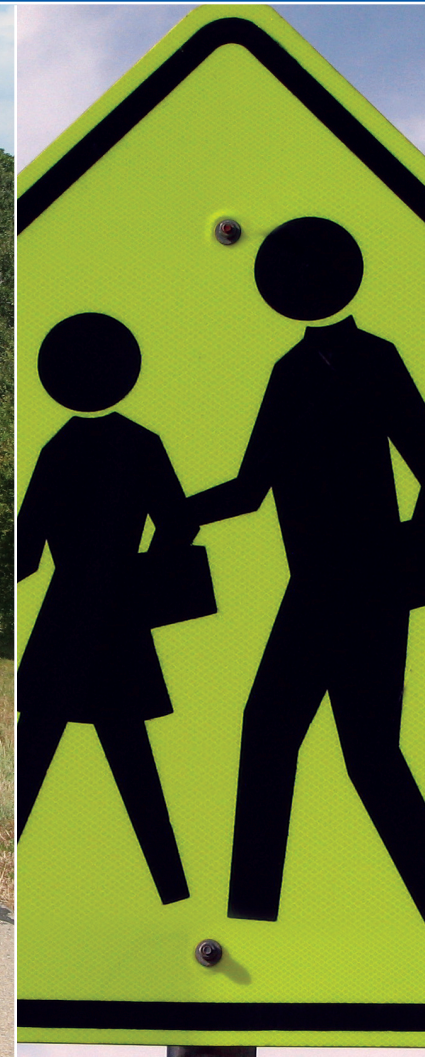


# Guidelines for Traffic Control for School Areas

February 2009  
0-5470-1 (Appendix A)





**APPENDIX A**

**GUIDELINES FOR TRAFFIC CONTROL FOR SCHOOL AREAS**

**of**

**TxDOT REPORT 0-5470-1: SPEEDS IN SCHOOL ZONES**

Project 0-5470

Project Title: Comprehensive Guide to Traffic Control Near Schools

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## INTRODUCTION

To achieve uniformity of traffic control in school areas, comparable traffic situations need to be treated in a consistent manner. The *Texas Manual on Uniform Traffic Control Devices* (TMUTCD) Part 7 (available at: [http://www.txdot.gov/txdot\\_library/publications/government/project\\_development/traffic\\_operations.htm](http://www.txdot.gov/txdot_library/publications/government/project_development/traffic_operations.htm)) provides information on traffic control devices related to schools. The Texas Department of Transportation (TxDOT) manual on *Procedures for Establishing Speed Zones* provides information on school speed zones. A recent TxDOT project (0-5470) investigated school speed zones and developed the *Guidelines for Traffic Control for School Areas* contained in this appendix. The purpose of these *Guidelines* is to augment the TMUTCD by providing additional background and information to assist in the traffic control device applications. The *Guidelines* are not intended to establish policy or procedures; rather they are to give typical guidance. Although the text may contain the words “shall,” “should,” or “may,” it is not intended that these words or their usage have the same implications as in the TMUTCD. An engineering and traffic investigation should be conducted to determine the need for a school speed limit as well as all appropriate traffic control devices.

## SCHOOL LOCATION

A previous TxDOT research project developed recommended guidelines regarding traffic operations and safety at schools (available at: <http://tti.tamu.edu/documents/4286-2.pdf>). An initial principle developed and emphasized in several discussions is the desire to have schools located with appropriate accessibility from the adjacent roadway network based on the type of school. One of the prominent site selection criteria was to avoid locations with direct access to high-speed roadways (e.g., trunk highways and frontage roads). Locations should be chosen on roadways with the lowest speed limit and/or lowest average daily traffic. Also suggested was to locate a school so that students approaching on foot would not have to cross main traffic routes and to consider locating schools adjacent to other community facilities where there is potential for shared-use parking (e.g., parks, churches, etc.).

Maintaining contact with school officials can help TxDOT become aware of proposed school site designs at an early stage. When proposed building plans are known, suggestions on access points can be made that could minimize future problems. Also the installation of appropriate safety and traffic control devices can be scheduled to be in place when needed. An engineering and traffic investigation should be conducted to determine the need for traffic control devices.

## DEFINITIONS

Following are definitions for use with these *Guidelines*.

School = location where children in grades from kindergarten through the 12<sup>th</sup> grade receive academic instruction.

School Area = the portion of the roadway adjacent to school building(s) or grounds or where school-related activity is occurring.

School Zone = a defined portion of a roadway associated with a school.

School Speed Limit Zone = a defined portion of the roadway where a school speed limit is present.

School Speed Limit = a speed limit posted in a school zone that is lower than the regulatory speed limit in that zone and is applicable during specific times of day on school days, when children are present, or when beacons are flashing.

School Buffer Zone = a defined portion of the highway in advance of and/or following a school speed limit zone where a school buffer speed limit is present.

School Buffer Speed Limit = a speed limit posted in a school zone that is lower than the regulatory speed limit in that zone but higher than the school speed limit, used to provide a transition between higher posted speed and school zone speed; it is applicable during the same time periods as the associated school speed limit.

School Entrance Warning Assembly = combination of signs warning drivers of the presence of a school entrance. The combination may be accompanied by an advisory speed plaque.

School Route Plan (also known as School Route Map) = a plan developed in a systematic manner by the school, law enforcement, and traffic officials responsible for school pedestrian safety. It consists of a map showing streets, the school, existing traffic controls, established school walk routes, and established school crossings. See the TMUTCD or Safe Routes to School website (<http://www.saferoutesinfo.org/>) for additional discussion. School speed limit zones shall only be located along child access routes as indicated on the school route plan.

Traffic Control Devices = all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, bikeway, public facility, or private property open to public travel by authority of a public agency or official having jurisdiction.



## SCHOOL AREA

Some jurisdictions find it beneficial to advise road users that they are approaching a school that is adjacent to a highway, where additional care is needed, even though no school crossing is involved and the speed limit remains unchanged. The portion of the roadway adjacent to school building or grounds or where school-related activity is occurring adjacent to the highway can be defined as the “school area.” The S1-1 School sign can be used to warn road users that they are approaching a school area. [Figure A-1](#) shows an example of signing for a school area. [Table A-1](#) lists suggested dimensions for the spacing distance shown in [Figure A-1](#).

**Table A-1. Suggested Dimensions for Distance d in [Figure A-1](#).**

Posted or 85 <sup>th</sup> percentile speed (mph)	25	30	35	40	45	50	55	60	65	70
Distance (d) between School (S1-1) sign and school driveway (ft)	100 to 325	100 to 450	100 to 550	125 to 650	175 to 750	250 to 850	325 to 950	400 to 1100	475 to 1200	550 to 1250

## SCHOOL SPEED LIMIT ZONE

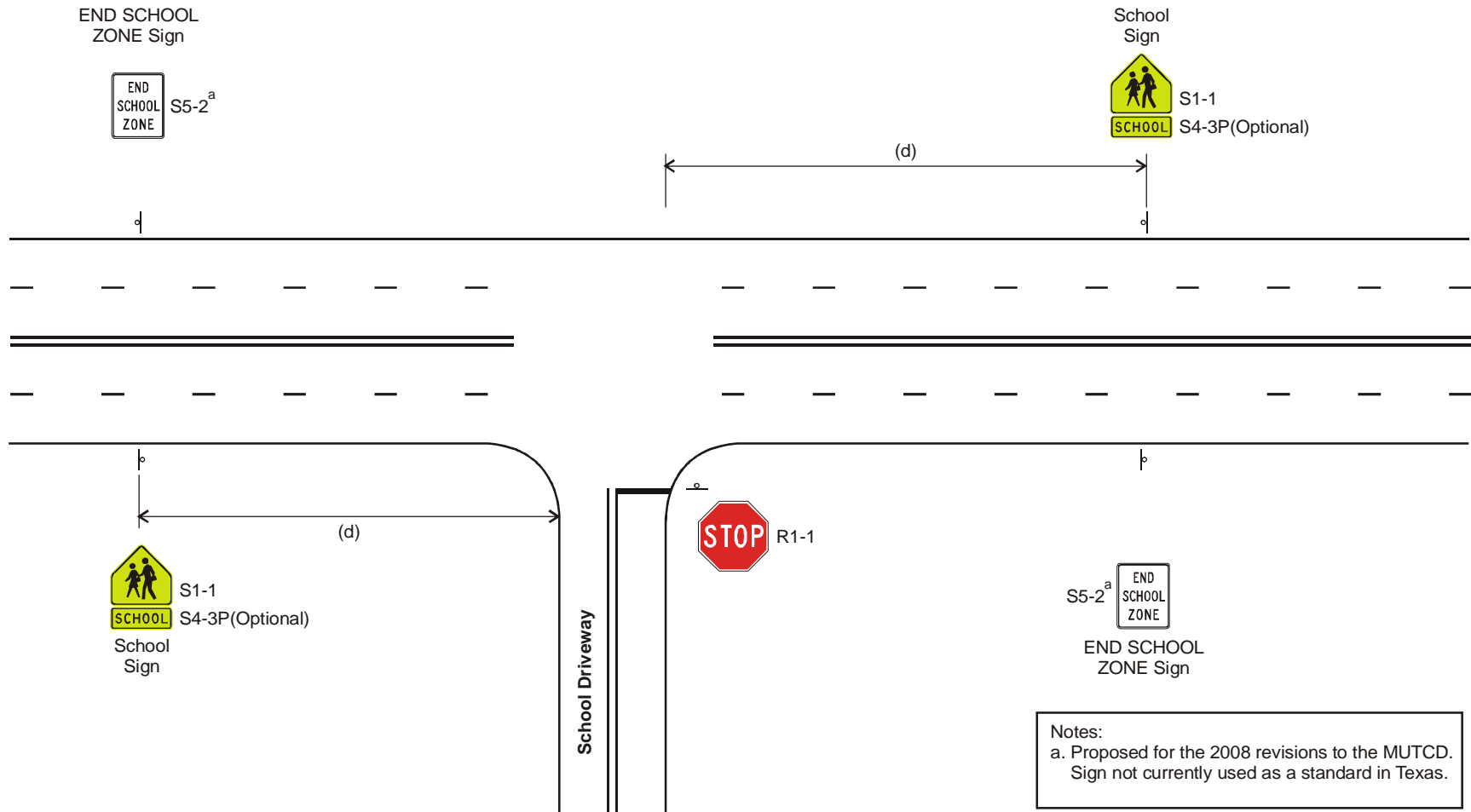
A school speed limit zone can be considered for the following conditions:

- School-age pedestrians are crossing the major roadway going to and from school.
- School is located adjacent to highways or is visible from highways.

School speed limit zones are typically not used at signalized or stop-controlled intersections because their traffic control creates gaps that can be used by school-age pedestrians to cross a roadway. A school speed limit zone may be installed, or may be allowed to remain, at a roundabout, signalized, or stop-controlled intersection as a mitigation measure for concerns related to sight distance, grade, or other critical issues, as determined by an engineering study.

The school speed limit zone is to be shown on the School Route Plan.

A speed zone strip map should be prepared if a reduced school speed limit is planned. A regular speed zone must not change within the limits of a school speed zone since posting of a Speed Limit (R2-1) sign would prematurely terminate the school speed zone. Speed limits remain fixed until a revised limit is encountered.



**Figure A-1. Typical School Area Signing (See Table A-1 for Suggested Dimensions for Distance d).**

The signing and markings for a school speed limit zone can include the following:

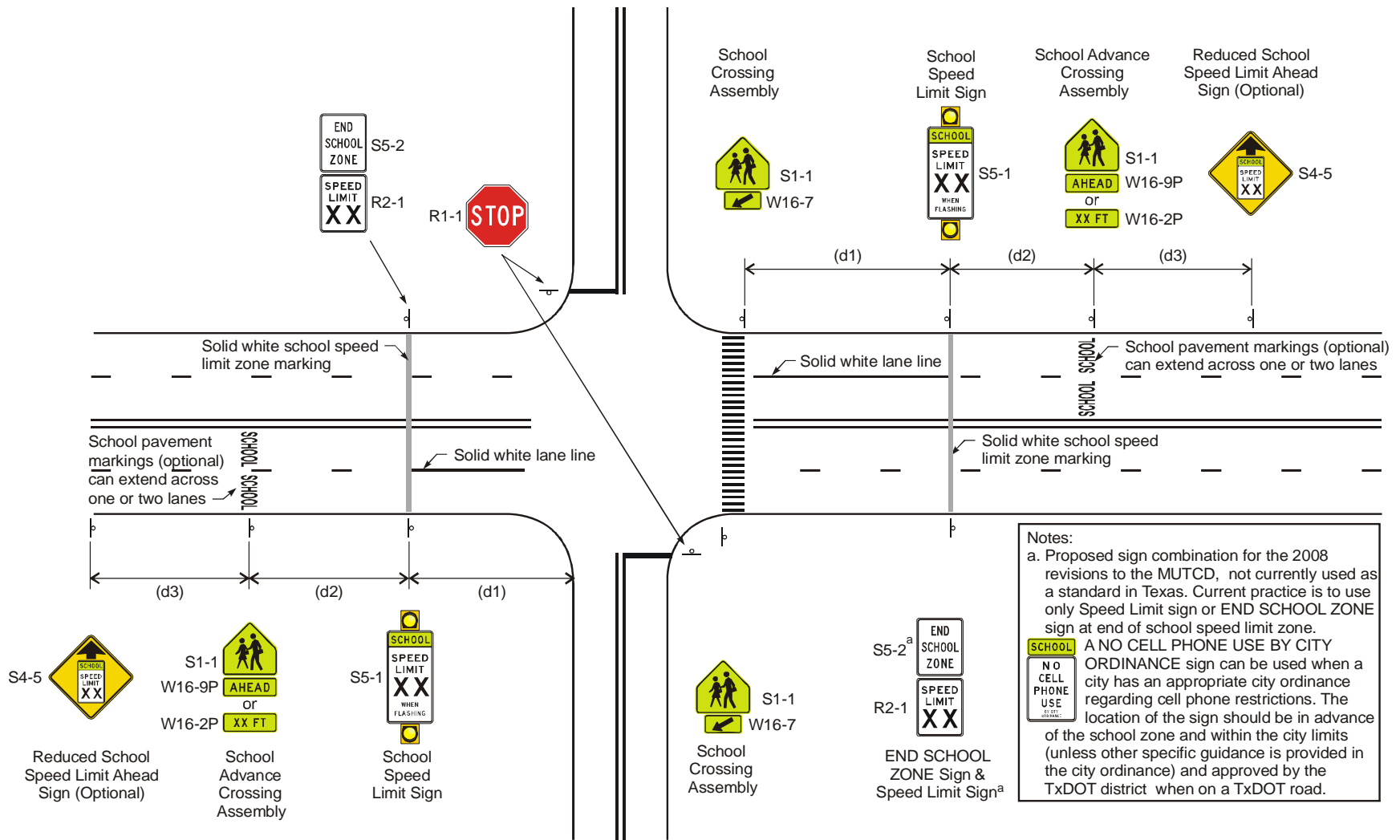
- the Reduced School Speed Limit Ahead (S4-5, S4-5a) sign (if included),
- the School Advance Crossing assembly (if included),
- SCHOOL marking on pavement (if included),
- the School Speed Limit (S5-1) sign,
- the School Crossing assembly (if included) and marked crosswalk (if included),
- the solid white school speed limit zone marking, and
- the appropriate Speed Limit (R2-1) sign. (Note that the 2008 proposed revisions to the MUTCD changes the requirement for the sign at the end of a school speed limit zone to include the END SCHOOL ZONE (S5-2) sign in combination with a Speed Limit (R2-1) sign on the same pole. TxDOT is examining the recommendation and will make a decision following the publication of the next edition of the MUTCD.)

Typical signing and pavement markings for a school speed limit zone are shown in [Figure A-2](#) and [Figure A-3](#). [Table A-2](#) includes the suggested dimensions for distance d1, d2, and d3 (shown in [Figure A-2](#) and [Figure A-3](#)).

Districts should initiate the installation of school speed limit signs and flashers immediately after submitting the request to the Traffic Operations Division (TRF) for Commission action or city ordinance approval. These signs should be in operation as soon as practical after the minute order is approved by the Transportation Commission or the city ordinance is approved by the city. If, for some reason, there is a delay in the installation of a school flasher, other static signs for school zones can be installed as temporary measures after the minute order or city ordinance is enacted.

**Table A-2. Suggested Dimensions for Distances in Figure A-2 and Figure A-3.**

<b>Posted or 85<sup>th</sup> percentile speed (mph)</b>	<b>25</b>	<b>30</b>	<b>35</b>	<b>40</b>	<b>45</b>	<b>50</b>	<b>55</b>	<b>60</b>	<b>65</b>	<b>70</b>
Distance (d3) between Reduced School Speed Limit Ahead (S4-5) sign (optional) and School Advance Crossing assembly (ft)	100	120	160	240	320	400	500	600	700	800
Distance (d2) between School Advance Crossing assembly and School Speed Limit (S5-1) sign (ft)	100	120	160	240	320	400	500	600	700	800
Distance (d1) between School Speed Limit (S5-1) sign and school driveway or marked crosswalk (and School Crossing assembly, when appropriate) (ft)	200	200	200	300	300	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>
Minimum solid white lane line in advance of marked crosswalk or school driveway (ft)	200	200	200	300	300	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>	400 <sup>1</sup>
<p><b>NOTES:</b>  <sup>1</sup>On higher-speed roadways a system of treatments is needed for pedestrians—a marked crosswalk should not be used without additional pedestrian treatments. The installation of a marked crosswalk and pedestrian signs does not necessarily result in more vehicles stopping for pedestrians. Therefore, treating a location to improve pedestrian access or safety should include several components. For example, in addition to traffic control devices, geometric improvements may be used to shorten the crossing distance. Traffic calming may be used to slow vehicle speeds near the pedestrian crossing. Additional traffic control devices may be needed.</p>										



**Figure A-2. Typical School Speed Limit Zone with Marked Crosswalk at a Two-Way Stop-Controlled Intersection (See Table A-2 for Suggested Dimensions for Distance d1, d2, and d3).**





## SCHOOL SPEED LIMIT ZONE CHARACTERISTICS

### School Speed Limit Value

The suggested value for the school speed limit is listed in [Table A-3](#). Factual studies, reason, and sound engineering judgment, rather than emotion, should govern the final decision on the maximum deviation from the 85<sup>th</sup> percentile speed, which will provide a reasonable and prudent speed limit.

**Table A-3. Suggested School Speed Limit Based on 85<sup>th</sup> Percentile Speed.**

<b>85<sup>th</sup> Percentile Speed</b>	<b>Suggested School Speed Limit</b>
Below 55 mph	Not more than 15 mph below 85 <sup>th</sup> percentile speed or posted speed. Not to exceed a 35 mph school speed limit.
55 mph	20 mph below the 85 <sup>th</sup> percentile speed or posted speed
Greater than 55 mph	Use buffer zone to transition to a 35 mph school speed limit

### School Speed Limit Zone Beginning Location

The 2006 TMUTCD states that the School Speed Limit Zone should begin either at a point 200 ft from the crosswalk, or from the first driveway on school property, whichever is encountered first as traffic approaches the school. Researchers suggest having the beginning of the School Speed Limit Zone based upon the school speed limit as follows:

<b>School Speed Limit (mph)</b>	<b>Distance to Crosswalk or First Driveway (ft)</b>
20	200
25	200
30	300
35	400

The location of the beginning and end of a school speed limit zone should be based on engineering judgment rather than the exact location of the school property line or fence. A practice in Texas is to end the school speed limit zone at the same location as the opposing school speed limit zone begins and to use a transverse solid white line across all travel lanes to mark the beginning and ending of a school speed limit zone.

## **School Speed Limit Zone Length**

The school speed limit zone should be centered at the location(s) where school-age pedestrians are crossing the roadway or where school-related traffic is leaving and entering the roadway. The beginning and ending points should be selected with appropriate consideration for the location of other traffic control devices and/or features that could impact the effective implementation of the school speed limit zone.

School speed limit zones in urban areas where speeds are 30 mph or less may have school zones as short as 400 ft.

School speed limit zones in rural areas where regulatory posted speeds are typically 55 mph or more will have longer school zones. The suggested length for zones in rural areas is 1000 ft.

Research has shown that speeds are approximately 1 mph higher for every 500 ft driven within a school zone; therefore, longer school zones are associated with greater speed variability within the zone.

When the speed reduction between the regulatory speed limit and the selected school speed limit is greater than 20 mph, a buffer zone is to be used (see following section on School Buffer Zones). Buffer zones are typically 500 ft in length.

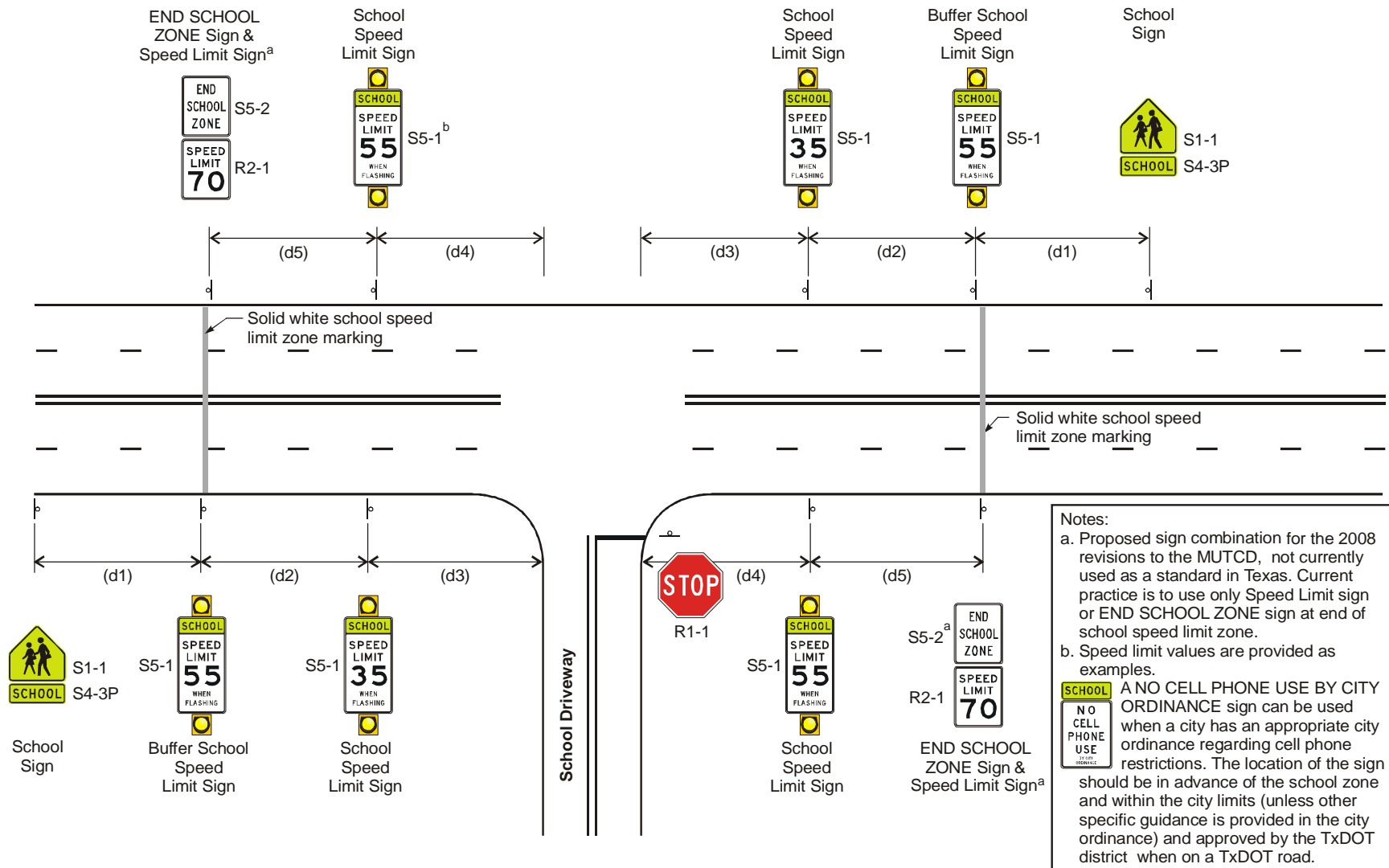
## **School Buffer Zone**

Any roadway with an 85<sup>th</sup> percentile speed greater than 55 mph is to have a buffer zone to transition to a 35-mph school speed limit. Buffer zones permit motorists to travel at the higher posted speeds through both zones when slower speeds are not necessary. An example of a buffer zone is where the regulatory posted speed limit is 70 mph and the school speed limit is 35 mph. In this case a buffer zone of 55 mph can be used on the approach and departure sides of the 35-mph school speed limit zone (see [Figure A-4](#)). [Table A-4](#) includes the suggested dimensions for the distances shown in [Figure A-4](#).

The basic design for a Buffer School Zone (S5-1) sign is the same as for a regular School Speed Limit (S5-1) sign. The SCHOOL SPEED LIMIT XX WHEN FLASHING sign should be used where TxDOT is responsible for signing school speed limit zones and school buffer zones. The buffer zone beacons can be activated up to 5 minutes earlier than the school speed limit zone to eliminate drivers who pass through the buffer zone while it is inactive seeing active beacons only in the lower speed zone.

**Table A-4. Suggested Dimensions for Distances in Figure A-4.**

Posted or 85 <sup>th</sup> Percentile Speed (mph)	70	65	60
School Speed Limit (mph)	35	35	35
Suggested Buffer Speed Limit (mph)	55	50	50
Distance (d1) Between School (S1-1) sign to School Buffer Speed Limit (S5-1) sign (ft)	800	700	600
Distance (d2) Between School Buffer Speed Limit (S5-1) sign to School Speed Limit (S5-1) sign (ft)	500		
Distance (d3) Between School Speed Limit (S5-1) sign to school driveway (ft)	400		
Distance (d4) Between school driveway to School Buffer Speed Limit (S5-1) sign (ft)	Same as d3		
Distance (d5) Between School Buffer Speed Limit (S5-1) sign to Speed Limit (R2-1) sign (ft)	Same as d2		



**Figure A-4. Typical School Speed Limit Zone with School Buffer Zones, Example Shown for Posted Speed of 70 mph (see Table A-4 for Suggested Dimensions for Distance d1, d2, d3, d4, and d5).**

## **Active Times**

Generally, the zones indicated on the signs should be in effect only during the following specified intervals:

- from approximately 30 minutes before and 5 minutes after classes begin,
- from the beginning to the end of the lunch period for open campuses, and
- from approximately 5 minutes before and 30 minutes after classes end.

The intervals of operation of the flashing beacons on the school speed limit assemblies may be extended or revised for school events as mutually agreed upon by the school district and the entity responsible for the operation of the flashing beacons. In this case, the flashing beacons should only be operated when there is an increase in vehicular activity and/or pedestrian traffic in and around the roadway associated with the school event.

Research has shown that operating speeds in an active school speed zone are at their lowest close to the start time or end time of the school day. Approximately 20 minutes before or after the start of school, speeds are 1 mph higher and increase as time increases away from the start or end bells.

## **School Speed Limit Zone Marking**

Where greater emphasis is needed to indicate the beginning and ending points of an established school speed limit zone, a 12- to 18-inch solid white transverse line may be used. The transverse line shall be located immediately adjacent to the School Speed Limit assembly or School Speed Limit sign.

## **SCHOOL PAVEMENT MARKINGS**

The SCHOOL pavement marking is used to supplement signs and provide additional emphasis. The SCHOOL word marking width may either be the width of one lane or can extend to the width of two approach lanes. When extended to two approach lanes, the markings are 10 ft (3 m) or more in height.

## **SCHOOL MARKED CROSSWALK**

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. In conjunction with signs and other measures, crosswalk markings help to alert road users of a designated pedestrian crossing point across roadways at locations that are

not controlled by traffic control signals or STOP signs. At nonintersection locations, crosswalk markings legally establish the crosswalk.

Because nonintersection marked crossings are generally unexpected by the road user, additional treatments should be installed for all marked school crosswalks at nonintersection locations. These treatments can include warning signs and high-visibility markings as a minimum. Other treatments can include school crossing guards or pedestrian-activated treatments. Adequate visibility of students by approaching motorists and of approaching motorists by students should be present. Parking prohibitions may be needed to provide the desired sight distance.

Warrants have not been established for pedestrian crosswalks in the TMUTCD or the MUTCD; however, guidance material is available, including in the following reports:

- TCRP Report 112/NCHRP Report 562, *Improving Pedestrian Safety at Unsignalized Crossings*, 2006. Available at: [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_562.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf)
- FHWA-RD-04-100, *Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines*. Full report available at: <http://www.tfhr.gov/safety/pubs/04100/04100.pdf>. Summary report available at: [http://drusilla.hsrb.unc.edu/cms/downloads/Effects\\_Un\\_MarkedCrosswalks\\_Summary.pdf](http://drusilla.hsrb.unc.edu/cms/downloads/Effects_Un_MarkedCrosswalks_Summary.pdf)

The 2008 proposed update to the MUTCD includes the following guidance based on information presented in the above FHWA report:

“Crosswalk lines should not be used indiscriminately. An engineering study 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 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 speed limit,
- The geometry of the location,
- The possible consolidation of multiple crossing points,
- The availability of street lighting, and
- Other appropriate factors.



Marked crosswalks alone, without other substantial measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where:

- A. The speed limit exceeds 60 km/h (40 mph);
- B. The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or
- C. The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.”

Research has shown that the installation of a pedestrian crossing treatment alone does not necessarily result in more vehicles stopping for pedestrians unless that device shows a red indication to the motorist. Therefore, treating a location to improve pedestrian access or safety should include several components. For example, in addition to traffic control devices such as signs or markings, geometric improvements (e.g., refuge island, roadway narrowing, and curb extensions) may be used to shorten the crossing distance (and hence the exposure time for the pedestrian). Traffic calming may be used to slow vehicle speeds near the pedestrian crossing.

Following are general suggestions regarding the use of crosswalk markings and signs; in all cases, engineering judgment should be used in selecting a specific device for installation.

Except as noted below, a school crosswalk should not be installed within 300 ft of another school crosswalk, or a marked pedestrian crosswalk, on the same roadway. The 300 ft spacing requirement shall not apply to another crosswalk at the same intersection, or to crosswalks on legs of intersecting roadways.

A school crosswalk should not be installed at any location that has inadequate stopping sight distance, as indicated in the most recent edition of the Texas *Roadway Design Manual*.

The School Crossing assembly shall not be installed on approaches controlled by a STOP sign. The School Crossing assembly shall not be used at crossings other than those adjacent to schools and those on an established School Route Plan.

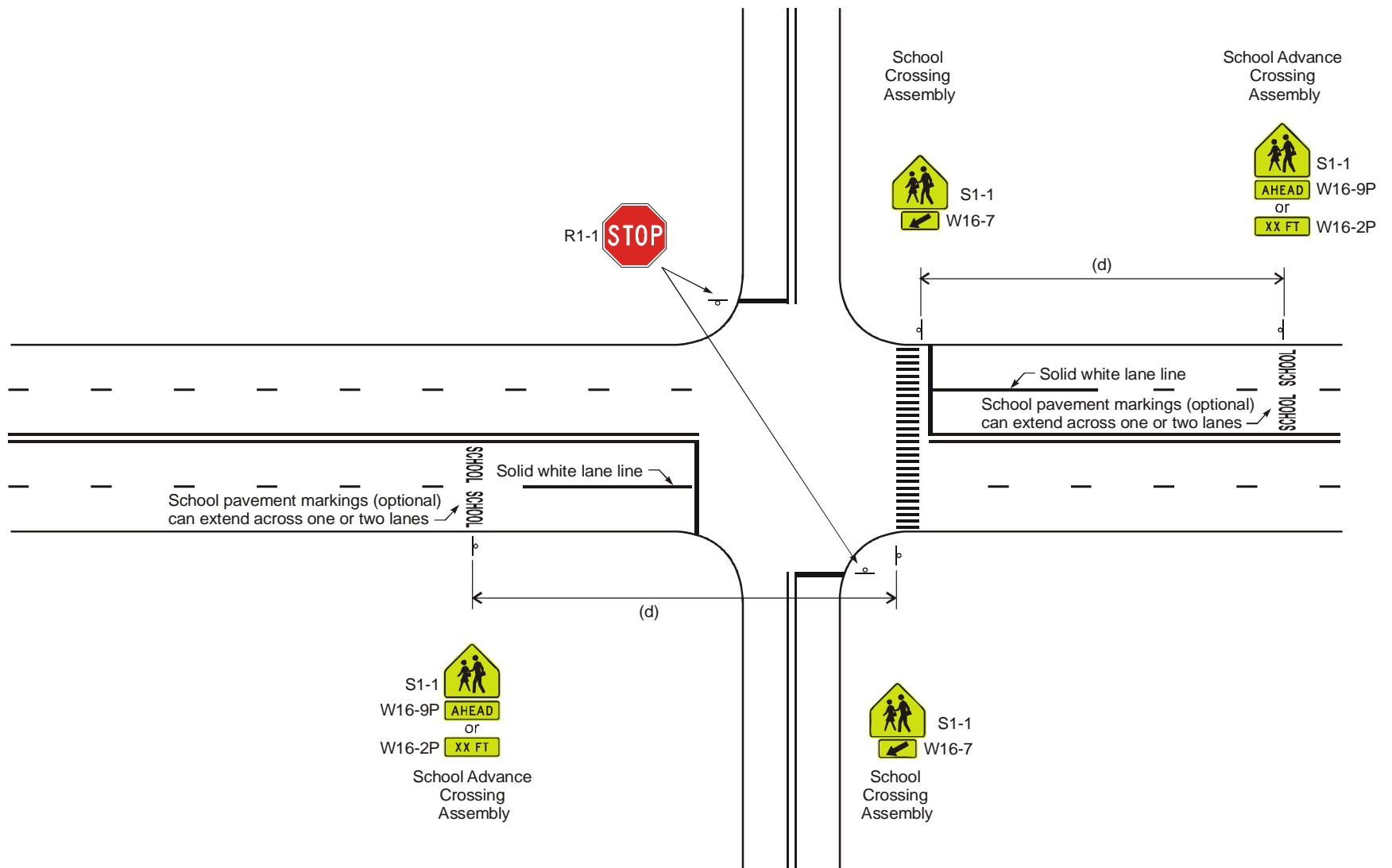
The signing for a school marked crosswalk not located on a stop-controlled approach includes:

- the School (S1-1) sign (if included),
- the School Advance Crossing assembly (if included) (S1-1 with W16-9P or W16-2P or W16-2ap), and
- the School Crossing assembly (S1-1, W16-7P).

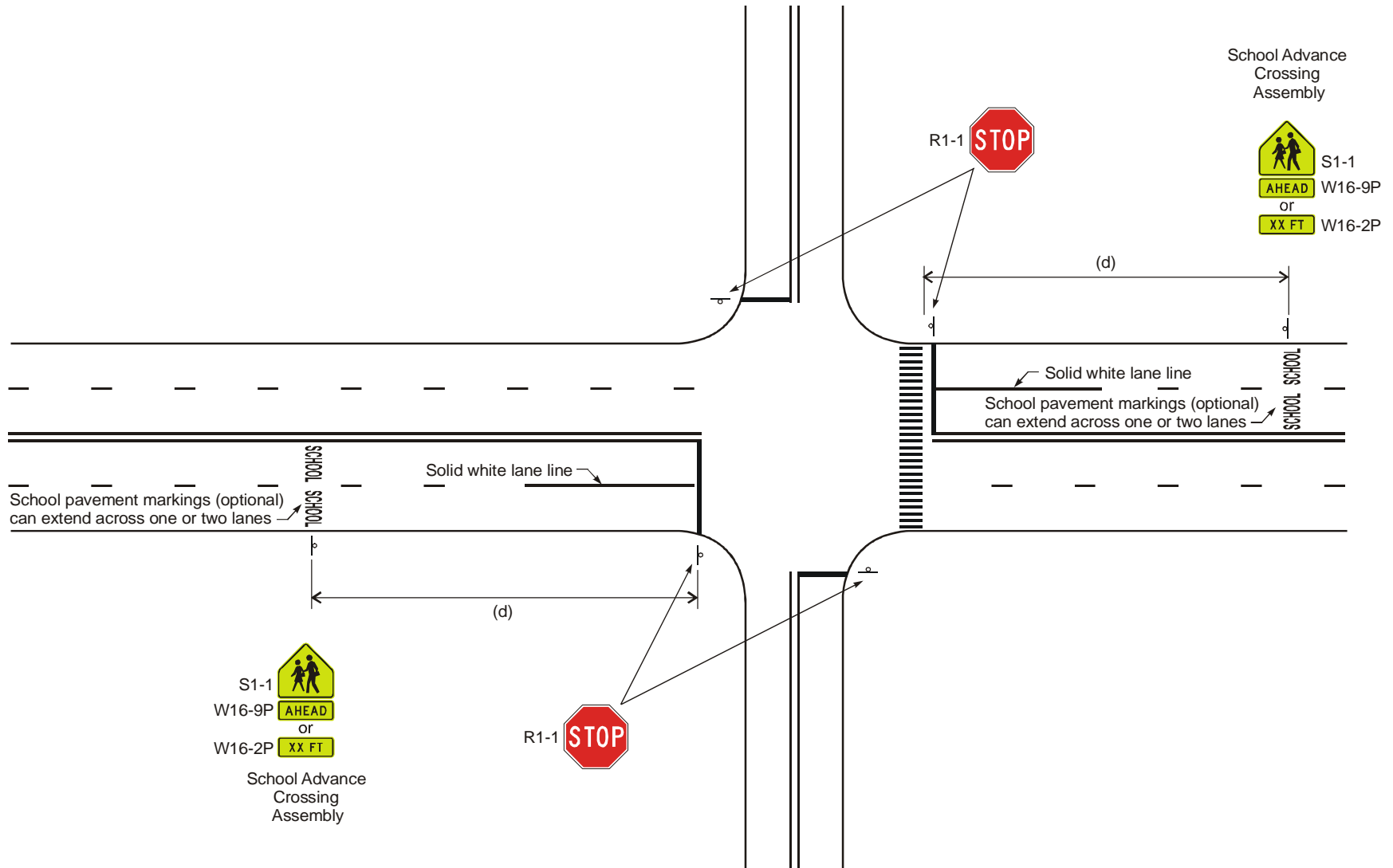
Signing and pavement markings for a school crosswalk zone are shown in [Figure A-5](#) for two-way stop control, [Figure A-6](#) for all-way stop control, and [Figure A-7](#) for signal control. [Table A-5](#) lists suggested dimensions for use in those figures. Additional information on signing and marking crosswalks is contained in the TMUTCD.

**Table A-5. Suggested Dimensions for Distances in [Figure A-5](#), [Figure A-6](#), and [Figure A-7](#).**

Posted or 85 <sup>th</sup> percentile speed (mph)	25	30	35	40	45	50	55	60	65	70
Distance (d) between School Advance Crossing assembly to marked crosswalk (and School Crossing assembly, when appropriate) (ft)	250	325	400	475	550 <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>
Minimum length of solid white lane line in advance of marked crosswalk (ft)	150	150	200	250	250 <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>
<sup>1</sup> On higher-speed roadways a system of treatments is needed for pedestrians—a marked crosswalk should not be used without additional pedestrian treatments. The installation of a marked crosswalk and pedestrian signs do not necessarily result in more vehicles stopping for pedestrians. Therefore, treating a location to improve pedestrian access or safety should include several components. For example, in addition to traffic control devices, geometric improvements may be used to shorten the crossing distance. Traffic calming may be used to slow vehicle speeds near the pedestrian crossing. Additional traffic control devices may be needed.										



**Figure A-5. Typical School Signing for Marked Crosswalk at a Two-Way Stop-Controlled Intersection (see [Table A-5](#) for Suggested Dimensions for Distance d).**



**Figure A-6. Typical School Signing for Marked Crosswalk at an All-Way Stop-Controlled Intersection (see Table A-5 for Suggested Dimensions for Distance d).**

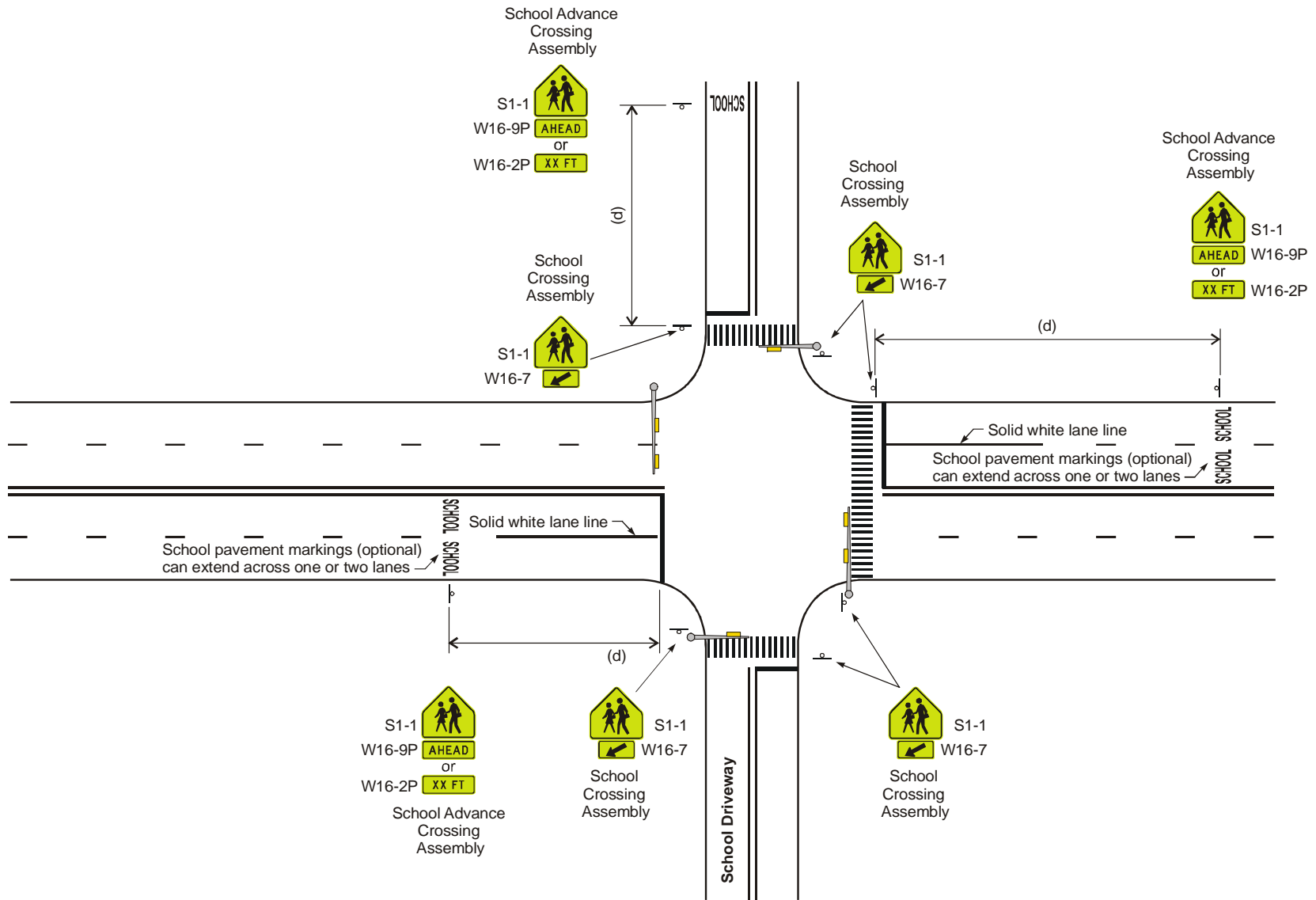


Figure A-7. Typical School Signing for Marked Crosswalk at a Signalized Intersection (see Table A-5 for Suggested Dimensions for Distance d).

## SCHOOL ENTRANCE WARNING ASSEMBLY

A School Entrance Warning assembly is used to inform drivers of the presence of a school driveway. It should not be used if a school speed limit zone is present. The decision to use a School Entrance Warning assembly should be based on engineering judgment.

Conditions at the site could include the following:

- Crash records involving vehicles entering or leaving the school entrance during normal school hours indicate a need to advise drivers to reduce speed.
- The majority of students are transported to and from school by bus and/or private vehicles.
- No provisions are made for students to walk to and from school.
- There are no left- or right-turn lanes on the highway at the school driveway, or queue spillover caused by turning vehicles is present, or measures to address the spillover have not corrected the situation.
- The entrance is not controlled by traffic signals.

A school entrance warning advisory plaque can be included at up to 15 mph below the normal posted speed limit.

Figure A-8 shows an example of a School Entrance Warning assembly. Table A-6 shows the suggested dimensions for the distances shown in Figure A-8.

**Table A-6. Suggested Dimensions for Distances in Figure A-8.**

Posted or 85 <sup>th</sup> Percentile Speed (mph)	25	30	35	40	45	50	55	60	65	70
Distance (d) Between Advance Entrance Warning Assembly to School Driveway (ft)	225	325	450	550	650	750	850	950	1100	1200

## CONDITIONS FOR REMOVING A SCHOOL SPEED ZONE

Conditions for considering removal of a school speed zone include the following:

- if a traffic signal or all-way stop is installed at the entrance of a school, creating a controlled environment for both vehicle entrance and exit and a controlled pedestrian crossing;
- if a school speed limit zone was previously established based on vehicles stopped in the lane of traffic for left and right turns into the school and left- and right-turn bays have been added to adequately separate the stopped vehicles from the through traffic;
- if a school speed limit zone was previously established based on a limited sight distance on the highway approaching the entrance to the school and a highway improvement project has removed the sight distance restriction; and
- if pedestrian patterns have changed due to changes in walking behavior or changes in bus ridership.



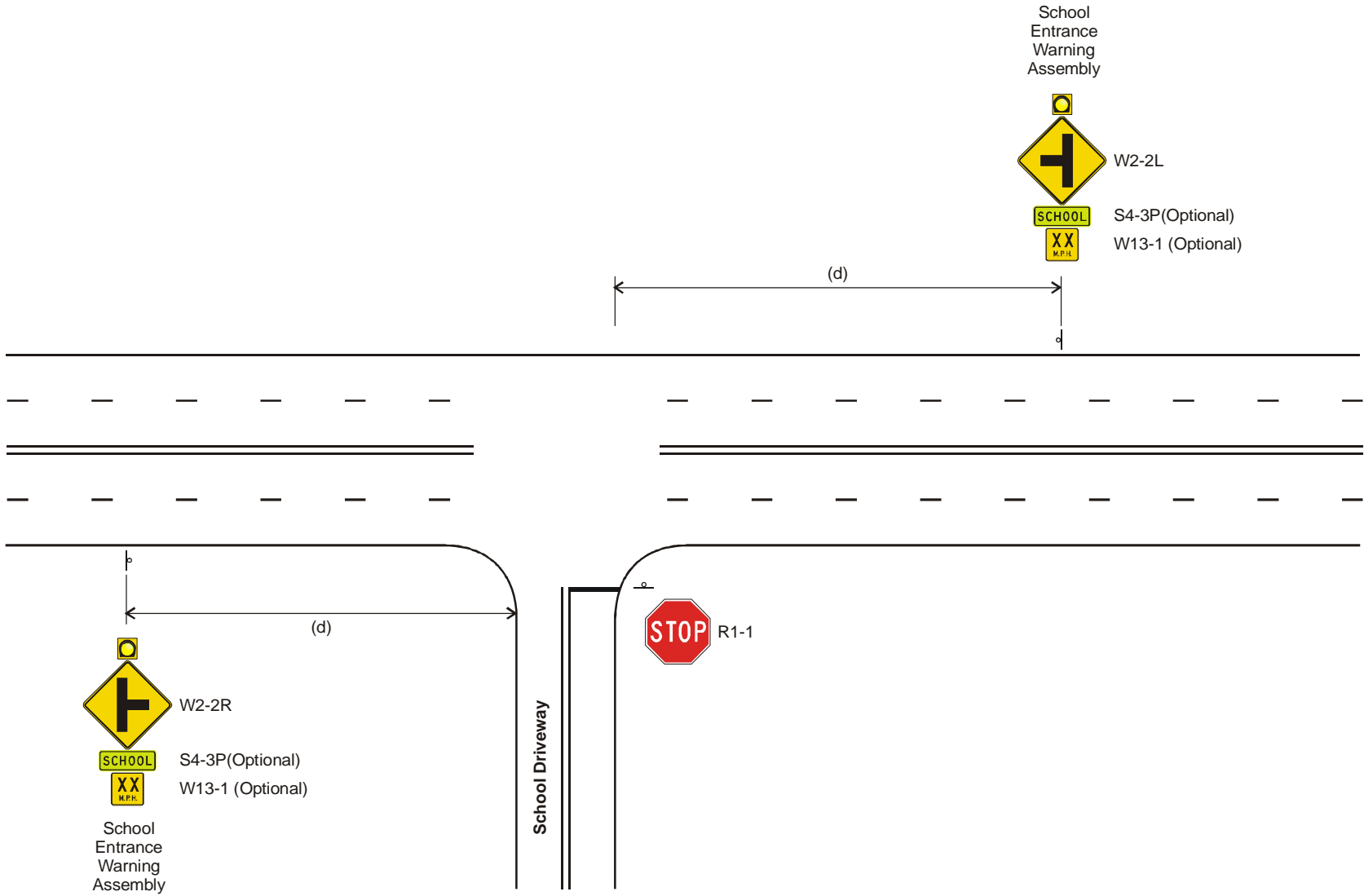


Figure A-8. School Entrance Warning Assembly Example (see Table A-6 for Suggested Dimensions for Distance d).

