such cases they serve as a very effective means of conveying certain regulations, guidance, and warnings that could not otherwise be made clearly understandable.

Pavement markings have some potential limitations. They might be obscured by snow, might not be clearly visible when wet, and might not be durable when subjected to heavy traffic. In spite of these potential limitations, they have the advantage, under favorable conditions, of conveying warnings or information to the road user without diverting attention from the road.

7C.2 Crosswalk Lines

MN Rev. 1

GUIDANCE:

Crosswalks should be marked at all intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and student movements; where students are encouraged to cross between intersections; or where students would not otherwise recognize the proper place to cross; or where motorists or bicyclists might not expect students to cross (see Figure 7A-1).

Crosswalk lines should not be used indiscriminately. An engineering study considering the factors described in Section 3B.18 should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign.

The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

Because non-intersection school crossings are generally unexpected by the road user, warning signs (see Sections 7B.11 and 7B.12) should be installed for all marked school crosswalks at non-intersection locations.

Adequate visibility of students by approaching motorists and of approaching motorists by students should be provided by parking prohibitions or other appropriate measures.

SUPPORT:

Section 3B.18 contains provisions regarding the placement and design of crosswalks, and Section 3B.16 contains provisions regarding the placement and design of the stop lines and yield lines that are associated with them. Provisions regarding the curb markings that can be used to establish parking regulations on the approaches to crosswalks are contained in Section 3B.23.

7C.3 Pavement Word, Symbol, and Arrow Markings

OPTION:

If used, the SCHOOL word marking may extend to the width of two approach lanes (see Figure 7C-1).

GUIDANCE:

If the two-lane SCHOOL word marking is used, the letters should be 10 feet or more in height.

SUPPORT:

Section 3B.20 contains provisions regarding other word, symbol, and arrow pavement markings that can be used to guide, warn, or regulate traffic.

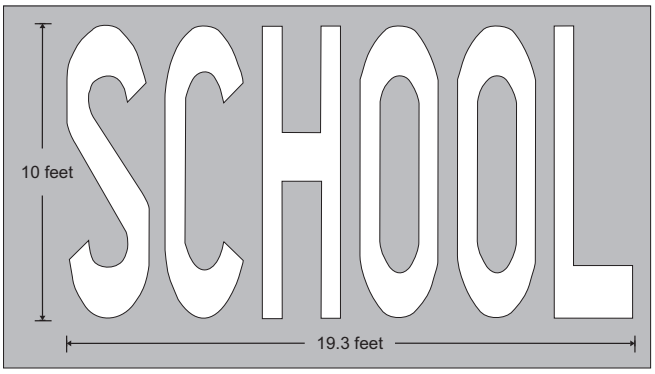


Figure 7C-1. Two-Lane Pavement Marking of "SCHOOL"

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

7D. Crossing Supervision

7D.1 Types of Crossing Supervision

SUPPORT:

There are three types of school crossing supervision:

A. Adult control of pedestrians and vehicles by adult crossing guards

B. Adult control of pedestrians and vehicles by uniformed law enforcement officers, and

C. Student and/or parent control of only pedestrians with student and/or parent patrols.

Information regarding the organization, administration and operation of a school safety patrol program is contained in "AAA School Safety Patrol Operations Manual" (see Section 1A.11).

7D.2 Adult Crossing Guards

OPTION:

Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps must be created (See Section 7A-3) and where authorized by law.

7D.3 Choice of Adult Guards

SUPPORT:

High standards for selection of adult crossing guards are essential because they are responsible for the safety of and the efficient crossing of the street by schoolchildren within and in the immediate vicinity of school crosswalks.

GUIDANCE:

Adult crossing guards should possess the following minimum qualifications:

A. Average intelligence;

B. Good physical condition, including sight, and hearing;

C. Ability to control a STOP paddle effectively to provide approaching road users with a clear, fully direct view of the paddle's STOP message during the entire crossing movement;

D. Ability to communicate specific instructions clearly, firmly, and courteously;

E. Ability to recognize potentially dangerous traffic situations and warn and manage students in sufficient time to avoid injury.

F. Mental alertness;

G. Neat appearance;

H. Good character;

I. Dependability; and

J. An overall sense of responsibility for the safety of students.

K. Completion of an official training program.

7D.4 Uniform of Adult Crossing Guards

STANDARD:

Law enforcement officers performing school crossing supervision and adult crossing guards shall wear high-visibility retroreflective safety apparel labeled as ANSI 107-2004 standard performance for Class 2 as described in Section 6E.2.

Compliance Date: December 31, 2011

MN Rev. 1

7D.5 Operating Procedures for Adult Crossing Guards

STANDARD:

Adult crossing guards shall not direct traffic in the usual law enforcement regulatory sense. In the control of traffic, they shall pick opportune times to create a sufficient gap in the traffic flow. At these times, they shall stand in the roadway to indicate that pedestrians are about to use or are using the crosswalk, and that all vehicular traffic must stop.

Adult crossing guards shall use a STOP paddle. The STOP paddle shall be the primary hand-signaling device and shall be used as shown in Section 6K (the Field Manual) of this Manual..

The STOP (R1-1) paddle shall be an octagonal shape. The background of the STOP face shall be red with at least 6-inch series upper-case white letters and border. The paddle shall be at least 18 inches in size and have the word message STOP on both sides. The paddle shall be retroreflectorized or illuminated when used during hours of darkness.

OPTION:

The STOP paddle may be modified to improve conspicuity by incorporating white or red flashing lights on both sides of the paddle. Among the types of flashing lights that may be used are individual LEDs or groups of LEDs.

The white or red flashing lights or LEDs may be arranged in any of the following patterns:

A. Two white or red lights centered vertically above and below the STOP legend,

B. Two white or red lights centered horizontally on each side of the STOP legend,

C. One white or red light centered below the STOP legend,

D. A series of eight or more small white or red lights having a diameter of 1/4 inch or less along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the STOP paddle (more than eight lights may be used only if the arrangement of the lights is such that it clearly conveys the octagonal shape of the STOP paddle), or

E. A series of white lights forming the shapes of the letters in the legend.

STANDARD:

If flashing lights are used on the STOP paddle, the flash rate shall be at least 50, but no more than 60, flash periods per minute.

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

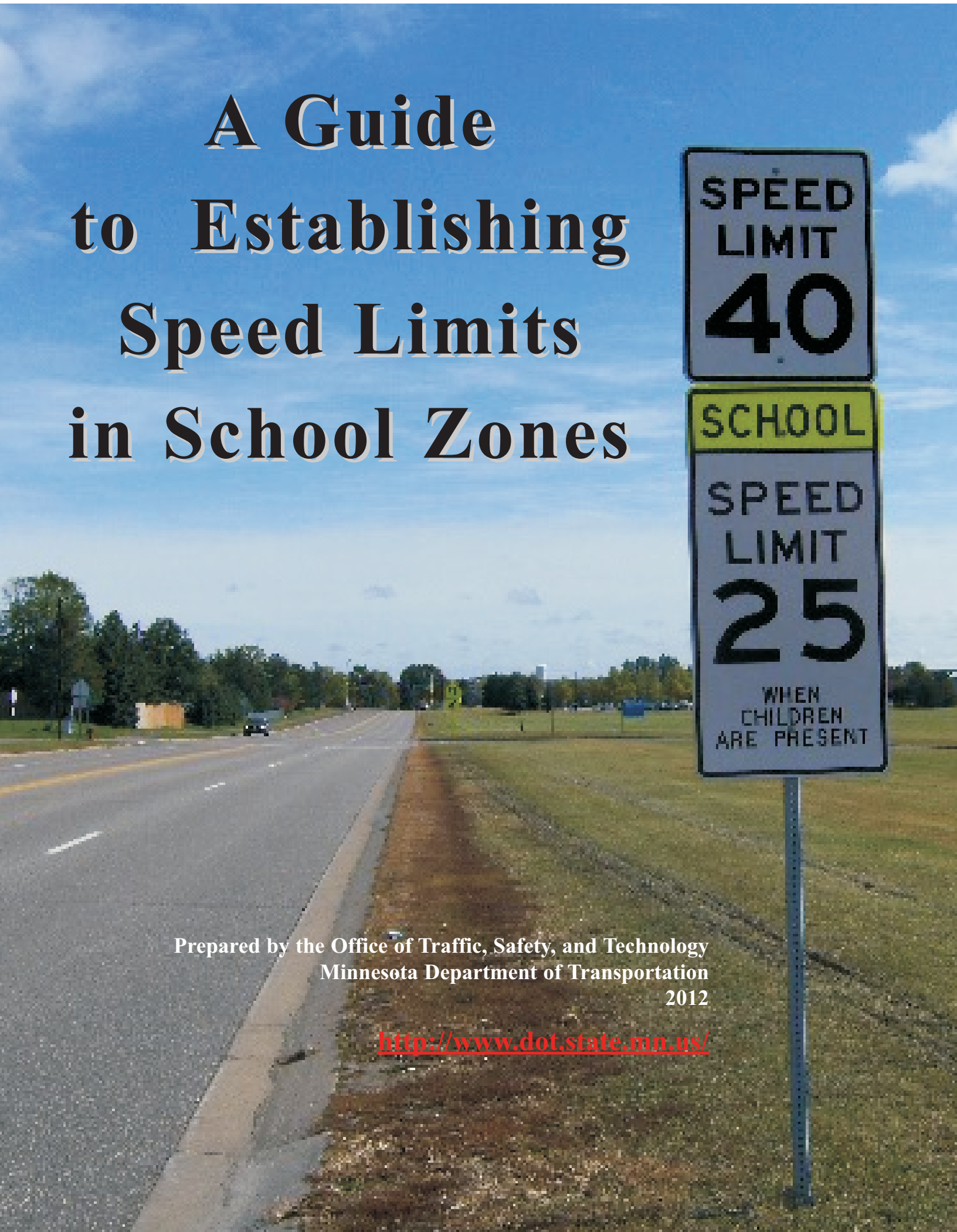
7E. Speed Limits in School Zones

7E.1 Establishing Speed Limits in School Zones

STANDARD:

When school speed limits are being established, they shall follow the guidelines set forth starting on the following pages.

A Guide to Establishing Speed Limits in School Zones



Prepared by the Office of Traffic, Safety, and Technology
Minnesota Department of Transportation
2012

http://www.dot.state.mn.us/

A Guide to Establishing Speed Limits in School Zones

TABLE OF CONTENTS

page

Preface 7E-ii

Introduction and Legislation 7E-1

The Law 7E-2

Definitions 7E-3

School Child Crash Experience 7E-4

The Traffic Engineering Investigation 7E-6

School Route Plan 7E-6

School Zone Hazard Evaluation 7E-7

Traffic Calming Methods 7E-13

Safety Education 7E-14

Special Situations 7E-15

Photo Credits and Bibliography 7E-21

FIGURES

Figure 1 - Sample School Route Plan 7E-16

Figure 2 - Tabular Listing 7E-17

Figure 3 - Road Log A 7E-18

Figure 4 - Road Log B 7E-19

Figure 5 - Sign Placement Diagram 7E-20

PREFACE

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.

THE LAW

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 Minnesota 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. "

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.

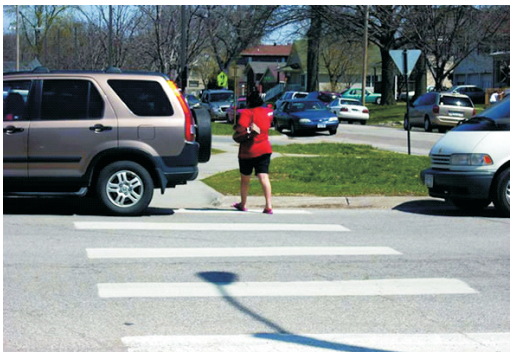
3) Pedestrian Volumes Information Needed

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 study5 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 reoccurring 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 recommended 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 authorized by the MnDOT 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 baseball 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 corrected, 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 research7 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 higher-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 MnDOT 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.

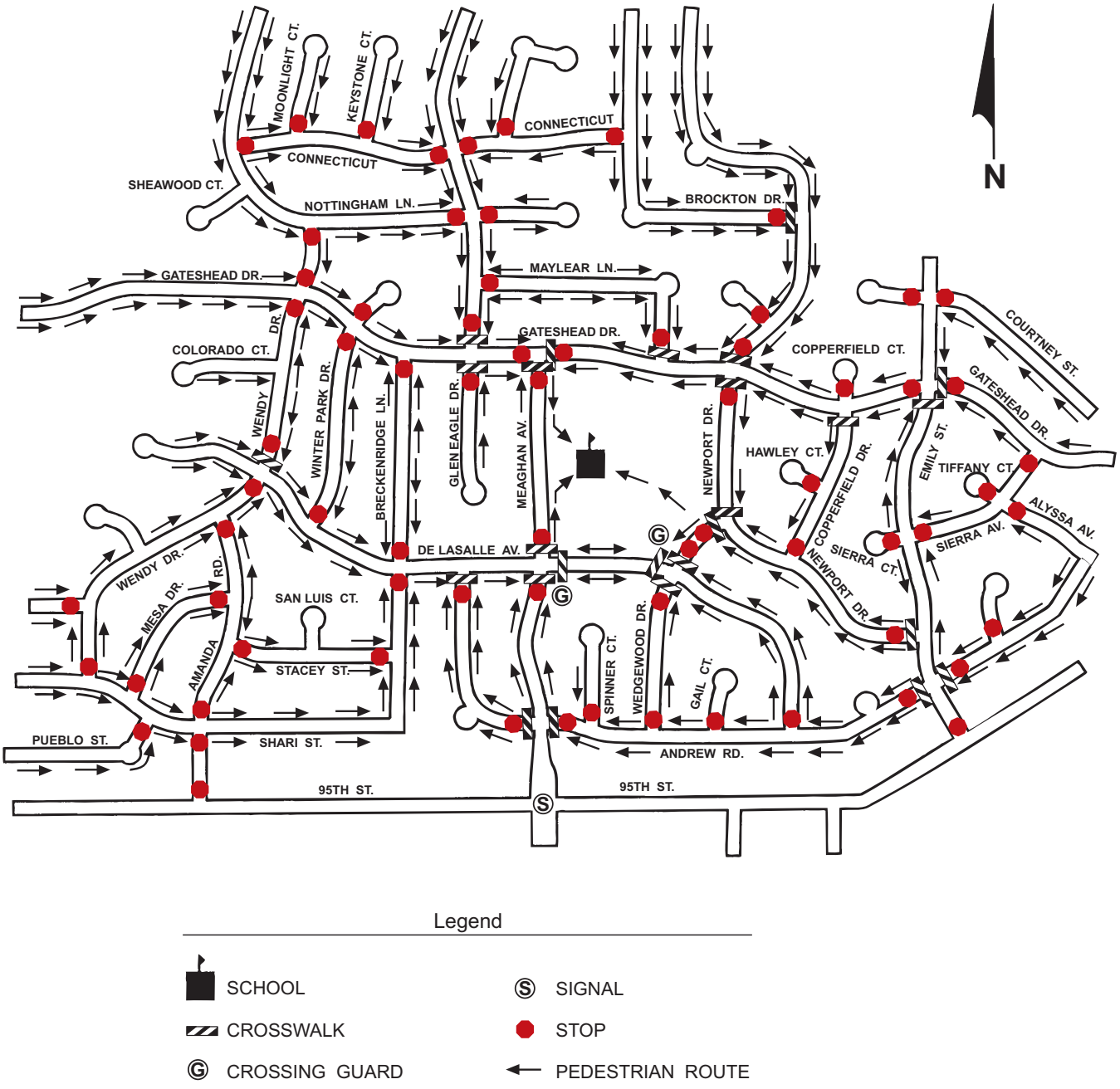
SPECIAL SITUATIONS

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

Figure 2

Sample

Tabular Listing of Safety Issues for Obama Elementary School

Problem Number : #1

Location: On Ford St. between Lincoln Rd.and Victoria Rd.
Description: Sidewalk broken with missing sections
Extent: 440 feet, children walking in the street
Posted Speed: 30 MPH
Traffic Volume: 150 vph during school walking time - 7-8 AM : 3-4 PM
Number of Students Affected: 30 students, elementary age
Recommended Action: Advise city public works to replace sidewalk.

Problem Number : #2

Location: Chrysler Ave. intersection with Ford St.
Description: Chrysler Ave. is a 5-lane road
Extent: Very wide, 66 feet. with no supervision.
Posted Speed: 35 MPH
Traffic Volume: 400 vph during school opening and closing hours
Number of Students Affected: 50 Elementary children crossing
Recommended Action: School District needs to provide adult crossing guard

Problem Number : #3

Location: State Trunk Highway Route 66
Description: School Advance Sign S1-1 is completely dark at night
Extent: MN MUTCD requires sign to be reflective at night
Posted Speed: 40 MPH
Traffic Volume: AADT 3000
Number of Students Affected: Many - This is primary bus entrance and student pick up area for extracurricular activities.
Recommended Action: Advise state transportation department to replace non-retroreflective sign to improve drivers' awareness of approaching school bus and student loading zone.

Problem Number : #4

Location: County Road 77 and Ford St.
Description: Crosswalk at intersection.
Extent: Crosswalk markings are nearly worn off where there are student crossing guards
Posted Speed: 30 MPH
Traffic Volume: 300 vph during school opening and closing hours
Number of Students Affected: 80 elementary and middle school students
Recommended Action: Contact the county engineer to repaint crosswalk or consider more durable pavement markings.

Figure 3

ROAD LOG (A)

EXAMPLE

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)

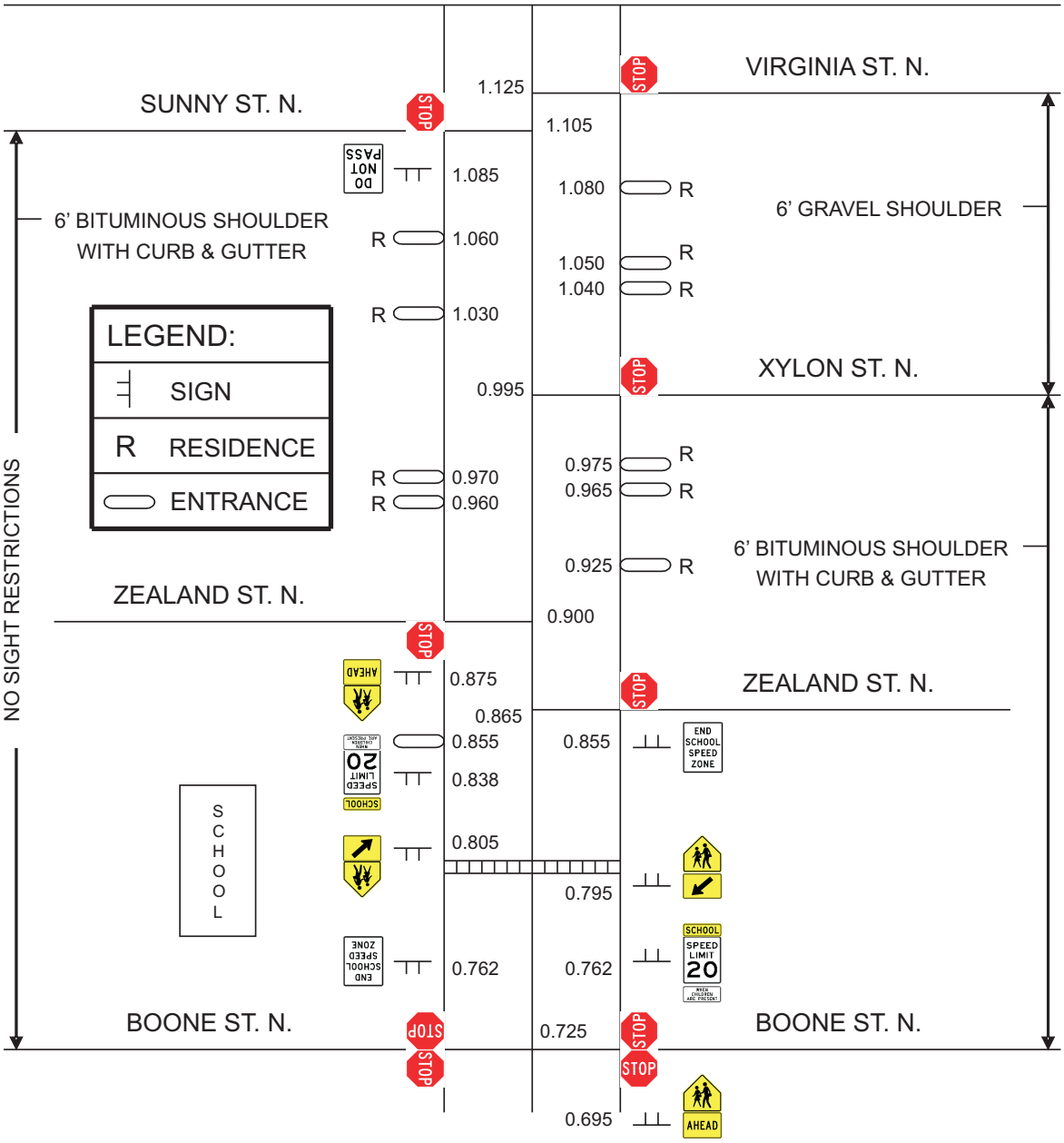


Figure 4

ROAD LOG (B)

EXAMPLE

DATE 5-3-2008 PROCESSED BY E. Brown

ROAD 62nd Ave North APPROX. LENGTH OF ZONE 0.3 miles

ROADWAY:

TYPE Bituminous

WIDTH 24'

CONDITION Fair

SHOULDER:

TYPE Bituminous

WIDTH 8'

CONDITION Good

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.

Figure 5

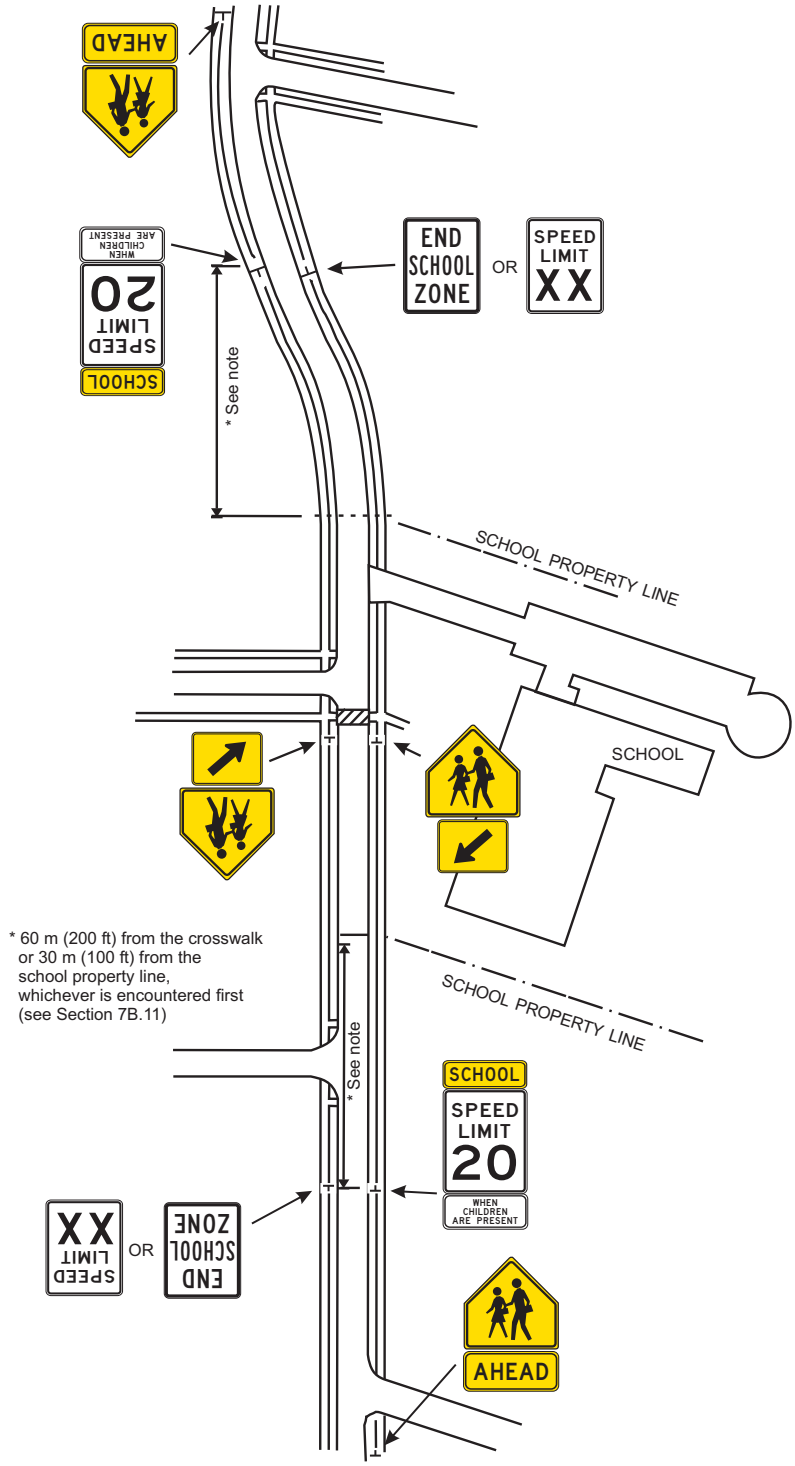


Figure 7B-3. Examples of Signing for School Area Traffic Control with School Speed Limits

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 - photographer Dan Burden, downloaded Aug 1, 2009

Route Plan, Traffic Volume, School Patrol and Pedestrian Waiting pictures from http://www.pedbikeimages.org - photographer Dan Burden, downloaded Aug 1, 2009

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

Fenced Playground, Police Car by Sign, and Bump Out pictures -photographer Dan Brannan, MnDOT, Oct., 2009.

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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

6) **School Safety Planning**, prepared by Goodell-Grivas, Inc., for the Michigan State Univ., distribution by Michigan Resource Center, Sept. 1996

7) **Operating Speed Characteristics in School Speed Zones in Texas**, TRB Report Paper #09-3031, Brewer, Marcus A. and Fitzpatrick, Kay, 2009 TRB Annual Meeting.