Clark County School Zone
Traffic Control Policy

Prepared jointly with

DKS

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INTEROFFICE MEMORANDUM
Transportation Division

Clark County, Washington
Department of Public Works

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SUBJECT: School Zone Traffic Control Policy

Uniformity in traffic control is a prime directive of the "Manual on Uniform Traffic Control Devices" (MUTCD). Its importance is emphasized in section 1A.06 of the MUTCD. Reviews of school zone traffic control both in unincorporated Clark County and in other cities within Clark County, shows major inconsistencies in the selection and placement of traffic control devices in school zones. Even school zones with very similar surrounding roadway network and similar school route pedestrian movement have been observed to have inconsistent school zone traffic control.

This is in part because MUTCD does not provide detailed guidance on dealing with school zone traffic control under various sets of conditions. The situation is further exacerbated by the fact that state law concerning school zone traffic control is not very clear. The inconsistencies in traffic control not only violate driver expectation, but also result in lower compliance of the traffic control devices and a decrease in traffic safety. These inconsistencies in traffic control also lead to difficulties in enforcement and validation of the traffic ticket in the court system.

The attached School Zone Traffic Control Policy document has been prepared by the Traffic Engineering section after careful examination of the MUTCD, state law, and exercising sound engineering practice. The document

- Provides clear guidance on the implementation of school zone traffic control.
- Provides guidance on the use of appropriate traffic control devices under various sets of conditions to ensure the most effective traffic control and traffic operations.
- Provides guidelines on assessment for school zone crossing.
- Provides guidance on the implementation of reduced school speed zones.
- Provides guidance on the implementation of active school zone (flasher) traffic control.
- Provides other guidelines on standard details such as signing, striping, and illumination requirements.
- Spells out the roles and responsibilities of the agency and the school district sharing the common responsibility of ensuring safety of school children.

Clark County will adopt this document in implementing traffic controls in school zones; it is hoped that other jurisdictions within Clark County will also benefit from the guidelines that will result in uniformity in school zone traffic control throughout regional Clark County.

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CHAPTER 1: INTRODUCTION

Road users have an easier time reading signs and driving prudently through school zones that are delineated in a consistent manner. The Manual on Uniform Traffic Control Devices, which sets national standards and guidelines for traffic control devices along facilities open to public travel, defines a school as, "a public or private educational institution recognized by the State education authority for one or more grades K through 12 or as otherwise defined by the State".[1] Therefore, throughout the policy, when a school is mentioned, this is the definition being used.

This policy is intended to provide Clark County, and other enforcement agencies operating within its boundary, with guidelines for the uniform and consistent application of traffic control devices in school zones. The guidelines cover the use of school areas, reduced school speed zones, and how the signing and pavement markings should be designed for consistent and uniform applications. (Appendix C provides further detail on school zone traffic control requirements and recommendations and presents information on active school zone flashers.)

This policy also describes the Safe Routes to School (SRTS) program, a national organization that encourages children to walk and bike to school. The SRTS program studies and recommends various engineering improvements, including pavement markings and signing, in school zones.

Guidelines are intended to improve safety for other pedestrian crossing enhancements near schools, such as rectangular rapid flashing beacons, pedestrian hybrid beacons, variable message signs, pedestrian refuges, curb extensions, illumination, and traffic calming measures.

Additionally, the policy describes the funding and cost-sharing aspects of providing treatments for school zones. Schools interested in establishing engineering elements for a school zone must meet the criteria and obtain the approval of Clark County. Typically, the school pays for the initial cost of the traffic control device and its installation and Clark County covers maintenance costs.

Other supplemental material is provided in the appendices attached to this policy, such as layouts showing the recommended signing and pavement markings for school zones.

[1] MUTCD 2009, Chapter 1 A

CHAPTER 2: LAWS AND RULES ABOUT SCHOOL ZONES

Laws and rules about school zones are set at both national and statewide levels. Several national and state manuals provide guidance on the implementation of school zone traffic control devices that are compliant with the laws. Because there are many sources for school zone laws and rules, it is important to understand their precedence over one another. Specific guidance established by the state of Washington supersedes national practice and must be followed, where applicable. In other cases, national guidance should be used for consistency. National guidance is used unless there is a Washington modification in place. Figure 1 shows the laws and manuals that were used to develop this policy regarding school zone signing and pavement marking and how they relate to each other.

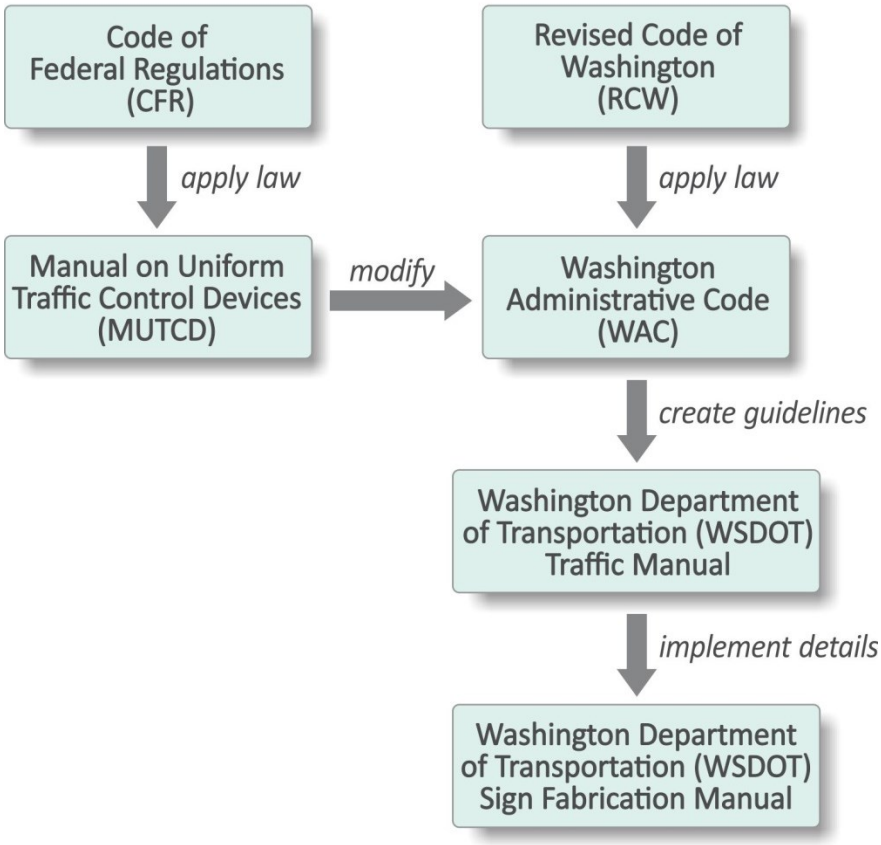
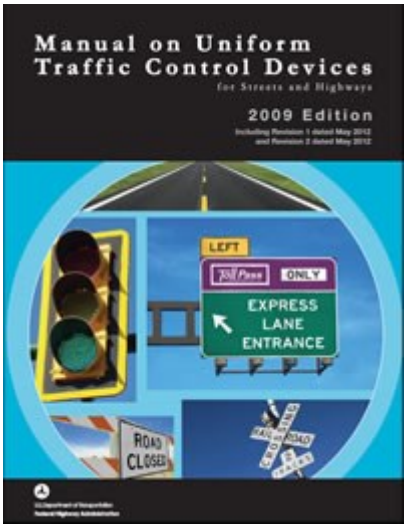


Figure 1. Sources for School Zone Laws and Rules

Consistency is crucial for school zone safety; therefore the recommendations provided in Chapter 5 should be used for designing signing and pavement markings for a school zone.

Manual on Uniform Traffic Control Devices (MUTCD)



The Manual on Uniform Traffic Control Devices (MUTCD) sets national standards and guidelines for traffic control devices along facilities open to public travel. The MUTCD is published by the Federal Highway Administration (FHWA) under Title 23 - Code of Federal Regulations (CFR), Part 655, Subpart F, and applies the national laws.

Traffic control devices for roadways that are located within school zones are covered in Part 7 (Traffic Control for School Areas) of the manual. Uniform application of school traffic control devices is one step to improving safety within school zones. Uniformity avoids confusion among road users and promotes consistent behavior and expectation.

The MUTCD emphasizes the importance of uniformity by providing standards and guidance on many aspects of school zone signing and pavement markings, ranging from sign sizes, color, location, mounting height, and retro-reflectivity to when marked school crossings and pedestrian hybrid beacons are recommended. The manual also presents examples of school zone and school crossing layouts, with the recommended signing and pavement markings (MUTCD Figures 7B-2 through 7B-5).

Revised Code of Washington (RCW)

The Revised Code of Washington (RCW) is a compilation of the current laws in the state of Washington. Title 46 relates to motor vehicle laws and Title 61 is specific to rules of the road. Several RCWs apply to school zones (see Appendix D). For example, under state law the penalty is doubled for speeding infractions committed within a school zone, and the penalty may not be waived, reduced, or suspended. Fifty percent of the money collected for these infractions must be deposited into the school zone safety account, which is created in the custody of the State Treasurer. Expenditures from the school zone safety account may be used only by the Washington Traffic Safety Commission for school zone safety projects in local communities.

Washington Administrative Code (WAC)

The Washington Administrative Code (WAC) amends the MUTCD to comply with laws and policies specific to the Revised Code of Washington (the RCWs). These amendments for school zones are listed in Appendix E.

WSDOT Traffic Manual and Sign Fabrication Manual

The Washington State Department of Transportation (WSDOT) Traffic Manual provides guidance on school zone signing and pavement markings (see Appendix F for sample layout). The WSDOT Sign Fabrication Manual implements these guidelines by providing fabrication details that maintain uniformity in appearance of the signs used by WSDOT. Standard S-series signs, which are specific to school zones, are illustrated in the WSDOT Sign Fabrication Manual, as shown in Appendix F. The WSDOT Traffic Manual also describes crosswalk specifications and standard details for crosswalks, stop lines, and traffic letter applications (see Appendix G).

Washington Modifications

The changes, additions, or deletions from national practice that are applicable in Washington related to school pavement marking and signing practices are:

- Drivers must stop for pedestrians at crosswalks,[2] NOT yield.
- The distance is 300 feet (revised from the national 200 feet) for the beginning point of a reduced school speed limit from the school grounds or school crosswalk.
- Fines are double in school zones, regardless of signage, therefore signs warning of higher fines are optional, not required.
- The END SCHOOL ZONE sign is accompanied by the posted speed limit sign.
- The law regarding when children are present is active when:
    - School children are occupying or walking within the marked crosswalk.
    - School children are waiting at the curb or on the shoulder of the roadway and are about to cross the roadway by way of the marked crosswalk.
    - School children are present or walking along the roadway, either on the adjacent sidewalk or, in the absence of sidewalks, on the shoulder within the posted school speed limit zone extending 300 feet in either direction from the marked crosswalk.
- The WHEN FLAGGED enforcement legend option for when a reduced speed is in effect was added, which is not a national standard.
- Different crosswalk marking patterns from the national standard.
- School route plans are required for all elementary schools.[3]
- School patrol controlled crosswalks, which are crosswalks that are attended by a crossing guard and not a traffic signal, pedestrian hybrid beacon, or stop sign, must have school crossing warning signs, a marked crosswalk, and a school speed limit assembly.

Other Guidelines (Local Agencies)

Three other agencies in and near Clark County have their own practices related to school zone signing and pavement markings. These are the cities of Vancouver, Camas, and Battle Ground. Their practices are summarized below (see Appendix H for standard details).

City of Vancouver

Vancouver has a standard detail for school zone signing, including a school speed limit sign assembly, a school ahead sign, and speed enforcement signs for WHEN CHILDREN ARE PRESENT or WHEN FLASHING (Standard Details T29-22 and T29-23 with and without a raised crosswalk). Additionally, Vancouver has a standard detail for a sign and flasher assembly (Standard Detail T20-14).

For pavement markings, Vancouver has a standard detail for traditional and ladder style crosswalks, as well as the SCHOOL legend (Standard Details T29-41 and T29-58).

[2] Crosswalks can be either unmarked or marked, but the criteria is that a pedestrian or bicyclist is within one lane of the half of the roadway in which the vehicle is traveling in or onto which it is turning (RCW 46.61.235).

[3] School route plans show the suggested walking or bicycling route to school on a map.

City of Camas

Camas has two standards for crosswalks—intersection and midblock (Standard Details ST30 and ST31).

City of Battle Ground

Battle Ground has one standard related to school zones—ladder stripe crosswalks (Standard Detail TR-8.01).

CHAPTER 3: SAFE ROUTES TO SCHOOL PROGRAM

Background

The Safe Routes to School (SRTS) program, which encourages children to walk and bike to school, started in the United States in 1997 in the Bronx, New York. After various pilot programs, the SRTS program spread throughout the country. Eight years later, Congress passed legislation that established a national program to assist states and communities. The program examines conditions around the school and provides guidelines for establishing a safe route to school.[4]

Washington became involved in SRTS as part of the pilot project in 2004. Since then, 230 schools in the state have participated in the SRTS program and the number of children walking and bicycling has increased by over 20 percent.[5]

As part of SRTS projects, various engineering improvements can be installed if warranted, such as sidewalk improvements, traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street bicycle and pedestrian facilities, and secure bicycle parking facilities.

In addition to engineering improvements, successful implementation of the SRTS program involves education and encouragement. The walking school bus is an example of an educational program that teaches children safety skills and promotes walking to school. The walking school bus is used in Washington, as well as nationally, and is paired with the SRTS program's Walk and Bike to School Day.

Enrollment

WSDOT administers the SRTS Funding Program and provides federal and state funded grants for projects throughout the state. These projects must be located within two miles of primary, middle, and high schools (K-12). Applicants must describe how their project would improve safety and mobility of children by enabling and encouraging them to walk and bike to school. WSDOT and the SRTS Review Committee reviews and prioritizes the funding requests. Projects completed through this grant must follow federal, state, and local requirements to receive funding.

Many proposed and constructed projects within Clark County were funded through the Washington SRTS program, from 2004 through 2015. Table 1 lists each project with year, agency, location, and project elements.

[4] National Center for Safe Routes to School, Accessed November 2014: http://www.saferoutesinfo.org/
[5] Washington State Department of Transportation. "Safe Routes to School." Accessed January 2015: http://www.wsdot.wa.gov/localprograms/saferoutes/

Table 1. Safe Route to Schools Projects

Year	Safe Routes to School Projects within Clark County		
	Agency	**Location**	**Project Elements**
2004 (Pilot)	**Evergreen School District**	SE 136th Improvements	Overhead flashing beacons at school crosswalk, refuge island, curb ramps, sidewalk
2007	**Washougal**	Hathaway Crosswalk Lighting	Flashing beacons, illumination, crosswalk, pavement markings, signs, emphasis patrol
	Vancouver	Fircrest Elementary	Sidewalk, safety education, emphasis patrol
		Riverview Elementary	
		Eleanor Roosevelt Elementary	
		Ogden Area Safe Routes to School	Sidewalk, speed cushions, emphasis patrol
		NE 104th Street Phase II	Sidewalk, safety education, emphasis patrol
	Hockinson School District	NE 159th Street Walkway	Pedestrian path, pedestrian-activated traffic signal, walking and biking safety program, radar speed feedback signs
2009-2011	**Vancouver**	MacArthur Blvd/Mill Plain Blvd to Lieser Rd School Safety Improvements	Sidewalk, crosswalk, pedestrian and bicycle safety education, school zone photo enforcement
		Image Elementary Pedestrian Safety Improvements	Sidewalk, crosswalk and pavement markings, pedestrian and bicycle safety education, emphasis patrol
	Camas	Grass Valley Trail Extension	Pedestrian path, pedestrian and bicycle education, "School Share"
2011-2013	**Camas**	NW 18th Ave Safety Improvements	Sidewalk, health and environmental education classes, additional police patrol
		NE 43rd Ave Safety Improvements	
	Vancouver	Walnut Grove Elementary	Sidewalk, pedestrian and bicycle safety education, additional police patrol
	Evergreen Public Schools	Pacific Middle School Walkway	Sidewalk, crosswalk, illumination, curb ramps, bicycle and pedestrian safety materials, additional police patrol
2013-2015	**Clark County**	Sacajawea Elementary Pedestrian Safety	Sidewalk, curb and gutter, crosswalk, crossing guard safety equipment, walking school bus program, education, speed feedback signs, emphasis patrol
	Vancouver	Endeavour Elementary Pathway and Safety Improvement Program	Shared use path, education, speed feedback sign, emphasis patrol
	Woodland	South Woodland Safe Walking Route	Sidewalk, curb and gutter, crossing guards and improvements, walking school bus program
	Battle Ground	School Zone Safety Improvements, City Wide	Crosswalk, flashing beacons, guided walk groups, crossing guards, education, emphasis patrol

What is a School Walk Route Plan

The MUTCD recommends that a school route plan be prepared for each school that serves elementary to high school students to develop uniformity in the use of school-area traffic control devices and to form the basis for the school's traffic control plan. In Washington, state law requires school districts to develop school walk routes for all elementary schools.[6]

The school walk route plan consists of a map showing streets, the school, existing traffic control devices, established school walk routes, and established school crossings. Additionally, the school walk route plan shall cover an area of at least one mile from the school and illustrate the suggested routes to school. The school walk route plan shall be distributed to all students with instructions that it be taken home and discussed with the parents.

How to Develop a School Walk Route Plan

In developing the school routes and crossings, certain guidelines should be followed:

- Limit the number of school zone crossings to encourage students to cross streets in groups, creating a larger concentration of students crossing in one desirable location.
- Avoid mid-block crossings, unless they are signalized or supervised by an adult crossing guard.
- Provide the greatest physical separation between walking children and traffic.
- Expose children to the lowest speeds and fewest vehicles.
- Limit the number of road or rail crossings.
- Allow only one entrance-exit from each block to and from school.
- Select routes with sidewalks or paths.
- Avoid areas with personal safety concerns, such as locations with abandoned buildings, unleashed dogs, lack of street lighting, overgrown vegetation, and known or suspected crime.
- Locate a crossing near the drop-off area or bus stop to create a path to the school.
- Serve every residence in the walking attendance boundary.
- Provide the most direct route possible, given the above considerations.

In establishing school crossing placement and the use of pedestrian hybrid beacons, the school must consider factors such as sidewalk presence, number of students, age level of students, and total extra walking distance. The school must also consider traffic issues such as vehicle traffic volume and the frequency of gaps in the traffic stream when determining appropriate crossing locations. If gaps are insufficient then the school must consider measures that create sufficient gaps.

[6] WSDOT, School Walk and Bike Routes: A Guide to Planning and Improving Walk and Bike to School Options for Students, February 2015

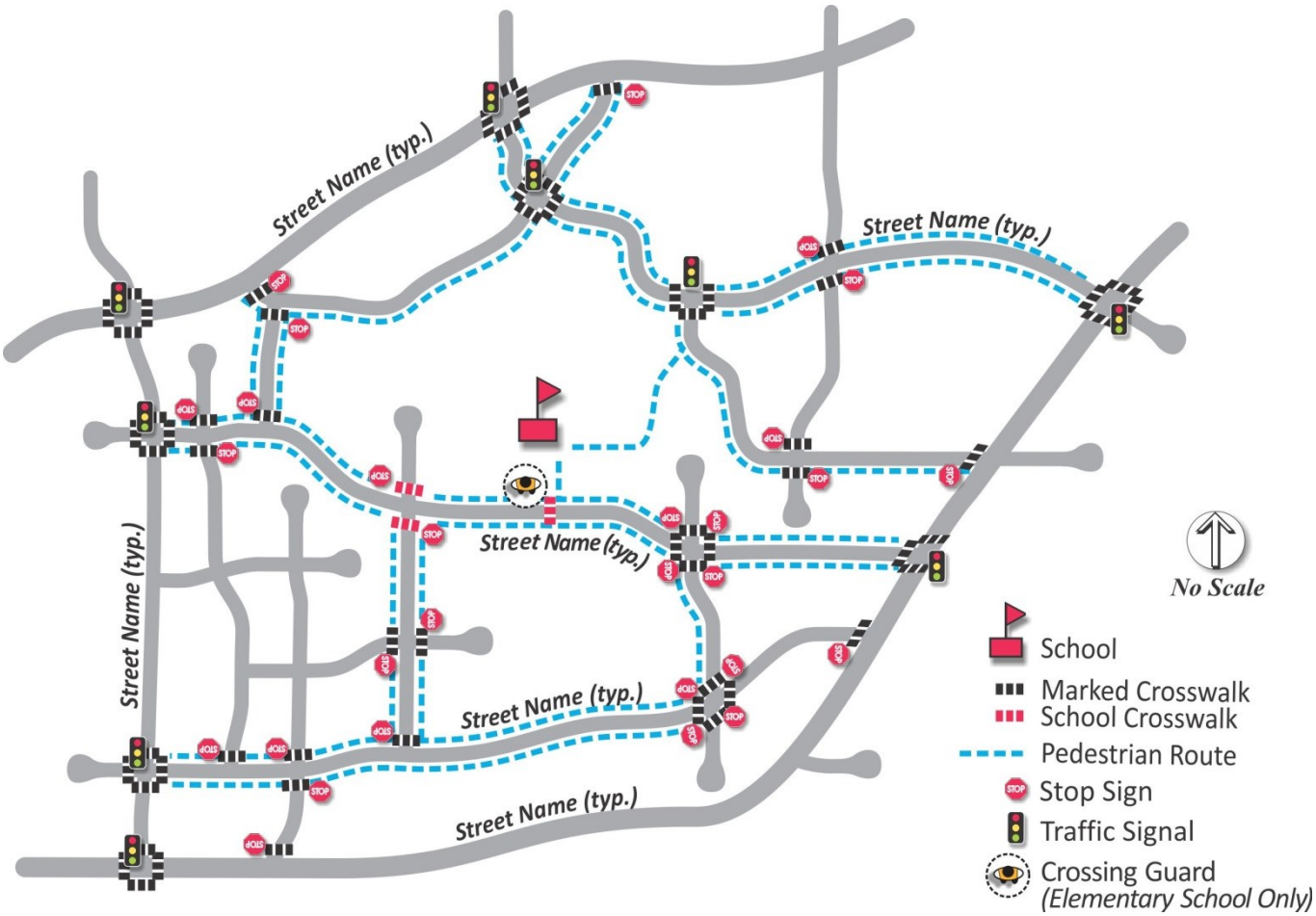


Figure 2. Example School Walk Route Plan

CHAPTER 4: SCHOOL ZONES

Reduced School Speed Zone and School Area Defined

A reduced school speed zone (RSSZ) is a designated section of roadway adjacent to a school or on a school route plan with a school crosswalk featuring signing to advise drivers of the reduced speed limit in the school zone of 20 miles per hour (mph). The RSSZ begins 300 feet in both directions of the marked school crosswalk or school boundary. According to Washington law, fines are doubled in school zones.

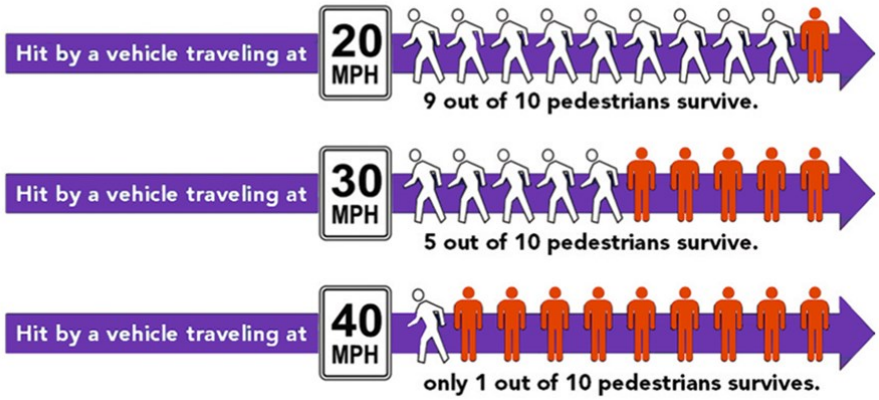
A school area, on the other hand, is a more general designation and the signage serves a warning purpose only. Regulations are no different than a typical roadway. School areas are adjacent to schools, but do not necessarily have a school crosswalk. The distance set for school areas is a function of the speed set for the roadway[7], instead of the 300 feet in both directions like the RSSZ.

Graphical definitions for both reduced school speed zones and school areas are shown on Figure 3.

Importance of Reduced School Speed Zone

RSSZs have a reduced speed limit that is enforced during specific times of day, depending on the enforcement legend used with the school speed limit sign assembly. In the state of Washington, the school speed zone is always 20 mph (note that this is state-specific).

The 20 mph speed is a critical threshold that the state selected based on pedestrian survival rates reported by PEDS, an organization based in Atlanta devoted to walking and pedestrian safety.[8] Studies have indicated that nine out of ten pedestrians will survive being hit by a vehicle traveling at 20 miles per hour or less. However, as vehicle speed increases, the pedestrian survival rate decreases, to the point where only one out of ten pedestrians will survive being hit by a vehicle traveling at 40 miles per hour. The RSSZ in Washington is enforced and set in place for pedestrian safety. The ability of the driver to reduce the vehicle's speed in school zones is crucial in keeping pedestrians safe.



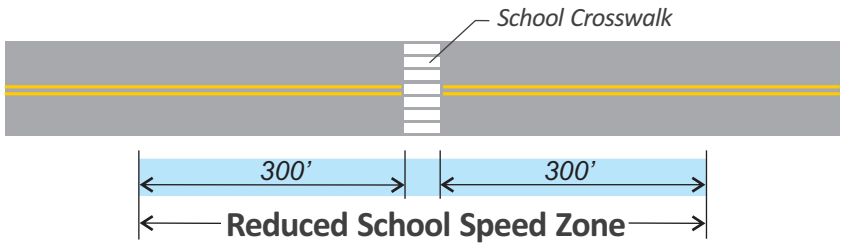
Pedestrian Survival Rates and Vehicle Speeds

[7] MUTCD 2009, Table 2C-4

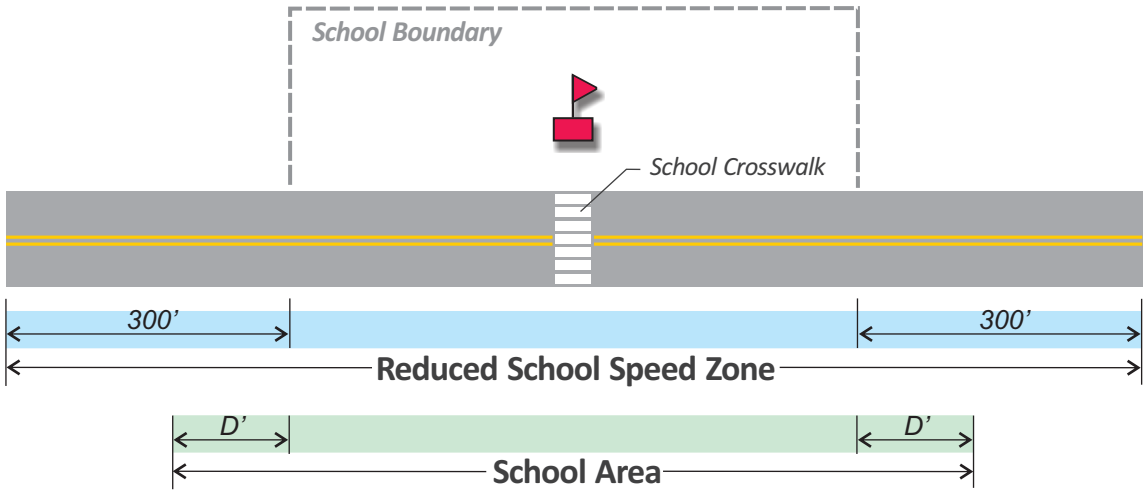
[8] PEDS. Accessed January 2015: http://peds.org/drive-like-your-kids-live-here/

Figure 3
Reduced School Speed Zones and School Areas Defined

Based On School Crosswalk



Based On School Boundary



Reduced School Speed Zone - *Regulatory, reduced 20 mph speed limit*

School Area - *Warning, normal speed limit*

Note: *Use Figure 4 to determine if a Reduced School Speed Zone is recommended, or Figure 5 to determine if a School Area is recommended.*

School Area Distance

85th Percentile Speed (mph)	"*D*" School Area Distance (ft.)
20-35	100-150
40	125-150
45	175

Distance defined by MUTCD Table 2C-4 and Clark County preference

When Should Reduced School Speed Zones Be Used

This policy establishes the guidelines for when reduced school speed zones should be used, when they should not be used, and when they would require further justification. The criteria for these guidelines are based on a literature review of current practices for school zone signing and pavement markings in other states,[9] though it should be noted many states have their own policies and there is no overall consensus. Based on this literature review,[10] the following is true regarding school zone signing and pavement markings:

- For elementary and junior high schools (K-8), school zones are encouraged when there is at least one marked school crosswalk within the proposed school zone that is not protected by a signal or STOP sign. Some states also require that the posted speed should be 40 mph or below.
- For elementary and junior high schools (K-8), school zones include a marked crosswalk, advance and school crossing signs, reduced speed limit enforced either when flashing, during school days for specific hours, or when children are present. For example, Arizona uses the STOP WHEN CHILDREN ARE IN CROSSWALK sign and the NO PASSING sign, which is different from the other states.
- For high schools, there is a range in school zone recommendations by state—from not typically being used unless an engineering study determines that there is a need for enhanced safety to being treated in the same manner as elementary and junior high schools.

Figure 4 illustrates the assessment for a RSSZ. Several criteria must be met to justify its installation and to assist in receiving approval from Clark County. When determining a RSSZ, the following considerations are used:

- When there is at least one school crosswalk that is not protected by a traffic signal, pedestrian hybrid beacon or STOP sign; and
- When the school is PK-8; and
- When the posted speed of the roadway is 40 mph or below.

When RSSZs are established, pavement markings and signing must be used to properly delineate these school zones. School flashers may be used as an alternate traffic control device to delineate RSSZ when appropriate (see Figure 9). When a RSSZ meets the criterion per the flow chart, the school must still get approval from Clark County.

[9] The literature review was of five states (Oregon, Alaska, Arizona, Florida, and New York).
[10] Ibid

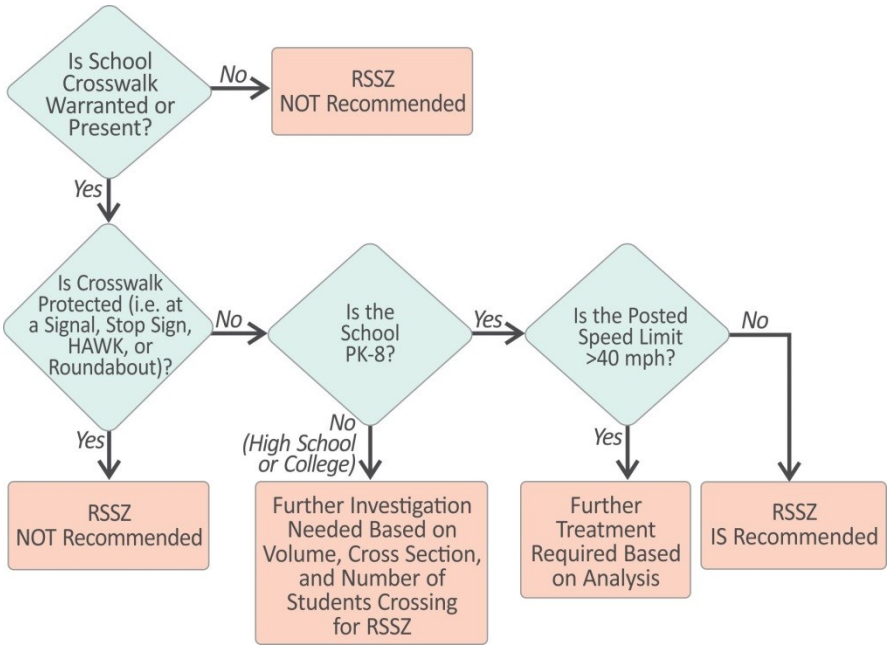


Figure 4. Assessment for a Reduced School Speed Zone (RSSZ)

When Should School Areas Be Used

The assessment for a school area is shown in Figure 5. When determining a school area, the following considerations are used:

- When the roadway is adjacent to the school; and
- When a public road intersects, there is a controlled crossing, or there is a direct school driveway; and
- When the posted speed of the roadway is greater than 30 mph.

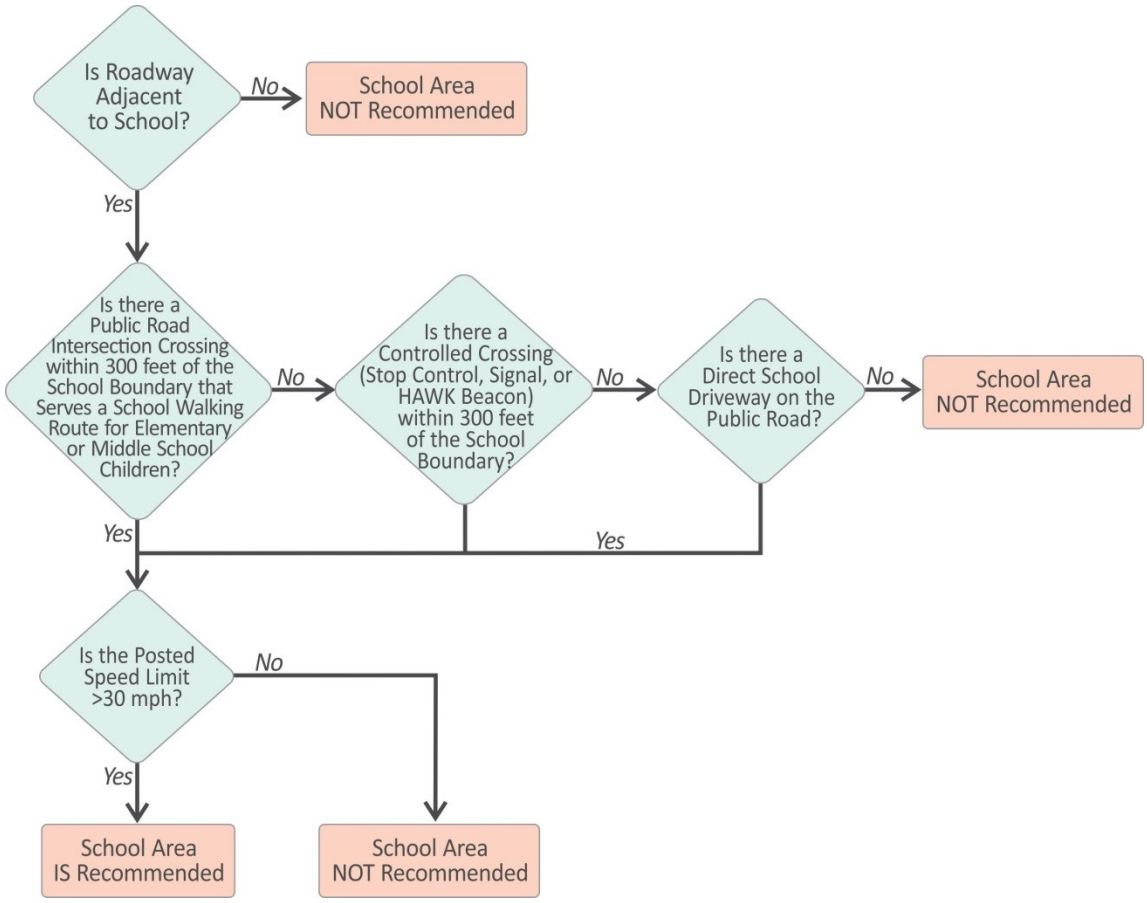


Figure 5. Assessment for a School Area

School Crosswalk Defined

Marked school crosswalks channelize and provide guidance for pedestrians who are crossing roadways and alert road users.[11] However, the crosswalk markings by themselves do not necessarily improve pedestrian safety.

When Should School Crosswalks Be Used

The assessment for a school crosswalk is shown in Figure 6. When determining school crosswalks, the following considerations are used:

- The roadway is adjacent to the school grounds and/or is on the school route plan; and
- There are least 20 children per any peak hour of the day who will use the crosswalk; and
- When the school is PK-8; and
- There is no adjacent school crosswalk within 300 feet; and
- The crossing location is not at a signal, stop sign, or other controlled crossing; and
- The annual daily traffic does not exceed 9,000 vehicles per day, and the number of travel lanes does not exceed two lanes.[12]

[11] Manual on Uniform Traffic Control Devices (MUTCD) 2009, Section 3B.18.

When school crosswalks are established, designated pavement markings and signing must be used. . If a school crosswalk is desired, the school must get approval from Clark County or the respective jurisdiction. Additionally, when school crosswalks are approved, the school district must commit to guarding the school crosswalk as well as providing necessary luminaire(s) for proper illumination of the school crosswalk. The jurisdiction shall conduct the necessary engineering investigation and follow the guidelines established in this document prior to granting approval.

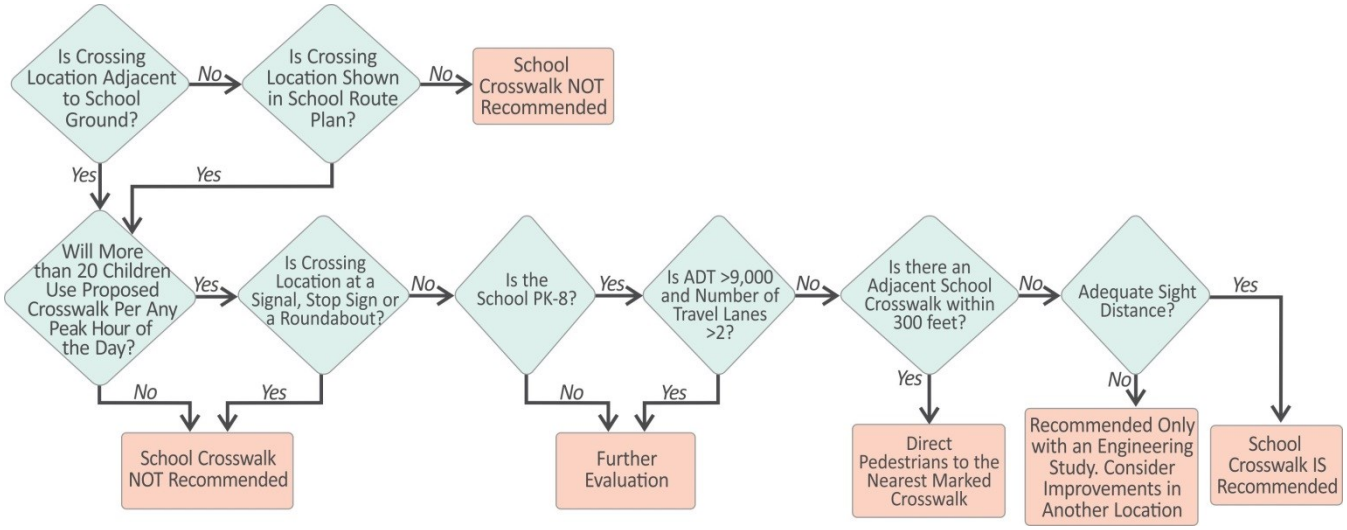


Figure 6. Assessment for a School Crosswalk

School Crossing Guards and Safety Patrols

Crossing guards not only guide children, they are role models in teaching students to cross streets safely. They provide supplemental traffic control and are an extra indicator (beyond pavement marking and striping) to drivers that children are present.

Clark County requires the use of school crossing guards at all of its elementary and middle school crossings during key times of the day. Crossing guards are present for twenty to thirty minutes right before school starts and after the school is released.[13]

The Washington Administrative Code states that school crossing guards shall only control school crossings that include the following items: school crossing warning sign (S1-1), marked crosswalk, and school speed limit sign[14].

For adult crossing guard qualifications, uniform requirements, and operating procedures, see the MUTCD.

[12] Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations, FHWA Publication Number: HRT-04-100, 2005.
[13] Meeting with Clark County Sheriff's Office, August 29, 2014.
[14] WAC 392-151-030 Controlled crossings

Enforcement

Although enforcement within reduced school speed zones is performed continually, Clark County typically stations more officers in these areas at the start of the school year to emphasize safety. The primary purpose of issuing tickets is to increase driver compliance, which results in ensuring the safety of children.

Both Clark County officers and school resource officers can enforce RSSZs throughout the school year. Clark County has a low ratio of enforcement personnel per resident (1/12,500 people),[15] which means a lower level of school zone enforcement compared to other agencies such as the City of Vancouver. Within Clark County, the number of tickets issued in school zones was steady for 2011 and 2012, at 111 tickets for each year, as shown in Figure 7. In 2013, about half as many school zone tickets were issued—57.12 tickets, an average of six school zone tickets per school month.

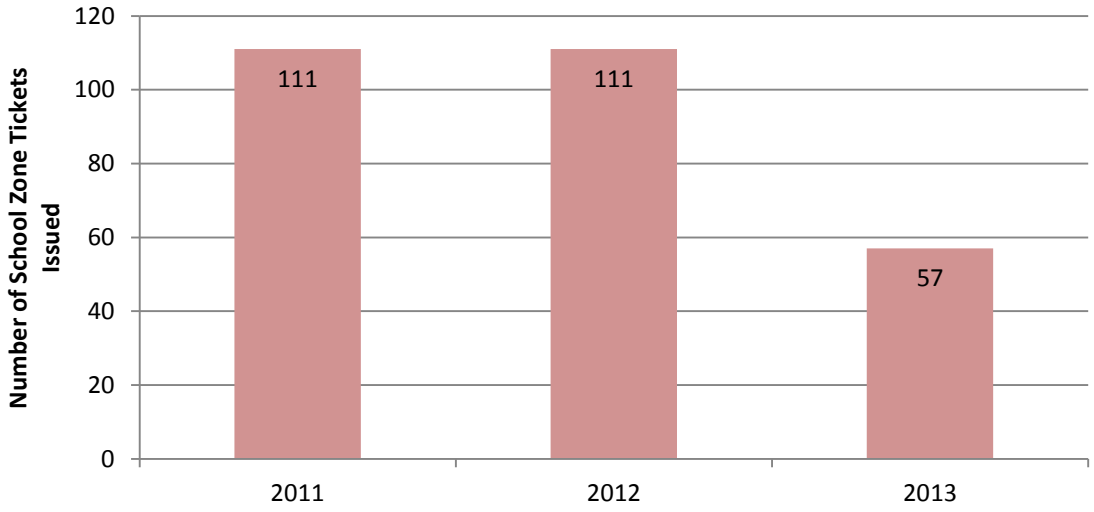


Figure 7. Clark County School Zone Ticket Trend

The RCW requires a speed limit of 20 mph for reduced school speed zones. The speed zone extends 300 feet in either direction of the crosswalk or border of the active school zone boundary.[16] The limits of an RSSZ are defined by appropriate signage or school speed limit flasher.

School zone speeding tickets are typically issued when the officer visually assesses a speeding condition and confirms it with a speed measurement via radar or LiDAR. The school boundary should be defined by the distance stated in Washington law. When writing a ticket, the officer must make note that either children are present or the flasher is active, indicating an active school zone. Officers keep a copy of the Clark County flasher schedule with them to assist with enforcement.[17]

The fines are doubled in school zones, with ticket costs ranging between $187 and $400. The standard base fine is doubled regardless of any additional signage (signs stating fines are higher) warning drivers. Although speeding is the primary violation, other violations that occur in school zones are also fined at double the rate—

[15] Meeting with Clark County Sheriff's Office, August 29, 2014.
[16] RCW 46.61.440
[17] Meeting with Clark County Sheriff's Office , August 29, 2014

these include failure to yield to a pedestrian in a crosswalk, failure to remain stopped to allow the pedestrian or bicyclist to cross the roadway, and failure to exercise care.

The ticket cannot be mitigated or reduced.[18,19] The only way a driver may not be required to pay the fine is to successfully contest the violation.

Clark County law enforcement staff stated that the most common reasons for contesting school zone speeding tickets were:[17]

- School speed zone sign was not visible.
- Vehicle was not in the school zone when speed was recorded.
- School zone boundary was not well defined.
- Vehicle was entering an active school zone from a side street that was not signed or the flashers were not visible.
- Validity of speed measurement (either radar or LiDAR) was in question.
- Children were not present.
- There was confusion with other speed limit signs located within the school zone.

Clark County law enforcement provided guidance on school zone signing for easier enforcement with the following recommendations:

- Duration of school flashers should be as short as possible while still covering the time with greatest pedestrian activity (preferably less than an hour at a time) for higher compliance.
- School zones with active flashers are easier to enforce.
- Additional flashers should be installed on the back side to assist with vehicles entering an active school zone from the side street.
- The enforcement legends for the school speed limit that include specific times of day and when flashing are more clear than when children are present. When children are present can be more difficult to enforce due to uncertainty on which days and hours to enforce as well as who is defined as a child.

[18] RCW 46.61.440
[19] Meeting with Clark County Traffic Court Commissioner, August 26, 2014

CHAPTER 5: SCHOOL AREA TRAFFIC CONTROL DEVICES

School Area Pavement Markings

Pavement markings assist in the delineation of a school area and can be used to supplement a sign, a signal, or can be used on their own. Pavement markings can have a regulatory or a warning purpose. The largest advantage to pavement markings is that the markings are on the road where drivers generally look. However, there are limitations to their functionality because they can be covered by snow, obscured by heavy traffic, or have reduced visibility when wet and are difficult to maintain.

Pavement markings must be visible at night and are required to be retro-reflective unless directly illuminated. Markings are typically applied using durable or thermoplastic material. Pavement word markings shall be white and should read in the direction of travel.

Pavement markings within school areas must comply with Part 3 (Markings) of the MUTCD, Washington State, or local guidelines, where available. The Washington guidelines include crosswalk specifications and standard details for crosswalks, stop lines, and traffic letter applications (as presented in Appendix G).

School pavement markings are listed in Table 2, including the pavement marking name, an image of the marking, a description, and the typical use. School pavement markings are:

- School crosswalk
- Stop line
- Word and symbol markings (SCHOOL or SCHOOL XING)

The SCHOOL pavement marking is optional and its use has both advantages and disadvantages. The greatest advantage is that the marking provides supplemental guidance and warning. A disadvantage is that it requires more frequent maintenance with periodic refreshing or replacement after road resurfacing. SCHOOL XING or PEDESTRIAN XING pavement markings can be used prior to the crosswalk location.

The SCHOOL and XING markings are most beneficial on high-volume or high-speed roads or locations requiring supplemental warning (such as vertical or horizontal curves). Therefore, the cross-section and presence of obstructions should be considered when deciding if the SCHOOL pavement markings are appropriate at a particular location.

Table 2: School Pavement Markings

Pavement Marking Name	Image	Description	Typical Use
School Crosswalk	***Longitudinal*** 	24-inch wide solid pattern separated by gaps of 4 feet, length of each marking is 8 feet	Where school crosswalks are recommended (see Figure 6). Note: Locate to avoid wheel paths, orient parallel with wheel paths
Stop Line		Solid white lines extending across approach lanes 12 inches wide at least. Clark County standard is 24 inches wide.	Indicates point at which vehicles need to stop for a STOP sign or other traffic control devices. Note: Should be placed at least 4 feet in advance of crosswalk at controlled intersection and 20-50 feet at uncontrolled locations
Word and Symbol Markings (SCHOOL)		White word marking, may extend to the width of two approach lanes; should be 10 feet or more in height If two or more words are used then they should read in the direction of travel and be separated by at least 4 times the character height	Can be used on approach lanes to guide or warn traffic

School Area Static Signing

School area signing must follow the general provisions in MUTCD sections 2A, 2B.06, and Part 7. Traffic control devices and other signs or messages within the roadway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction.

School warning signs and any supplemental plaques shall have a fluorescent yellow-green background with black legend and border. School (S-series) signs shall have ASTM Specification D 4956 Type VIII or IX background sheeting. The signs used for school area traffic control shall be retro-reflectorized or internally illuminated. The sizes of signs and plaques used in school areas shall comply with MUTCD Table 7B-1 unless engineering judgment determines that a minimum or oversized sign size would be more appropriate.

School Signs

School signs are listed in Table 3, including the sign name, an image of the sign, the sign code, the typical use, and desired location. The school signs are:

- School Zone Assembly
- School Advance Crossing Assembly
- School Speed Limit Assembly
- HIGHER FINES/FINES DOUBLE
- School Crossing Assembly
- END SCHOOL ZONE
- END SCHOOL SPEED LIMIT
- Posted Speed Limit
- Reduced School Speed Limit Ahead Sign
- In-Street School Children Crossing
- School Bus Stop Ahead
- School Bus Turn Ahead
- Parking and Stopping Restrictions
- Overhead Crosswalk
- Overhead Stop for Pedestrians

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

- School Area – The S1-1 sign can be used to warn road users they are approaching a school area that might include school buildings or grounds, a school crossing, or school-related activity adjacent to the roadway.
- School Zone – The S1-1 sign can be used to identify the location of the beginning of a designated school zone. Although, in the state of Washington it would not serve this purpose since all school zones are reduced school speed zone, which would instead have a school speed limit assembly.
- 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 place where school children cross the roadway.

- School Crossing – If combined with a diagonal downward pointing arrow plaque (W16-7P) to comprise the School Crossing Assembly, the S1-1 sign can be used to warn approaching road users of the location of the school crosswalk.
- School Advance Area/Zone – If combined with an arrow plaque (W16-6 or M6-4), the S1-1 sign can be used to warn road users on cross streets that once they make a turn, they will enter a school area or a reduced school speed zone.

The penalty is doubled for infractions committed within a designated reduced school speed zone, regardless of whether the HIGHER FINES/FINES DOUBLE sign is installed. Because of the increased penalty within a reduced school speed zone, the end of school zone sign is installed to alert the driver of the boundary and to give permission to return to normal speed. For locations where the posted speed is more than 10 mph greater than the reduced school speed limit of 20 mph (i.e., when the posted speed is 35 mph or greater), a reduced school speed limit ahead sign should be considered.

The School Speed Limit Assembly has various enforcement legends that can be used, and these should be selected by Clark County on a case by case basis. The following are the enforcement legend options:

- WHEN FLASHING (S5-1)
- WHEN CHILDREN ARE PRESENT (S5-101) – as defined in WAC 468-95-335
- WHEN FLAGGED (S5-102)
- 8:30 AM to 5:00 PM (S4-1)
- SCHOOL DAYS X:XX AM to X:XX PM (S4-5)
- SCHOOL DAYS X:XX AM to X:XX AM (S4-5A)
- SCHOOL DAYS X:XX PM to X:XX PM (S4-5A)

The guidelines for use of in-street signs were provided by the Safe Routes to School Guide and follow MUTCD standards.[20,21] When considering the installation of overhead crosswalk signs, the approach speed of traffic, width of crossing, and number of lanes should be assessed.

[20] Safe Routes to School (SRTS) Guide. Available online: http://guide.saferoutesinfo.org/engineering/in-street_signing.cfm
[21] MUTCD 2009, Section 2B.12

Table 3A: School Signing

Sign Name	Image & Sign Code	Typical Use	Desired Location
School Zone Assembly	 *S1-1* *S4-3P (optional)*	Warn road users they are approaching a school area ***OR*** identify the beginning of a designated school zone	Dependent on speed of roadway (see MUTCD Table 2C-4), 700 feet maximum from school boundary and at least 100 feet from School Speed Limit Assembly
School Advance Crossing Assembly	-OR-  *S1-1* *W16-9P* -OR-  *S1-1* *W16-6* -OR-  *S1-1* *M6-4*	Warn road users they are approaching a school crossing	Dependent on speed of roadway (see MUTCD Table 2C-4), minimum 100 feet from School Crossing Assembly
School Speed Limit Assembly	 *S5-1*  *WSDOT* *S5-101*  *S4-3* *R2-1*  *WSDOT* *S4-101* -OR-  *S4-1* -OR-  *WSDOT* *S4-5* -OR-  *WSDOT* *S4-5A*	Notify road user there is a reduced speed limit in effect according to the enforcement legend	300 feet from school boundary or crosswalk
HIGHER FINES/ FINES DOUBLE	 *R2-6P* -OR-  *R2-6aP*	Notify road user where increased fines are imposed	Located below School Speed Limit Assembly
School Crossing Assembly	 *S1-1* *W16-7P*	Warn road users they are at the school crossing location	At school crosswalk
END SCHOOL ZONE	 *S5-2*	Notify road users the school zone has ended	300 feet from school boundary or crosswalk opposite School Speed Assembly
END SCHOOL SPEED LIMIT	 *S5-3*	Notify road users the reduced speed limit is no longer in effect	300 feet from school boundary or crosswalk opposite School Speed Assembly
Posted Speed Limit	 *R2-1*	Notify road users of the speed limit outside of the school zone Note: Should not be installed within limits of school speed zones	Located above END SCHOOL ZONE sign
Reduced School Speed Limit Ahead	 *S4-5*  *S4-5a*	Warn road users they are approaching a reduced school speed limit that is more than 10 mph less than the normal speed limit	Dependent on speed of roadway (see Layouts in Appendix B)

Note: *Sign code is from MUTCD unless otherwise noted.*

Table 3B: School Signing

Sign Name	Image & Sign Code	Typical Use	Desired Location
In-Street School Children Crossing	 *R1-6c*	At unsignalized crossings, mounted on a portable base, used only during school commute times, and on unsignalized two-lane low-speed streets rather than multi-lane high-speed streets Note: State law may be omitted from sign	In advance of the crosswalk, preferably in the median to avoid being hit
School Bus Stop Ahead	 *S3-1*	Only used when the school bus stop is not visible to road users within 500 feet of sight distance	In advance of locations where the school bus stops to pick up or drop off children
School Bus Turn Ahead	 *S3-2*	Only used when there is limited sight distance to the school bus turnaround	Located at the school bus turnaround
Parking and Stopping Restrictions	 *R7 and R8 series*	To restrict parking by a school, can be used near a crossing, for drop off/pick up activities, or near driveways Typical enforcement legends include the following: No Parking X:XX AM to X:XX PM School Days Only No Stopping X:XX AM to X:XX PM School Days Only XX Min Loading X:XX AM to X:XX PM School Days Only No Standing X:XX AM to X:XX PM School Days Only Note: Parking will not be allowed within 100 feet upstream and 50 feet downstream of the school crosswalk	Located by curb markings to reinforce the restriction area
Overhead Crosswalk	 *WSDOT* ***W11A-301***	At marked school crosswalks where a traffic engineering analysis has determined that conventional traffic control measures are not adequate Note: Must include pedestrian or school activated flashing lights	At marked school crosswalk
Overhead Stop for Pedestrians	 *R1-9a*	Can be used instead of overhead crosswalk sign Note: Must include pedestrian or school activated flashing lights	At marked school crosswalk

Note: *Sign code is from MUTCD unless otherwise noted.*

Layouts for Static Signing

The layouts in Appendix A show the recommended pavement markings and static signing for school areas. The layouts in Appendix B show the recommended pavement markings and signing for reduced school speed zones (RSSZ's) under various scenarios to provide consistency. The layouts provide recommended distances for the sign locations. The distances were developed based on MUTCD standards and modified per Clark County preference.

The layouts for reduced school speed zones (RSSZ's) include options for the enforcement legend of the school speed zone, including when children are present, when flagged, when flashing, for specific times of the day, or when flashing. The when flashing enforcement legend option, which is supplemented with flashing beacons, will be further discussed in the active signing section of this policy.

The enforcement legend to be used at each school zone should be examined carefully. As noted by Clark County law enforcement, the enforcement legend that describes specific times of day when the school zone is active may be a clearer definition for drivers and law enforcement than simply "when children are present."

A supplemental School Speed Limit Assembly is recommended when the static sign spacing in any direction exceeds 600 feet within a RSSZ or when the active sign spacing exceeds 1,250 feet. The repeated assembly is meant as a reminder to drivers regarding the presence of a RSSZ and also to advise any side street drivers. The spacing distance is to be measured between School Speed Limit Assemblies assuming there are no school crosswalks encountered. If a school crosswalk is present, the distance needs to restart again. The supplemental School Speed Limit Assemblies are required based on the spacing criteria, unless otherwise determined by an engineering study.

The County has established thresholds for how to handle scenarios where school boundaries and/or school crosswalks are located adjacent to one another. When a school crosswalk is located outside of the school boundary, the threshold of 800 feet is used to determine if the entire area should be treated as one RSSZ, or if the two areas should be treated separately. The distance of 800 feet was established using a distance of 300 feet on each side (the state mandated distance) and a 200 foot long distance in the middle.

For adjacent schools, two threshold distances have been established, 800 and 1,500 feet. For schools separated by less than 800 feet, the entire area will be treated as one RSSZ. For schools separated by more than 800 feet, but less than 1,500 feet, the two schools will be treated mainly separate, where the school speed limit is ended, but the school zone is not ended in between the schools. For schools separated by more than 1,500 feet, the two schools will be treated completely separately where the school zone is ended in between the schools. The details for exactly how each scenario should be handled are shown in the layouts in Appendix B.

School Zone Active Signing

Flashing Beacons Defined

Flashing beacons can be used for RSSZ's and at school crosswalks to provide additional warning for drivers. Flashing beacons improve awareness and provide warning of reduced speeds for school safety. Beacons must be in compliance with MUTCD requirements outlined in section 4L.[22] The MUTCD states that beacons shall have a

[22] MUTCD 2009, Chapter 4L, Flashing Beacons.

flash rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall be a minimum of half and a maximum of two-thirds of the total cycle.[23,22] There are no Washington modifications to the MUTCD related to flashing beacons.

There are two types of beacons applicable for school zones—warning beacons and speed limit beacons. A warning beacon may be used for other applications to provide warning, such as a midblock school crosswalk. A speed limit sign beacon shall be used only to supplement a school speed limit sign.

Warning Beacons

Warning beacons may be used to warn users of obstructions, emphasize the presence of midblock crosswalks, and supplement warning and regulatory signs that include the phrase WHEN FLASHING. Warning beacons shall not be used to supplement STOP, DO NOT ENTER, WRONG WAY, and SPEED LIMIT signs. A warning beacon shall:

- Consist of one or more signal sections of a standard traffic signal face with a flashing circular yellow signal indication in each signal section.
- Be used only to supplement an appropriate warning or regulatory sign or marker.
- Have a minimum clearance of 15 feet and a maximum of 19 feet above the pavement, if the beacon is suspended over the roadway.

Warning Beacon

Warning beacons should be operated only when the condition or regulation exists. Furthermore, if more than one signal section is used, they may be flashed either alternately or simultaneously.

Speed Limit Beacons (or School Speed Limit Flasher)

A speed limit beacon, also referred to as a school speed limit flasher, shall be used only to supplement a speed limit sign. A speed limit beacon shall:

- Be used only to supplement a fixed or variable speed limit sign.
- Have circular yellow signal indications that have a nominal diameter of not less than 8 inches.
- Be horizontally aligned[24].
- Be alternately flashed if two signal indications are used.
- Be accompanied by appropriate signing indicating that the displayed speed is in effect.

School Speed Limit Flashing Beacon

When a school speed limit flasher is used, it must follow the detail shown in Figure 8. The detail includes a school speed limit sign for use with flashing beacons (S5-1)

[23] Ibid
[24] County preference per discussion with MUTCD and FHWA in October 2014

from the Washington Sign Fabrication Manual, two twelve-inch yellow vehicle signals with backboard, and a visor located side-by-side at the top of the speed limit sign, all mounted on a spun aluminum pole. The fines double sign (R2-6a) will be located below the school speed limit sign, leaving a vertical clearance of seven feet to the ground. The flasher cabinet will be located below the fines double sign to house the components. Additionally, another single twelve-inch yellow vehicle signal with a backboard and a visor or a strobe light will be located on the back of the sign. This informs side street traffic regarding an active school speed zone and helps with enforcement.

When Should Warning Beacons Be Used

Warning beacons should be used to emphasize the time that a warning sign is active. For example, warning signs that could be active under certain conditions include pedestrian-activated midblock crossing, be prepared to stop, ramp meter ahead, etc. When warning beacons are used, the warning sign and beacon must be accompanied by the WHEN FLASHING sign.

When Should Speed Limit Flashing Beacons Be Used

According to the WSDOT Traffic Manual, the School Speed Limit Assembly may be supplemented with flashing beacons to draw attention and increase compliance within the RSSZ. Flashing beacons are not necessarily needed in all school zones but are more effective than static signs under certain conditions.

When used in the appropriate situations, flashing beacons can reduce 85th percentile speeds and increase driver compliance compared to static signs, according to a Washington Traffic Safety Commission Study and the results from a speed study conducted in Clark County (see Appendix C).[25] The Washington study noted, in areas where the approach speed to a school speed zone is 35 mph or above, schools with WHEN FLASHING signs had significantly fewer vehicles travelling in excess of 35 mph (only 3 percent) compared to WHEN CHILDREN ARE PRESENT signs (30 percent) and WHEN FLAGGED signs (23 percent).

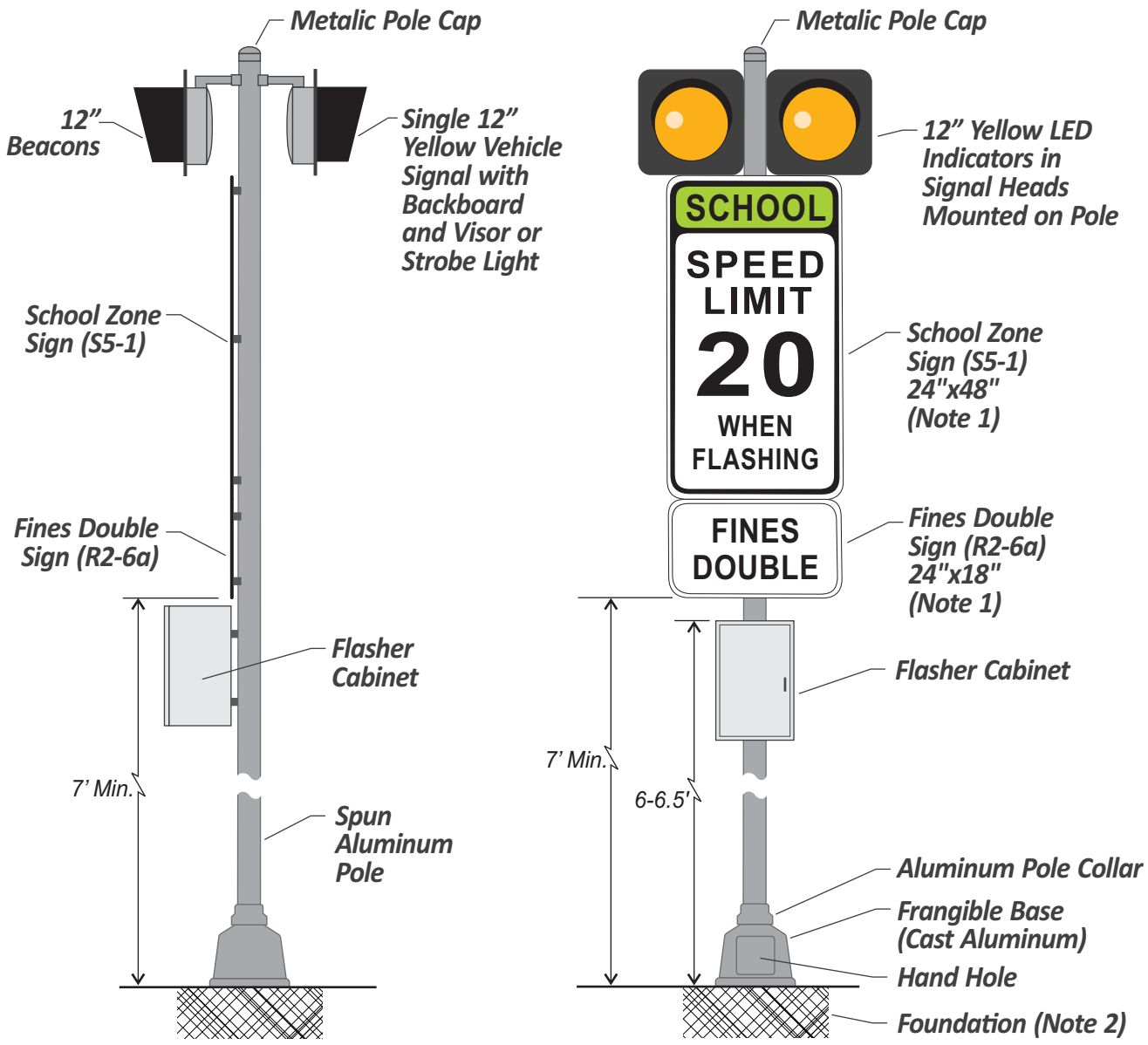
The assessment for a school speed limit flasher is shown in Figure 9. When determining the use of flashers with the reduced school speed limit sign, the following considerations are used:

- There is a RSSZ that has been established (an outcome from the Figure 4 process).
- The posted speed is greater than or equal to 30 mph.

However, schools need to get approval from Clark County and conduct an engineering study, in addition to meeting the criteria outlined in Figure 9.

[25] Washington Traffic Safety Commission. *Vehicle Speeds in School Zones. Available online:* http://wtsc.wa.gov/wp-content/uploads/dlm_uploads/2014/10/VEHICLE-SPEEDS-IN-SCHOOL-ZONES-full-rept.doc

Figure 8
School Speed Limit Flasher Detail



Notes:

1.) When the roadway has four lanes or more with a posted speed limit of 40 mph or higher use oversized sign sizes of:
36"x72" for S5-1
36"x24" for R2-6a

2.) For foundation details see Clark County School Flasher Standard Drawing.

3.) Use of solar power must be approved by County Traffic Engineer and only used when conditions occur that make hard wire power infeasible.

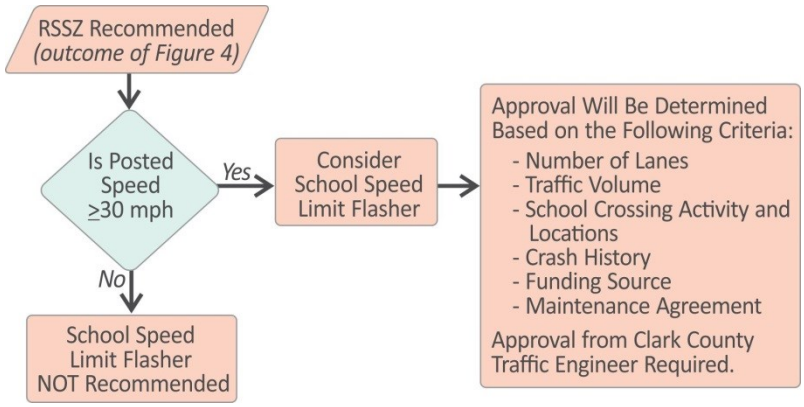


Figure 9. Assessment for a School Speed Limit Flasher

Layouts for Active Signing

The layouts in Appendix B show the recommended pavement markings and signing for RSSZ's under various scenarios to provide consistency. The layouts provide recommended distances for the sign locations. The distances were developed based on MUTCD standards and modified per Clark County preference.

The layouts in Appendix B show school speed limit flashers as one of the enforcement legend options in a RSSZ.

CHAPTER 6: OTHER PEDESTRIAN CROSSING ENHANCEMENTS

Additional pedestrian enhancements are available to increase the safety of crossings near and along school routes. The crossing improvements discussed below can be used as a supplement to the standard signs and pavement markings discussed in previous chapters. The County will develop a Pedestrian Policy that will provide further detail on the use of other pedestrian crossing enhancements in the future.

Pedestrian Hybrid Beacon or High Intensity Activated Crosswalk

Application of the Pedestrian Hybrid Beacon (PHB), also referred to as the HAWK (High Intensity Activated Crosswalk), is discussed in Chapter 4F of the MUTCD. The HAWK is used to control traffic at unsignalized locations and should only be used in conjunction with marked crosswalks.

Further guidance can be found in Figures 4F-1 and 4F-2 from the MUTCD (see Appendix I), which provide guidelines on when to install a PHB based on the roadway speed, number of pedestrian crossings, and the vehicular volume along the roadway.

Pedestrian Hybrid Beacon (PHB) or High Intensity Activated Crosswalk (HAWK)

MUTCD Signal Warrant 5 (School Crossing) is intended for situations where school children crossing a major roadway is the primary reason to consider installing a traffic control signal. School children are defined as elementary through high school students.

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream meets the warrant requirements. The traffic signal warrant for school crossings is met when the number of adequate gaps in the traffic stream is less than the number of minutes during the period when school children are using the crossing (MUTCD Section 7A.03) and when there are a minimum of 20 school children during the highest crossing hour.

In addition to identifying pedestrian and vehicle thresholds, the MUTCD provides the following guidance:

- The school crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.
- Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

- If installed at a non-intersection location, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and it should be pedestrian-actuated.

Rectangular Rapid Flashing Beacon

Rectangular Rapid Flashing Beacons (RRFBs) are a type of active warning beacon that can enhance safety at unsignalized pedestrian crossings. Use of RRFBs is not covered in the 2009 MUTCD; however, FHWA has published an interim approval documenting the appropriate installation of these warning devices.[26] Additionally, the WSDOT has issued a similar approval for their use in Washington.

Rectangular Rapid Flashing Beacon (RRFB)

In school zones, a RRFB may be used at marked crosswalks to supplement school crossing warning signs. RRFBs should not be installed on approaches controlled by YIELD signs, STOP signs, or traffic signals. The FHWA suggests limiting the installation of RRFBs to locations with the most critical safety concerns because their effectiveness may diminish with over use.

While RRFBs can be used at crosswalks like PHBs, they are a warning device rather than being a regulatory device like a PHB. RRFBs are typically more affordable than PHBs. Several research efforts have focused on the effectiveness of each warning device and have developed guidelines to determine when each device should be applied.

The Oregon Department of Transportation funded a research effort to evaluate the effectiveness of RRFBs and PHBs in Oregon. This research concluded that PHBs are not well understood by drivers and that public education should accompany installations in new areas. This research provides a crosswalk treatment decision matrix that can be used to identify the appropriate treatment based on several key considerations. Potential treatments included in the matrix are PHBs, RRFBs, median installed RRFBs, and standard crosswalks. A copy of the decision matrix is included in Appendix I.

Changeable Message Signs

Changeable message signs may be used to inform drivers of the reduced school speed limit in situations where added emphasis is needed. When used, the variable sign should have the same basic shape, message, legend layout, and colors as the associated fixed-message signs. Section 7B.15 of the MUTCD provides additional guidance on the installation and requirements for these devices.

Changeable Message Sign

[26] Federal Highway Administration, "Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)", Accessed November 2014, http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

Pedestrian Refuges and Curb Extensions

Pedestrian refuges or islands split a roadway crossing into multiple stages while providing a safe place for pedestrians to wait between stages. These refuges are most beneficial when there are multiple travel lanes in each direction that contribute to a longer crossing distance. A center turn lane is a great opportunity for pedestrian islands to be installed without impacting travel lanes.

Pedestrian crossing distances can also be reduced through the use of curb extensions (also known as bulb-outs). Curb extensions narrow the roadway and can serve as a traffic calming device—these have been shown to reduce vehicle speeds. Additionally, curb extensions provide increased visibility for pedestrians waiting to cross and are particularly beneficial when on-street parking is present.

Pedestrian Refuge

Stop Here for Pedestrians

The STOP HERE FOR PEDESTRIANS (R1-5b or R1-5c) sign provides advance notice for crosswalks on uncontrolled multi-lane approaches. The stop bar supplements the sign and should be placed twenty to fifty feet in advance of the nearest crosswalk line. The advance stop bar indicates the point at which vehicles need to stop behind the STOP HERE FOR PEDESTRIANS sign. The advance stop bar is a 24-inch-wide solid white line extending across all approach lanes. This treatment is particularly helpful when used on multilane roadways.

Grade Separated Crossings

Grade separated crossings can be used at locations with high pedestrian crossing demand and heavy vehicular flow. These may include overpasses or underpasses; note that overpasses are typically easier to maintain and easier to protect from vandalism. Grade-separated crossings are expensive and should be considered only in locations where pedestrians are likely to use the facility (rather than cross at nearby locations without appropriate signing and pavement markings). Grade separated crossing should: be accessible, have minimal grade changes, and have a clear passage width of at least 12 feet.

Illumination

Lighting is important to include at all pedestrian crossing locations where pedestrian activity is expected during dark conditions. Lighting provides visibility for drivers to see pedestrians in the crosswalk.

FHWA HT-08-053, The Information Report on Lighting Design for Mid-block Crosswalks, found that a vertical illumination of 20 lux in front of the crosswalk, measured at a height of 5 feet from the road surface, provided adequate detection distances in most circumstances. The optimal location of street lights is positioned 10 feet in advance of the crosswalk to achieve the desired lighting.[27]

Illumination at Pedestrian Crossings

The County follows WSDOT standards for light levels and uniformity ratios for a midblock pedestrian crossing[28].

Traffic Calming Measures

Traffic calming devices are used to reduce vehicle speeds along a roadway. They can sometimes impede emergency response vehicles, however, and new applications should be coordinated with emergency services. There are a number of traffic calming measures that can be used depending on the design of the roadway and surrounding land use. For neighborhoods streets, these devices typically include:

- Speed humps
- Traffic circles or diverters
- Curb extensions
- Raised crosswalks

See WSDOT's Pedestrian Facility Guidebook or AASHTO's Guide for the Planning, Design and Operation of Pedestrian Facilities[29] for more information.

[27] Los Angeles County. *Model Design Manual for Living Streets.* 2011.
[28] WSDOT Design Manual, Exhibit 1040-25 Light Levels and Uniformity Ratios, July 2014.
[29] American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition, 2004

CHAPTER 7: TRAFFIC CONTROL DEVICES INSTALLATION, MAINTENANCE, AND FUNDING

Once school zones and their associated traffic control devices have been identified, the devices will need to be funded, installed and maintained. In order to establish an understanding regarding funding, installation and maintenance of the traffic control devices, the roles and responsibilities of each entity will need to be recognized.

AGENCY RESPONSIBILITIES

1.1

- Agencies (Cities and County) will be responsible for evaluating and traffic engineering analysis of school zone traffic control. The responsibility would extend to a request for new pedestrian crossing, safety or mobility treatment for existing schools or any other school zone traffic control for existing schools. Agencies will follow established engineering principles and guidelines in making the determination.
- Agencies will be financially responsible for the upkeep of active traffic control devices. The upkeep will include but is not limited to the replacement of solar panels, beacons, and internal electronics, etc. The upkeep and replacement may be due to normal wear, theft, or third party damage. In cases where the third party can be identified, the agency will attempt to collect costs from the third party's insurer.
- Agencies will be responsible for the day-to-day operation and maintenance of active traffic control devices and street illumination. The agencies will bear the cost of routine operation and maintenance and pay for recurring associated fees, such as internet fee, energy cost for flashing beacon and illumination, etc.
- Agencies will be financially responsible for upgrading the existing infrastructure to current standards with either a new County construction project or an alteration project. The upgrades could include school zone flashers, crosswalk illumination, ADA ramps etc.
- Agencies will be financially responsible for installation, maintenance and upgrade of passive school zone traffic control devices, within the County right-of-way. These passive traffic control devices include static signs, striping and pavement markings. The responsibility would extend to either existing passive traffic control devices or new approved crosswalk treatment for existing schools.
- Agencies will be responsible for the system programming for flashing beacons; the school district will be responsible for providing school schedules (times and dates) on a yearly basis or any interim change.

1.2

- With justification agencies reserve the right to replace flashing beacons with a sign indicating when the school zone is enforced if the continuation of the flashing beacons becomes impractical or revoke the approval of an active traffic control device.
- Pedestrian crossing or mobility treatment such as HAWK beacon, RRFB, pedestrian signal, median refuge island, curb extensions etc.; as well as other infrastructure improvements including sidewalk and ADA

ramps will be installed and maintained by the agency at its cost subject to availability of funding and the position of the requested location in the priority array ranking. Approved yet unfunded pedestrian crossing treatments urgent on the district's priority will be the financial responsibility of the district.

- The agency will partner with the school district in obtaining grants, from various sources, pertaining to school related pedestrian safety and mobility. The agency will evaluate project ideas from school districts and prepare grant applications for the most feasible/cost effective projects brought forward by the school district. Projects in the grant applications may not necessarily be priority ranked projects.

SCHOOL DISTRICT RESPONSIBILITIES

2.1 For new schools or schools undergoing major expansion or reconstruction, the district will be required to identify all necessary pedestrian treatments, including traffic control devices and infrastructure improvement necessary to accommodate the "safe route to school" and pedestrian safety and mobility. The district will be responsible for all design, engineering and construction costs for school zone related traffic control and pedestrian safety and mobility improvements.

2.2 When the school district makes any changes to an existing school, physical or otherwise that creates impacts warranting pedestrian safety and/or mobility improvements the below stated guidelines will generally apply:

- School districts will be financially responsible for the cost to install approved active traffic control. Active traffic control devices include school zone flashers and changeable speed limit signs, HAWK beacon, Rectangular Rapid Flashing Beacon, warning beacon, pedestrian crossing signal etc; and any appurtenances and setup cost associated with the active traffic control devices.
- School districts will be financially responsible for the cost to install street illumination related either to a new to a school crossing or existing crossing impacted by the change.
- School district will be financially responsible for the cost to install any infrastructure improvement related to an approved pedestrian safety or mobility treatment. The infrastructure improvements may include sidewalk improvements, ADA ramps, pedestrian median refuge island etc.
- School districts will be financially responsible for upgrading of existing active school traffic control devices and street illumination to current standards impacted by the change.
- School districts will be requested to provide a single point of contact within each district for all school zone related traffic safety and mobility issues. Agencies will respond to requests from the school districts. Citizens will be directed to the school districts for all school zone related traffic control issues.

In Washington, the responsibilities for school traffic control devices along roadways that are part of the state highway system are assigned based on the population of the city[30], as follows:

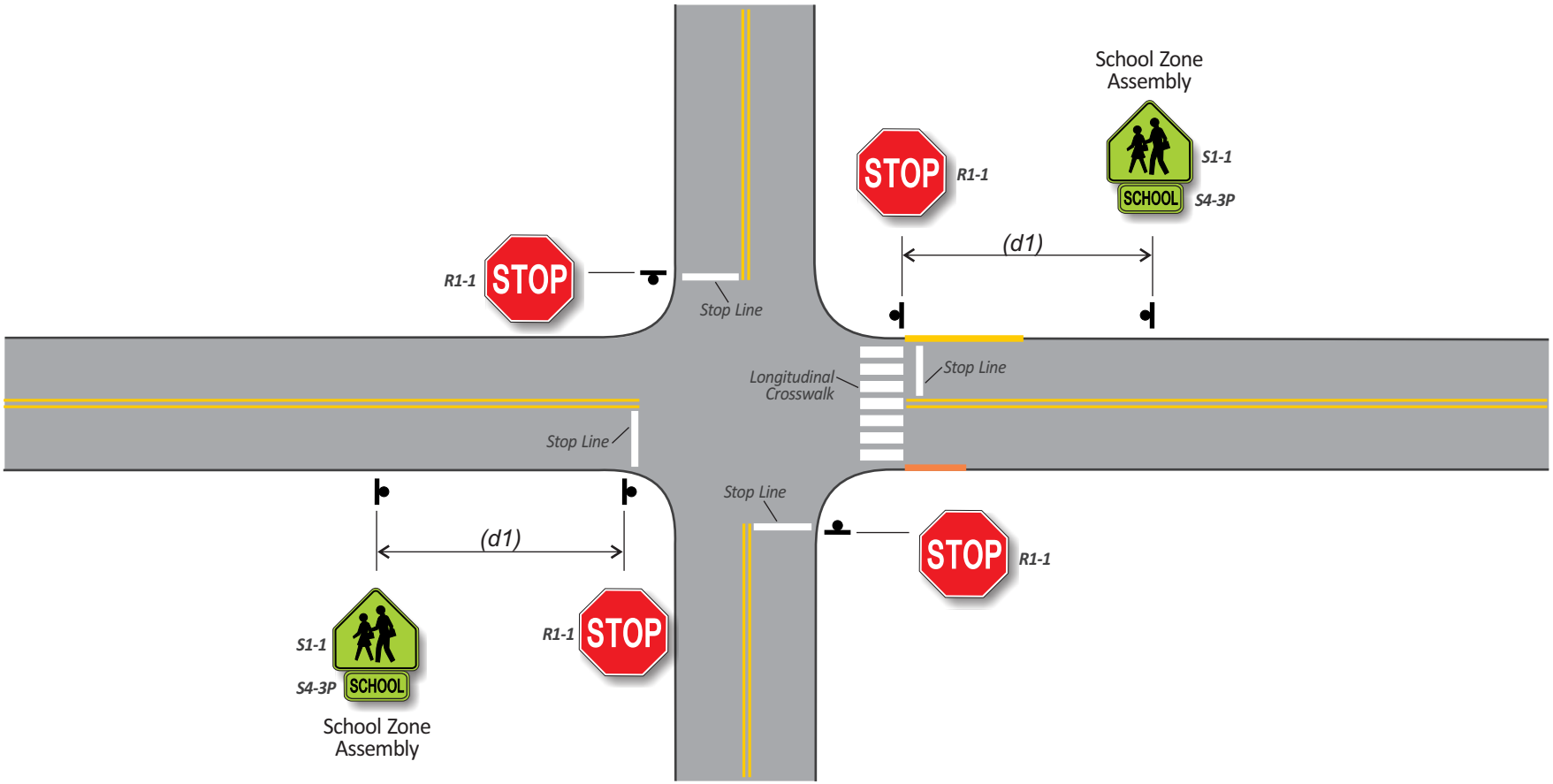
- Population ≥ 25,000 = City
- Population <25,000 = State

[30] RCW 47.24.020

APPENDIX A:
SCHOOL AREA LAYOUTS

List of School Area Layouts

- A1 – All Way Stop in School Area
- A2 - Traffic Signal in School Area



100' Parking Restriction
50' Parking Restriction

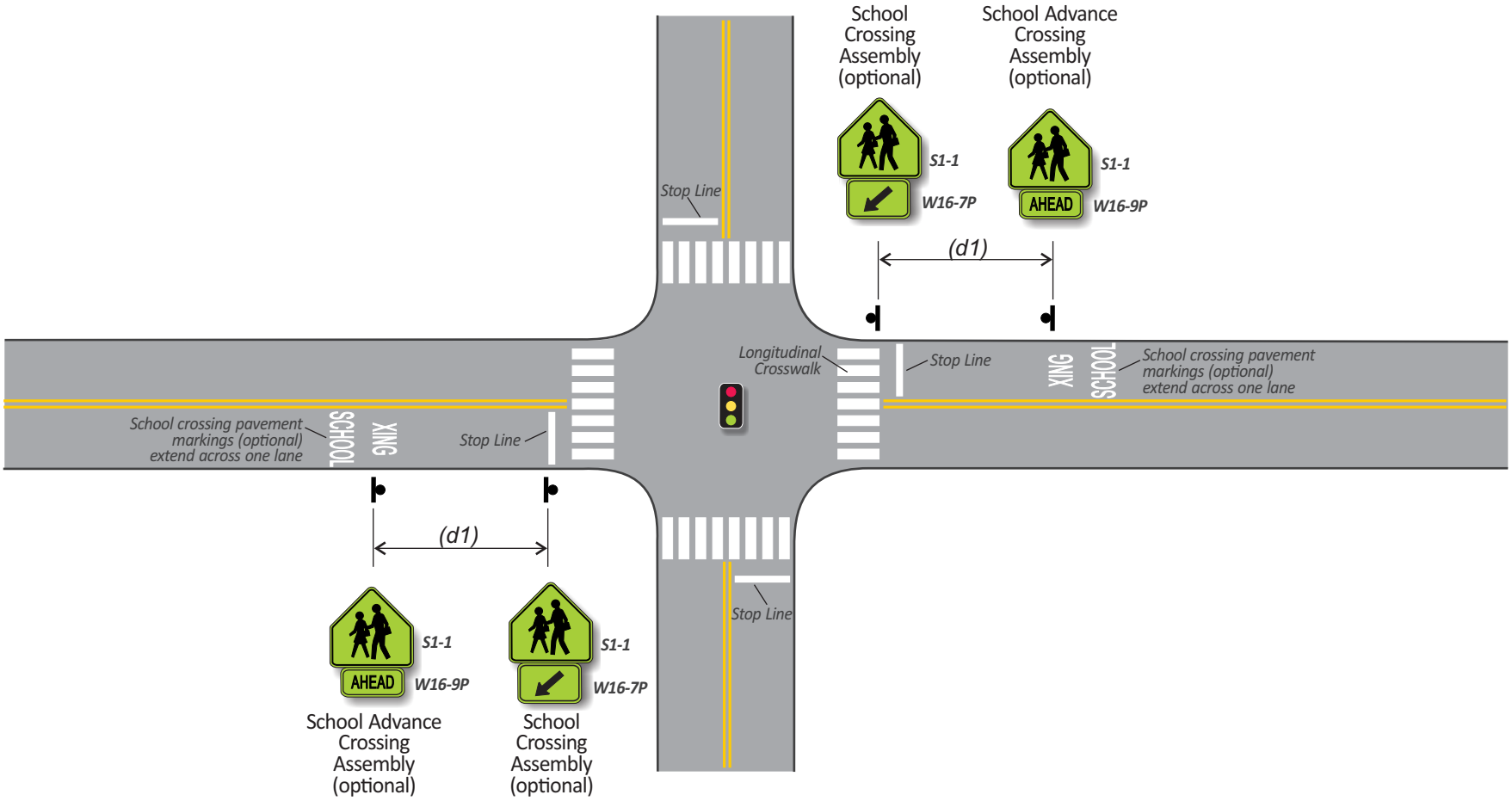
Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-40	45	50
Distance (d1) - Between Stop Sign and School Zone Assembly (ft)	150*	175	250

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout A1 -- All Way Stop in School Area

Clark County School Zone
Signing & Pavement Marking Policy



Signalized Intersection or High-Intensity Activated Crosswalk (HAWK)

Note: The school crossing must be guarded by a school patrol. The patrol member may not direct the traffic against the traffic signal but only control the pedestrian.

Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-40	45	50
Distance (d1) - Between School Crossing Assembly and School Advance Crossing Assembly (ft)	150*	175	250

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout A2 -- Traffic Signal in School Area

Clark County School Zone Signing & Pavement Marking Policy

APPENDIX B:

REDUCED SCHOOL SPEED ZONE (RSSZ) LAYOUTS

List of Reduced School Speed Zone (RSSZ) Layouts

- B1 - School Crossing in RSSZ
- B2 - School Crossing Adjacent to School in RSSZ
- B3 - Midblock School Crossing in RSSZ
- B4 - Midblock School Crossing Adjacent to School in RSSZ
- B5 – Side Street School Crossing Adjacent to School in RSSZ
- B6 – School Crossing Located Less than 800 Feet from School Boundary in RSSZ
- B7 – School Crossing Located Greater than 800 Feet from School Boundary in RSSZ
- B8 - Adjacent Schools Spaced Less than 800 Feet Apart in RSSZ
- B9 - Adjacent Schools Spaced Between 800 and 1,500 Feet Apart in RSSZ
- B10 - Adjacent Schools Spaced Greater than 1,500 Feet Apart in RSSZ

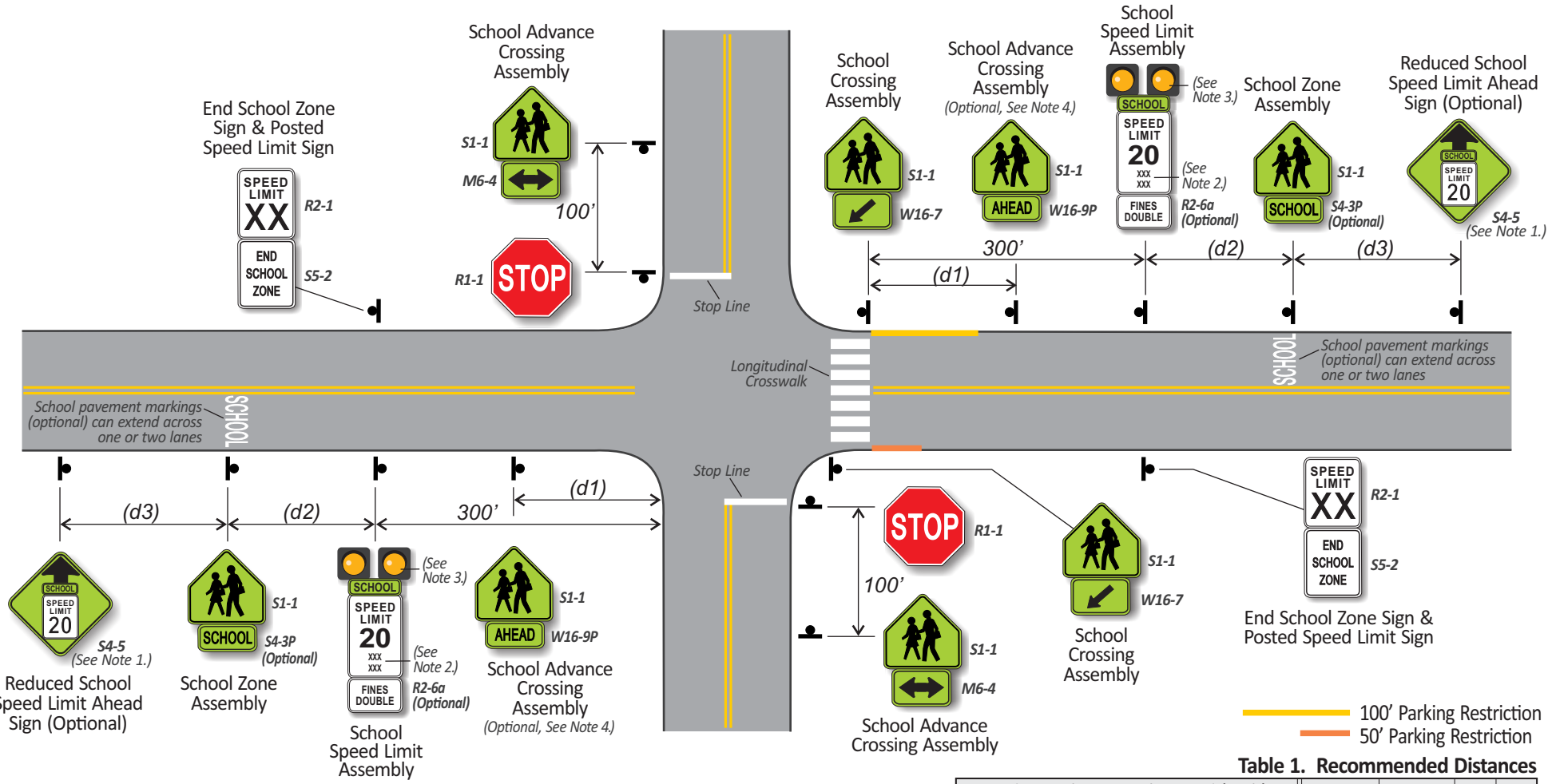


Table 1. Recommended Distances

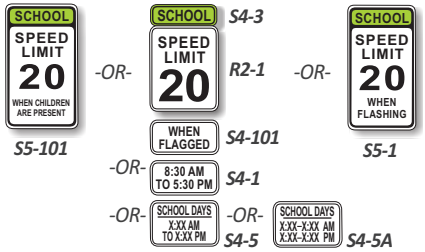
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.

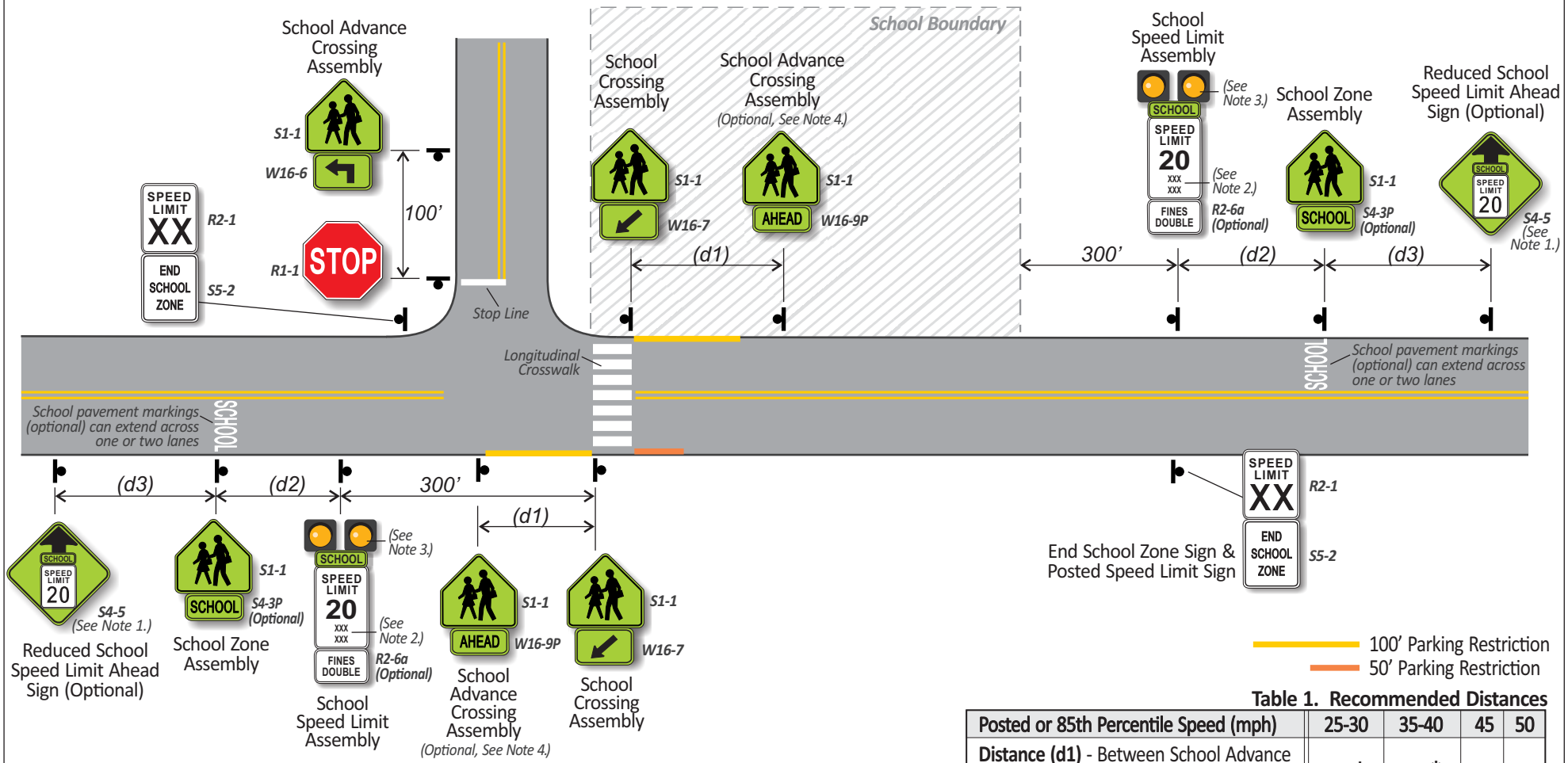


3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B1 -- School Crossing In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy



100' Parking Restriction

50' Parking Restriction

Table 1. Recommended Distances

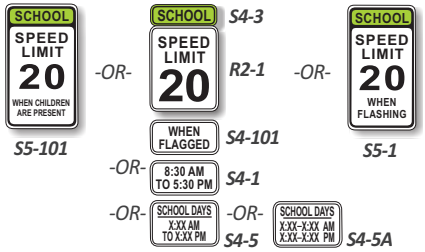
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B2 -- School Crossing Adjacent To School In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy

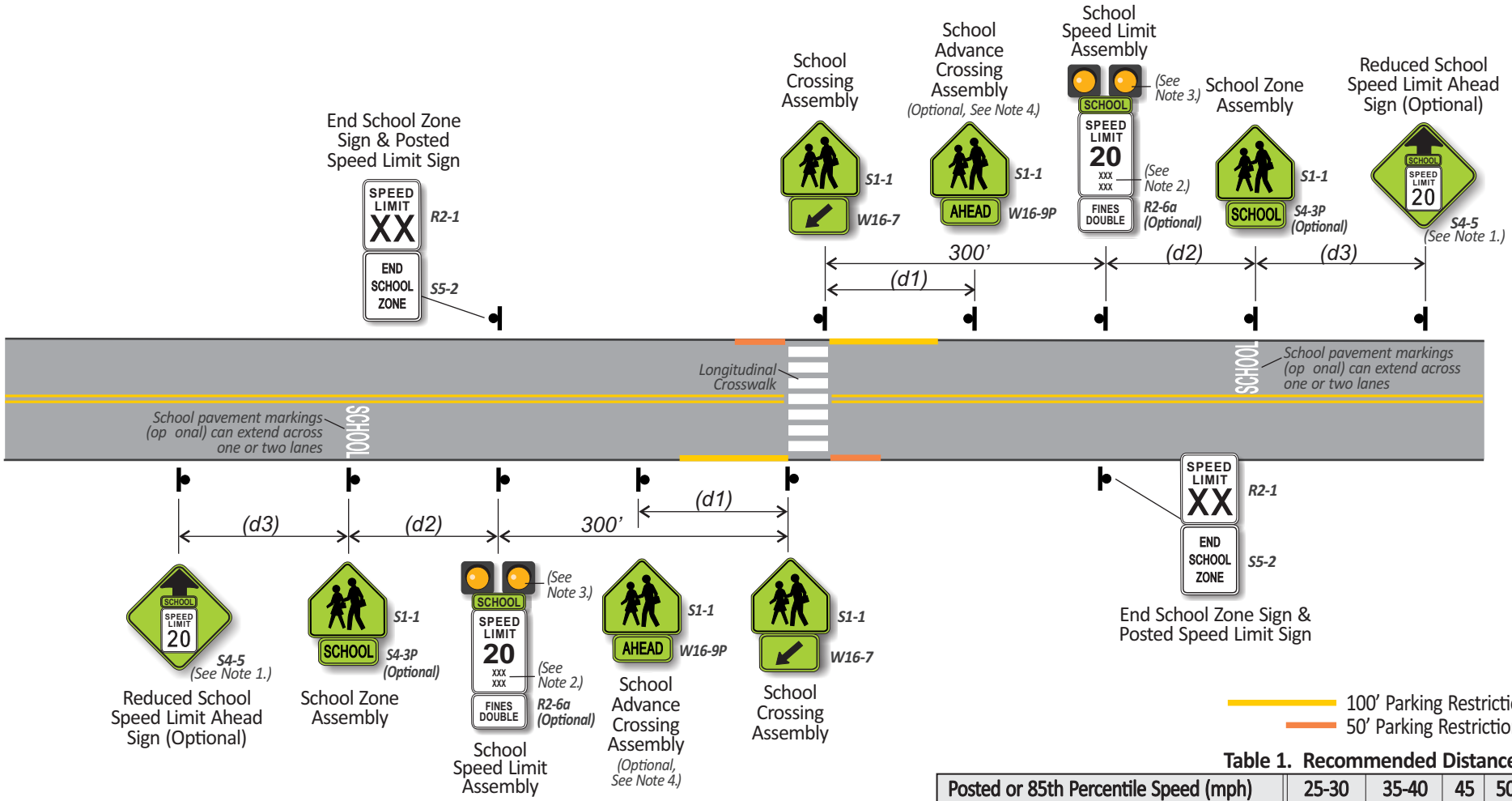


Table 1. Recommended Distances

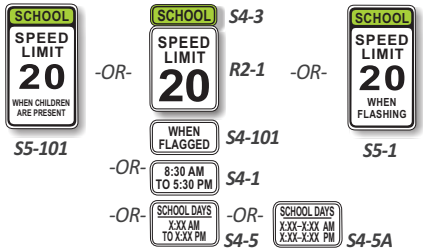
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

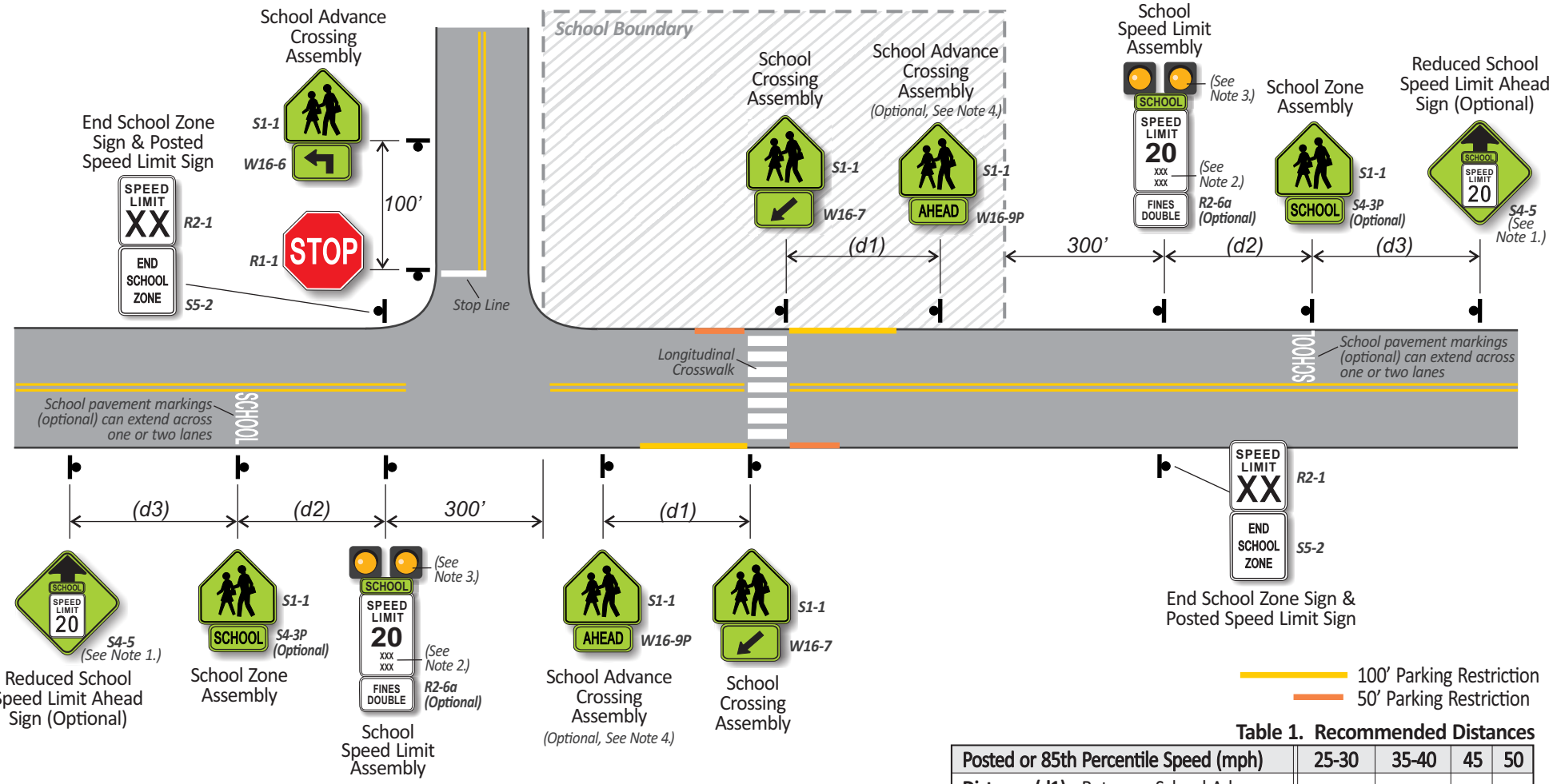
2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B3 -- Midblock School Crossing In Reduced School Speed Zone



100' Parking Restriction
50' Parking Restriction

Table 1. Recommended Distances

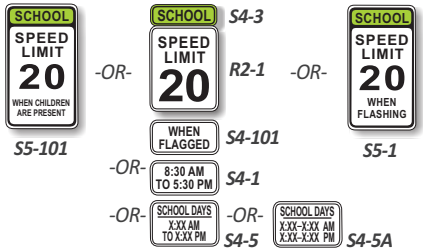
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

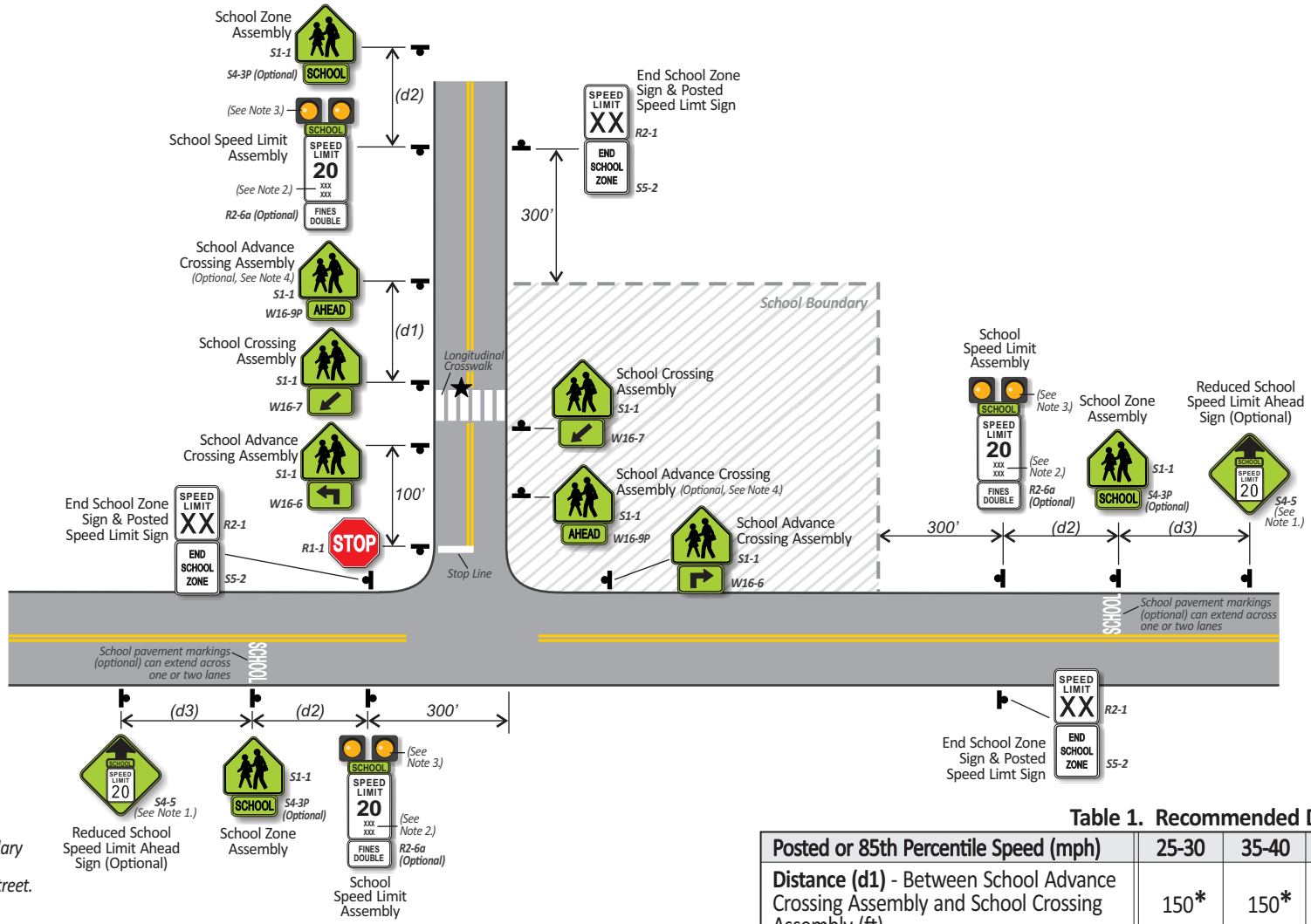
2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B4 -- Midblock School Crossing Adjacent to School in Reduced School Speed Zone

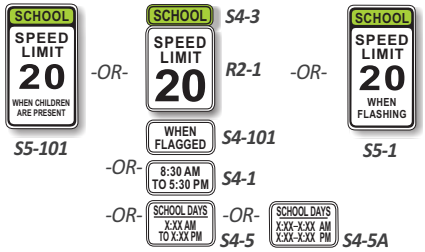


★ *Crosswalk must be within school boundary or less than or equal to 600 feet from crosswalk to school boundary on side street.*

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

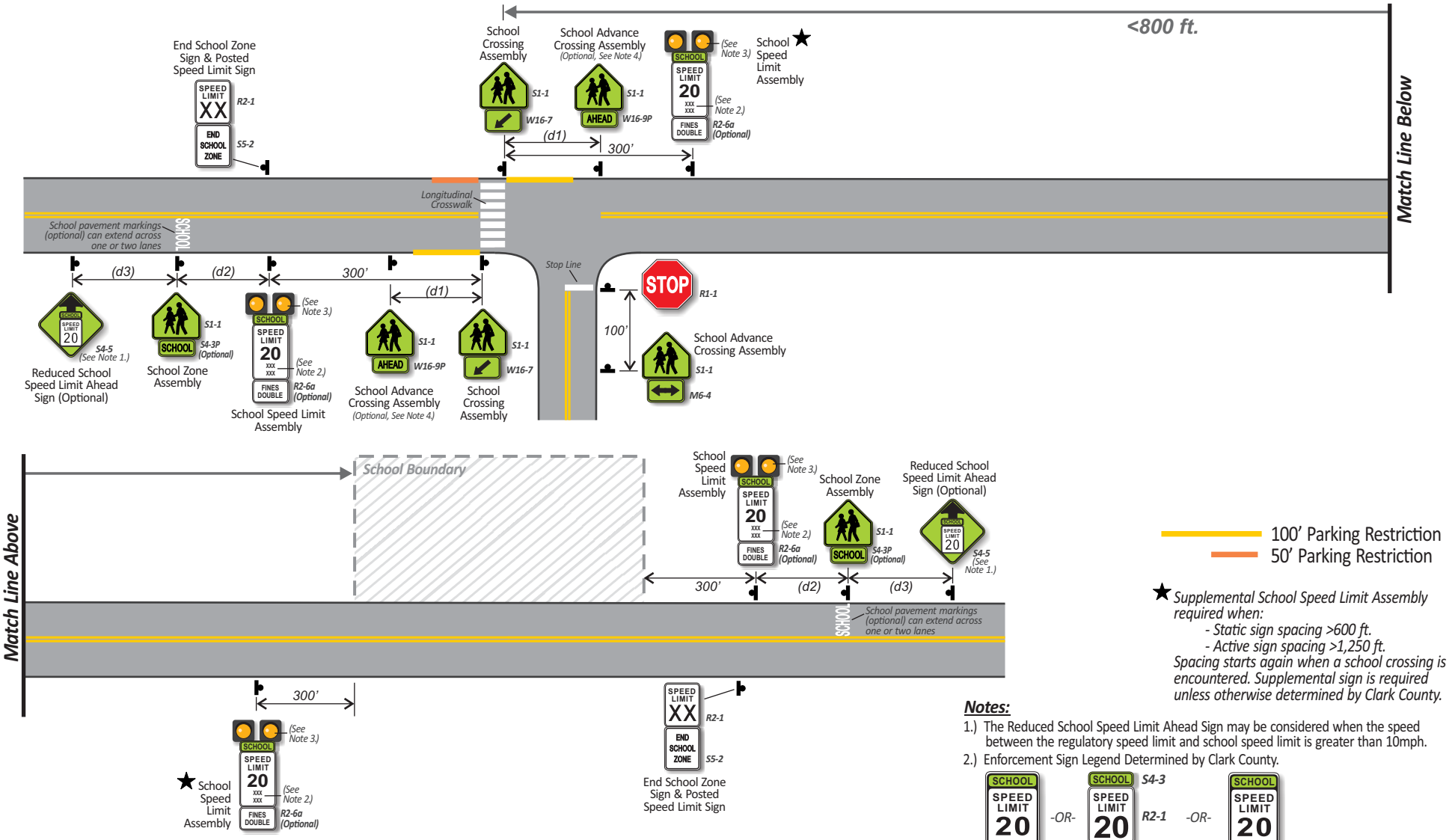
Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout B5 -- Side Street School Crossing Adjacent to School In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy



100' Parking Restriction
50' Parking Restriction

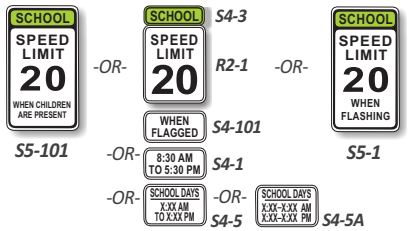
★ *Supplemental School Speed Limit Assembly required when:*
- *Static sign spacing >600 ft.*
- *Active sign spacing >1,250 ft.*

Spacing starts again when a school crossing is encountered. Supplemental sign is required unless otherwise determined by Clark County.

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

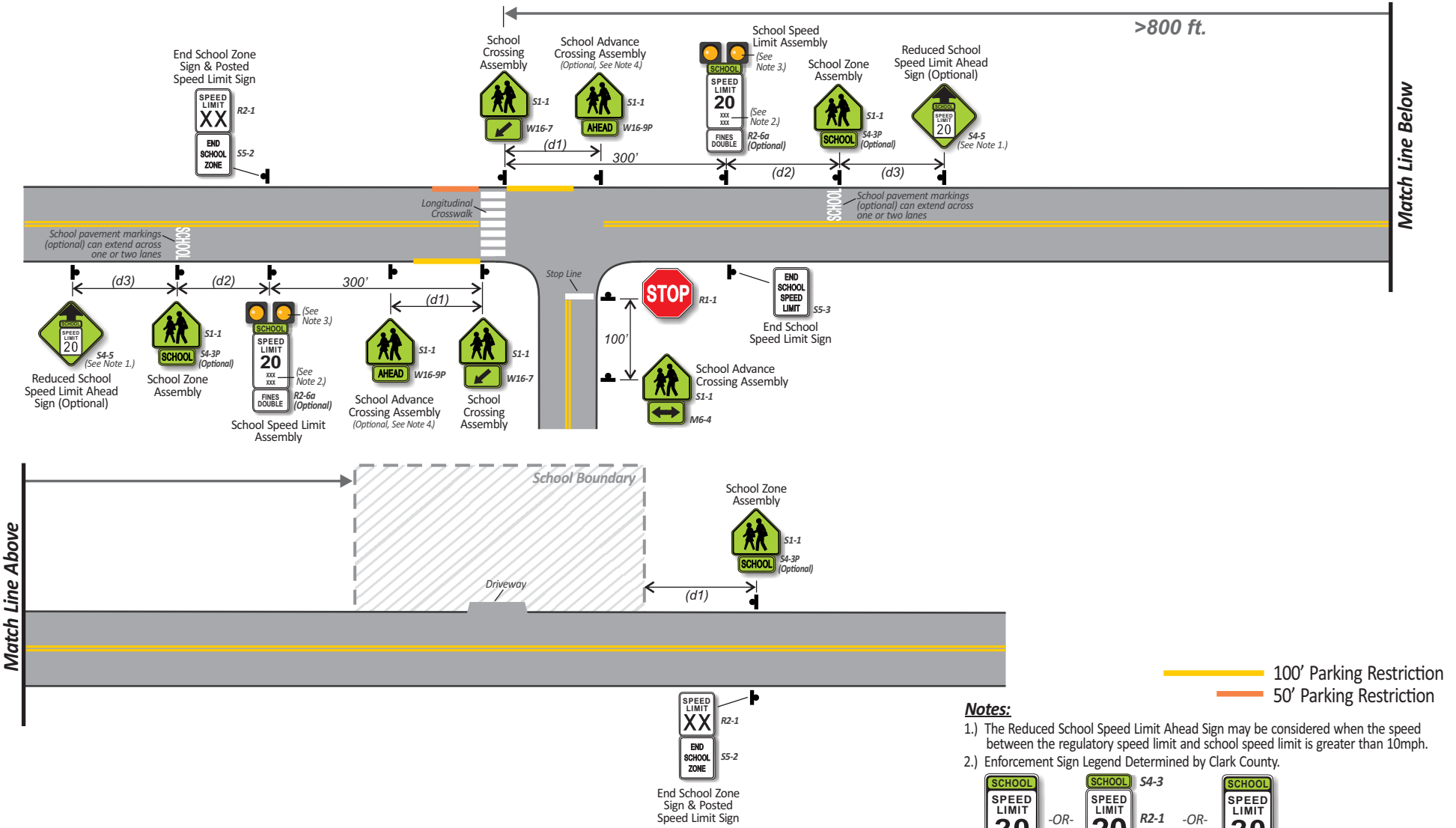
Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout B6 -- School Crossing Located Less Than 800 Feet From School Boundary In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy

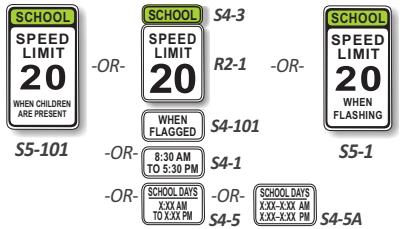


100' Parking Restriction
50' Parking Restriction

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

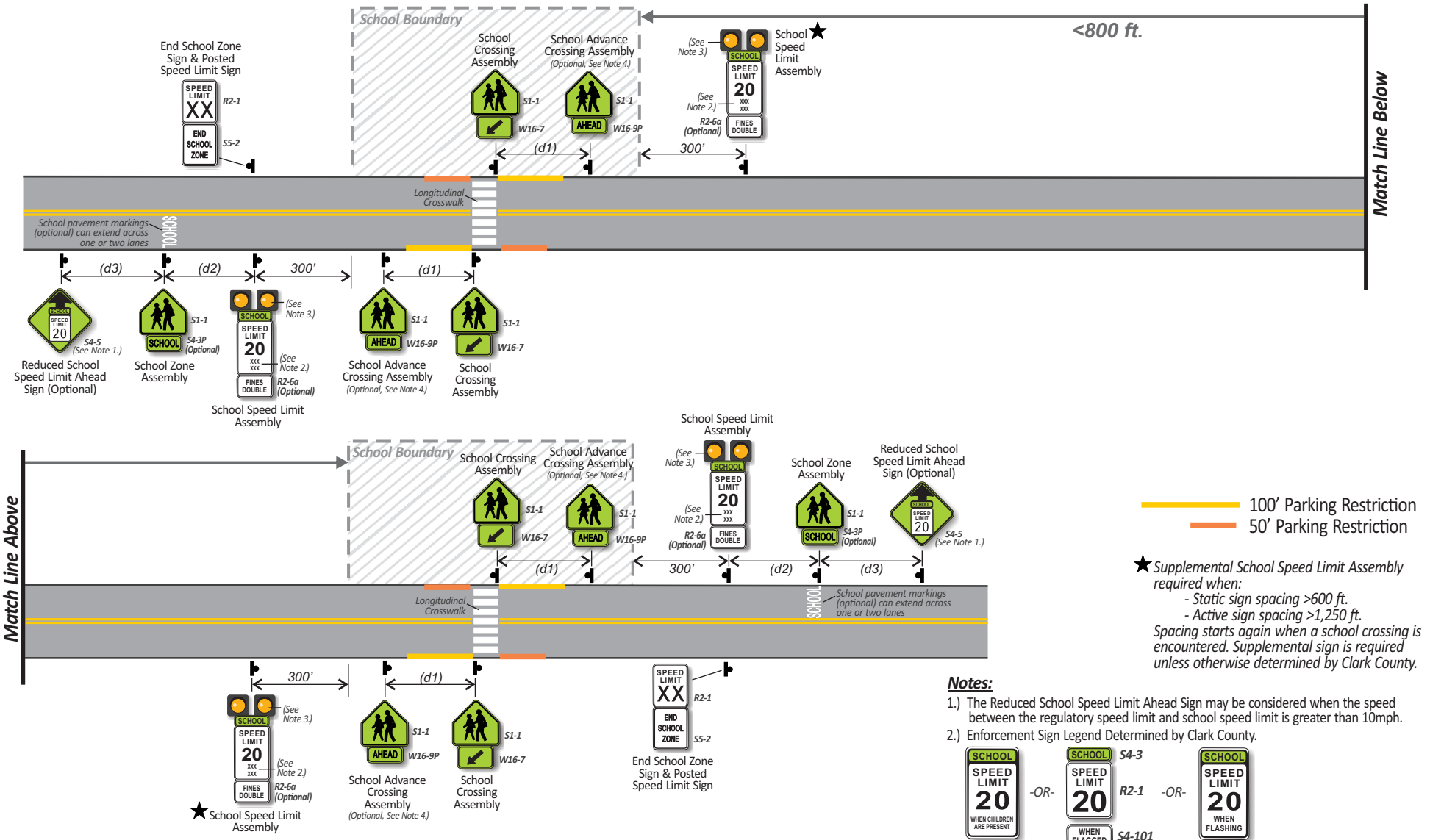
Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout B7 -- School Crossing Located Greater Than 800 Feet From School Boundary In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy



★ *Supplemental School Speed Limit Assembly required when:*
- *Static sign spacing >600 ft.*
- *Active sign spacing >1,250 ft.*

Spacing starts again when a school crossing is encountered. Supplemental sign is required unless otherwise determined by Clark County.

Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.

S5-101 -OR- S4-3 / R2-1 / S4-101 -OR- S5-1

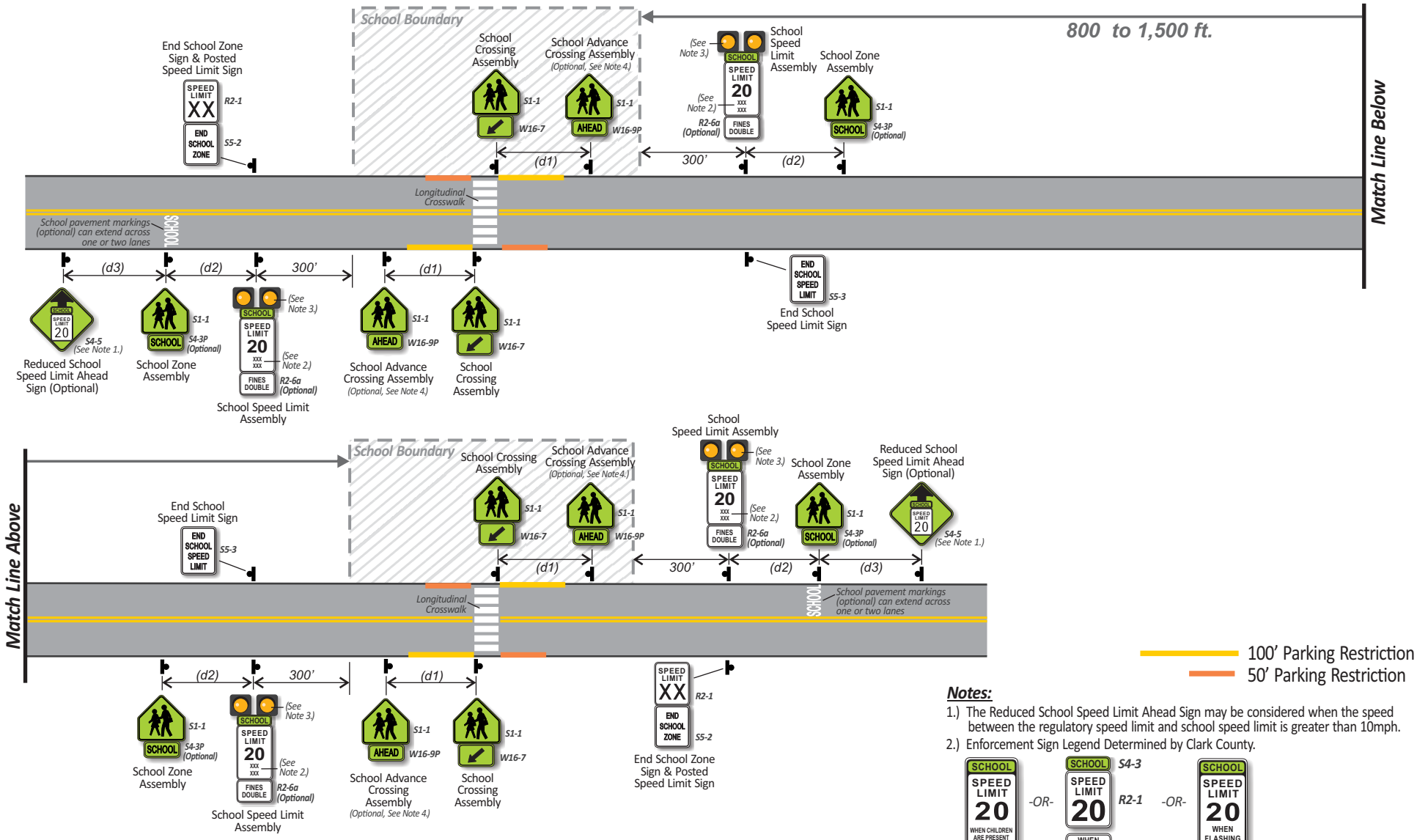
-OR- S4-1 -OR- S4-5 -OR- S4-5A

3.) Only use flashing beacons with WHEN FLASHING enforcement legend. The flashing time period will encompass the entire time period for both schools.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B8 -- Adjacent Schools Spaced Less Than 800 Feet Apart In Reduced School Speed Zone

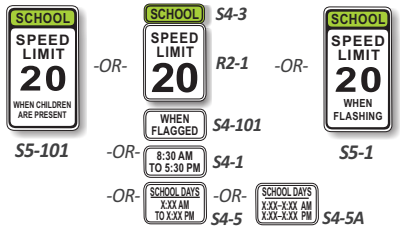
Clark County School Zone Signing & Pavement Marking Policy



Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.



3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Layout B9 -- Adjacent Schools Spaced Between 800 and 1,500 Feet Apart In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy

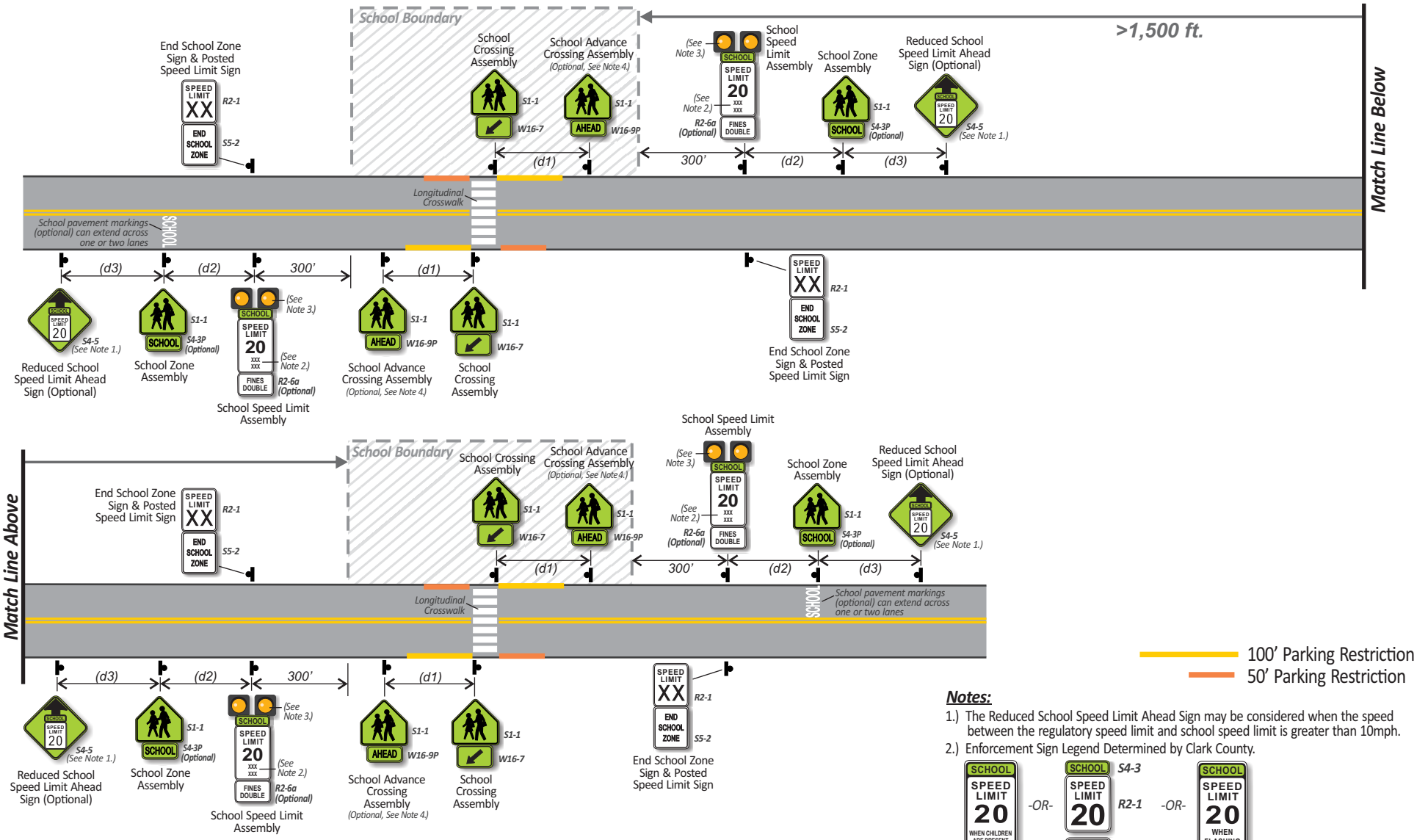


Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between Reduced School Speed Limit Ahead Sign and School Advance Crossing Assembly (ft)	NA	150	150	150

*Distance may be reduced per Table 2C-4 of the 2009 MUTCD

Notes:

1.) The Reduced School Speed Limit Ahead Sign may be considered when the speed between the regulatory speed limit and school speed limit is greater than 10mph.

2.) Enforcement Sign Legend Determined by Clark County.

S5-101 -OR- S4-3 / R2-1 -OR- S5-1

-OR- S4-101 -OR- S4-1 -OR- S4-5 -OR- S4-5A

3.) Only use flashing beacons with WHEN FLASHING enforcement legend.

4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B10 -- Adjacent Schools Spaced Greater Than 1,500 Feet Apart In Reduced School Speed Zone

APPENDIX C:
SUPPORTING MEMORANDUMS

MEMORANDUM

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: October 13, 2014

TO: Marcela Rodriguez, Clark County
Matt Griswold, Clark County

FROM: Steve Boice, P.E., PTOE
Courtney Furman, E.I.T.

SUBJECT: Clark County School Zone Signing and Pavement Marking Policy
Task 2.3 Static Signing versus Active School Zone Flashers P14085-002

This memorandum summarizes a literature review on the effectiveness of static signs versus supplemental active flashers for school speed zone signing, an analysis of vehicle speed data collected within eight school zones in Clark County, and presents results regarding compliance with the school speed limit for schools with static or active school zone flashers. Additionally, the role of school crossing guards and enforcement of school zone speeding will be discussed. The memorandum concludes with recommendations for school speed zone signing practices.

LITERATURE REVIEW

The current literature was reviewed for the effectiveness of static school speed zone signs versus the use of active flashers to supplement static school speed zone signs. Studies conducted in Washington, North Carolina, and Texas yielded different results as far as the differences between static and active school zone signage. A comparison of the key elements of the three most relevant studies is shown in Table 1, including the location, number of schools, how study groups were assembled, types of schools included, school speed limit ranges, and the overall study results.

The Washington study indicated that the use of flashers with static school speed limit signing was more effective in slowing vehicles down than static signage alone. Along this conclusion, the flashers were more effective when the posted speed was 30 miles per hour (mph) or greater, whereas static signs were just as effective for slower posted speeds (25 miles per hour or less). It is worth noting that the Washington study only included elementary schools, and the school zone speed limit was 20 miles per hour for all study sites.

Both the North Carolina and Texas studies concluded that flashers were not more effective at lowering speeds in school zones than static signs. Both of these studies included schools of the elementary, middle, and high school levels, and varying school speed limits ranging from 25 to 45 miles per hour for North Carolina and from 20 to 45 miles per hour for Texas. These two studies did not separate out schools by level or by posted speed, as the Washington study did.

Table 1. Literature Review Comparison

Location	Washington[1]	North Carolina[2]	Texas[3]
Number of Schools	38	30	24
Study Groups	Based on speed limit and enforcement legend (time of day, when children are present, when flagged, or when flashing)	Flashers and non-flashers/school and non-school times	Tested many variables for correlations with school speeds
Type of Schools	Elementary	Elementary, Middle, and High	Elementary, Middle, and High
School Speed Limit	20 mph	25 – 45 mph	20 – 35 mph
Results	Flashers were effective in slowing vehicles, average speeds were 5-7 mph slower than static signing. For posted speeds $\leq$ 25 mph, type of school zone signage did not make a significant difference. For posted speeds $\geq$ 30 mph, average speed is lower with flashers than static signs.	Flashers were not more effective at lowering speeds in school zones than static signs. School time speeds were lower than non-school time speeds.	Flashers were not more effective at lowering speeds in school zones than static signs. School zones in rural areas had higher average speeds. Lower speeds are associated with shorter speed zones (< 1,500 feet). Sites with a crosswalk are associated with lower speeds sites without one.

STUDY SITE DATA

For analysis purposes, the following eight locations were selected by Clark County, grouped by the presence of either static school speed zone signing or active school zone flashers to supplement static school speed zone signing, as shown in Figure 1:

- Schools with Static School Speed Zone Signing
  - Chinook Elementary School on NW 21st Avenue
  - Sunset Elementary School on NE 95th Street
  - Hockinson Heights Primary School on NE 164th Street
- Schools with Active School Zone Flashers supplementing Static School Speed Zone Signing
  - Columbia River High School on 99th Street

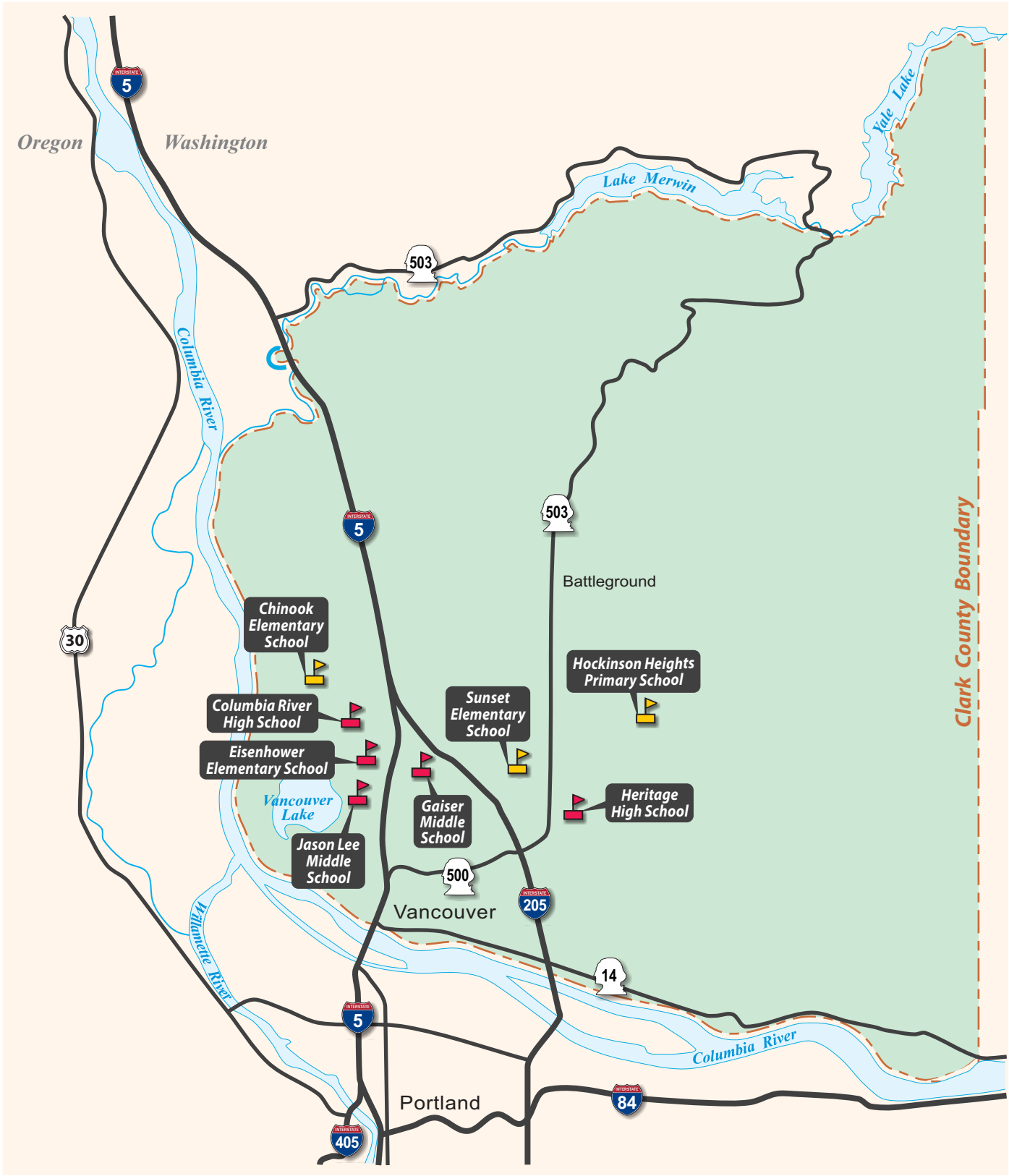
[1] Vehicle Speeds in School Zones, Washington Traffic Safety Commission
[2] An Evaluation of the Effectiveness of School Zone Flashers, North Carolina Department of Transportation, 2007
[3] Speeds in School Zones, Texas Transportation Institute, 2009

- Heritage High School on NE 130th Avenue
- Gaiser Middle School on 99th Street
- Jason Lee Middle School on NW 9th Avenue
- Eisenhower Elementary School on NW 9th Avenue

The eight study sites have different characteristics such as school districts, school levels, type of school zone signing, roadway cross section, traffic volume, and posted speed limits, as summarized in Table 2. The schools are within Vancouver, Evergreen, or Hockinson School Districts, ranging from Elementary, Middle, and High School levels. The school speed zone signing is either static or flashers are used to indicate when the school speed zone is active. All school zones surveyed have one or more designated school crosswalks with pavement markings and signing except for Columbia High School. Most roadways consist of a two-lane cross section with average daily traffic ranging from 1,000 to 15,050. The posted speed limit ranges from 25 to 40 miles per hour. All sites are located in an urban setting, except for Hockinson Heights Primary School which is located in a rural setting.

Table 2. Study Site Characteristics

School Name	School Frontage Street	School District	School Level	School Speed Zone Signing	Travel Lanes	Average Daily Traffic (ADT)	Posted Speed Limit (mph)
Chinook Elementary School	NW 21st Avenue	Vancouver	Elementary	Static	2	2,800	35
Sunset Elementary School	NE 95th Street	Evergreen	Elementary	Static	2	1,000	25
Hockinson Heights Primary School	NE 164th Street	Hockinson	Elementary	Static	2	2,150	40
Columbia River High School	99th Street	Vancouver	High	Flasher	4-5	15,050	35
Heritage High School	NE 130th Avenue	Evergreen	High	Flasher	2	5,600	35
Gaiser Middle School	99th Street	Vancouver	Middle	Flasher	3	10,700	35
Jason Lee Middle School	NW 9th Avenue	Vancouver	Middle	Flasher	2	5,600	35
Eisenhower Elementary School	NW 9th Avenue	Vancouver	Elementary	Flasher	2	4,900	35



LEGEND

Study School Locations:

- Static School Zone Signs
- Active Flashers

DKS

No Scale

Figure **1**

STUDY AREA

Clark County collected vehicle speed data along the roadways adjacent to all eight school zones when school was in session[4]. The data was used to compare the effectiveness of static school speed zone signing and the use of supplemental active school zone flashers for reducing speeds and improving compliance with the school speed zone limit of 20 mph. Additionally, the times for when the flashers were on and off were obtained from Clark County in order to determine when the school zone was active. This schedule is developed each year in coordination with the School Districts and is shown in Table 3 for each the schools.

Table 3. Study Site Active School Zone Schedule

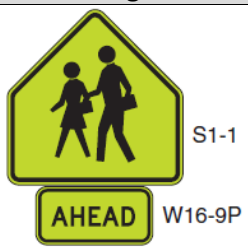
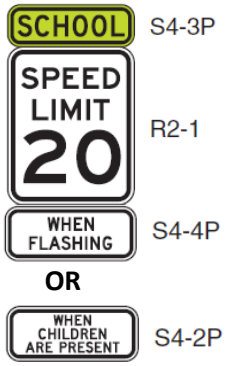
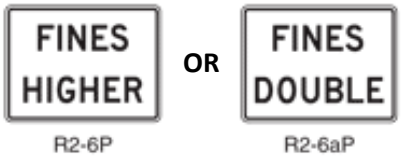
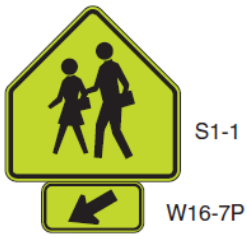
School Name	Static/ Flasher	Active School Zone Times			
		AM		PM	
		Start	End	Start	End
Chinook Elementary School	Static	7:50 AM	8:35 AM	2:45 PM	3:30 PM
Sunset Elementary School		8:25 AM	9:10 AM	3:30 PM	4:15 PM
Hockinson Heights Primary School		7:20 AM	8:05 AM	2:40 PM	3:25 PM
Columbia River High School	Flasher	7:00 AM	7:35 AM	2:00 PM	2:35 PM
Heritage High School		7:15 AM	7:50 AM	2:10 PM	2:45 PM
Gaiser Middle School		8:30 AM	9:05 AM	2:00 PM	4:00 PM
Jason Lee Middle School		8:30 AM	9:05 AM	2:00 PM	4:00 PM
Eisenhower Elementary School		7:50 AM	8:35 AM	2:45 PM	3:30 PM

Typically, the flasher is set to turn on thirty to forty minutes before school begins in the morning and will remain on until five minutes after school has started. In the afternoon, the flasher typically starts five minutes before school ends and remains on for thirty to forty minutes after school has ended for the day. There are some exceptions to this general time frame, such as the longer flashing duration around school release at the two middle schools. For locations with static signing, the school zone is considered active when children are present as defined by Washington Administrative Code[5]. Therefore, comparable times were used for these locations as with the flashers for comparison purposes since children would likely be present at those times.

Additionally, an inventory of the school zone signing along the roadway in which speed data was collected was conducted to assist with the data analysis. Washington specific guidelines for standardized signing of school zones are summarized in Table 4, including the sign name, an image, and the desired location. The school zone signing for each school zone study area is shown in Figures 2 through 9.

[4] Collected on January 16, 22, 28, 30, and February 5, 2014 except for Columbia River High School and Heritage High School, which were collected on September 30 and October 1, 2014
[5] Washington Advisory Code 468-95-335

Table 4. WSDOT recommended School Zone Signing

Sign Name	Image	Desired Location
School Advance Crossing Assembly		700 feet maximum from school boundary or crosswalk on both approaches and at least 100 feet from school crossing assembly or school speed limit assembly
School Speed Limit Assembly		300 feet from school boundary or crosswalk on both approaches
Higher Fines/Fines Double		Located below school speed limit assembly
School Crossing Assembly		At school crosswalk on both approaches
End School Zone		300 feet from school boundary or crosswalk on both approaches opposite school speed assembly
Posted Speed Limit		Located below end school zone sign

LEGEND

- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Sign Post Location
- Designated School Crosswalk

DKS

No Scale

Figure **2**

Chinook Elementary School
SITE AREA
(Static School Zone Signs)

LEGEND

- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Sign Post Location
- Designated School Crosswalk

DKS

No Scale

Figure 3

Sunset Elementary School
SITE AREA
(Static School Zone Signs)

LEGEND

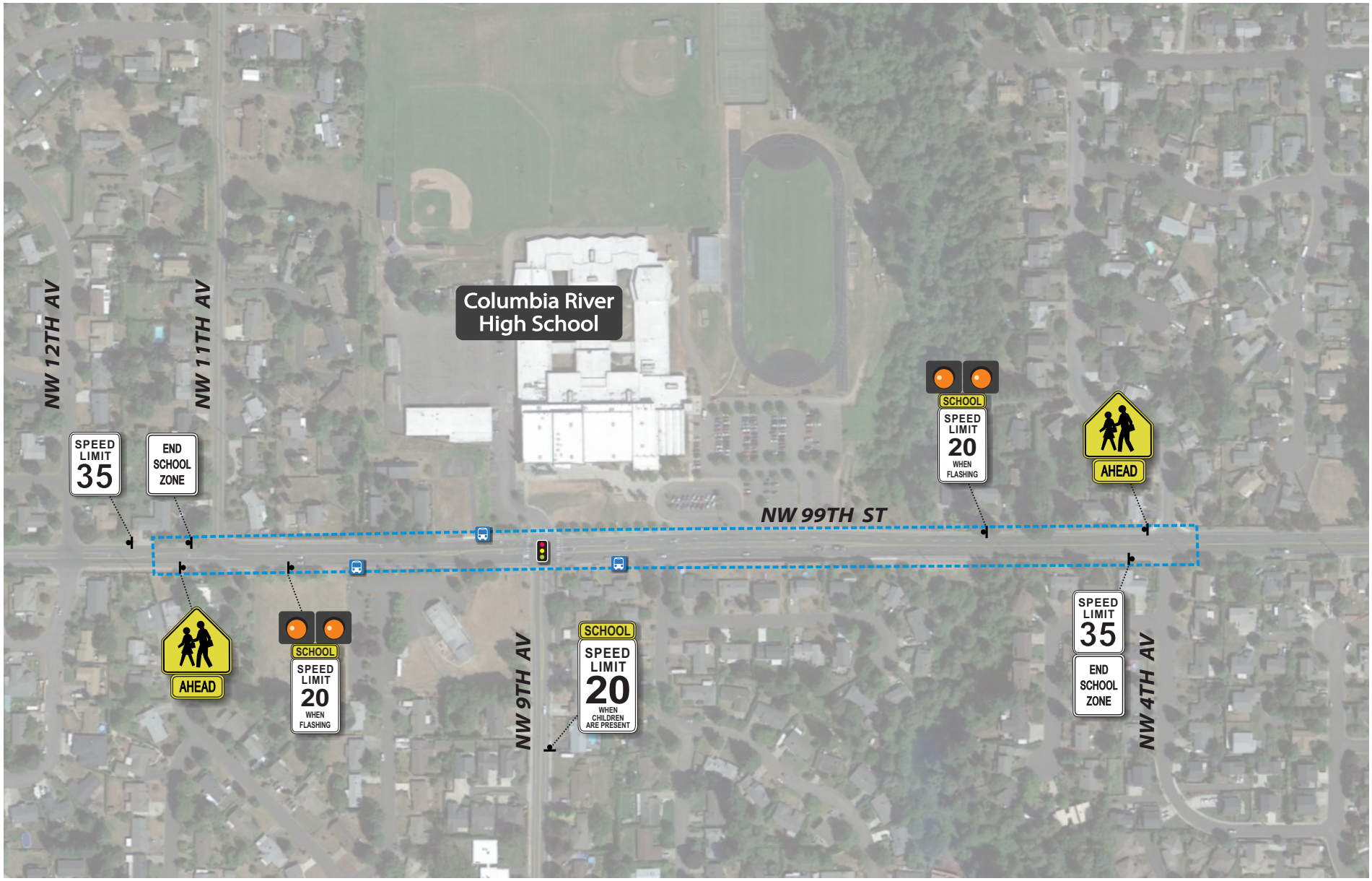
- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Sign Post Location
- Designated School Crosswalk
- Stop Sign

DKS

No Scale

Figure **4**

Hockinson Heights Primary School
SITE AREA
(Static School Zone Signs)



LEGEND

- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Signalized Intersection
- Sign Post Location
- Bus Stop

DKS

No Scale

Figure **5**

Columbia River High School
SITE AREA
(Active Flashers)

LEGEND

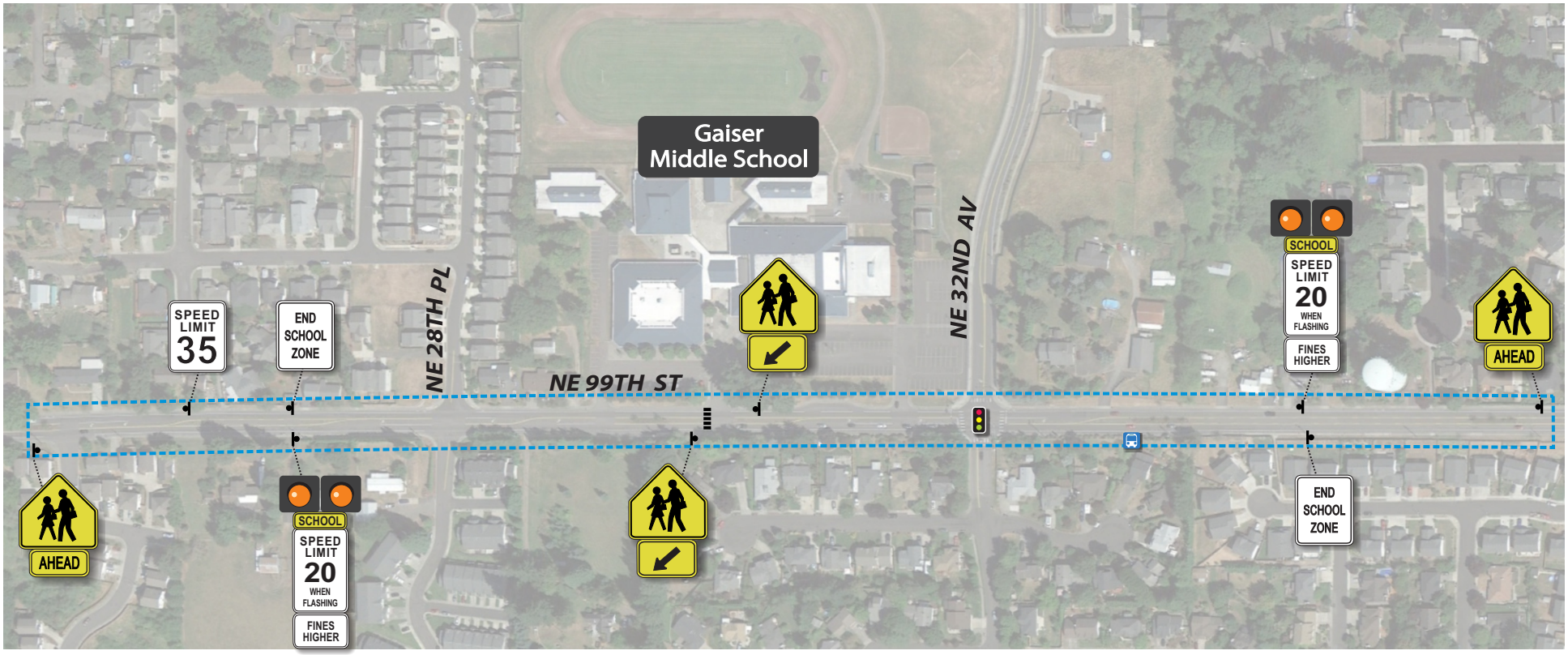
- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Signalized Intersection
- Sign Post Location
- Designated School Crosswalk

DKS

No Scale

Figure **6**

Heritage High School
SITE AREA
(Active Flashers)



LEGEND

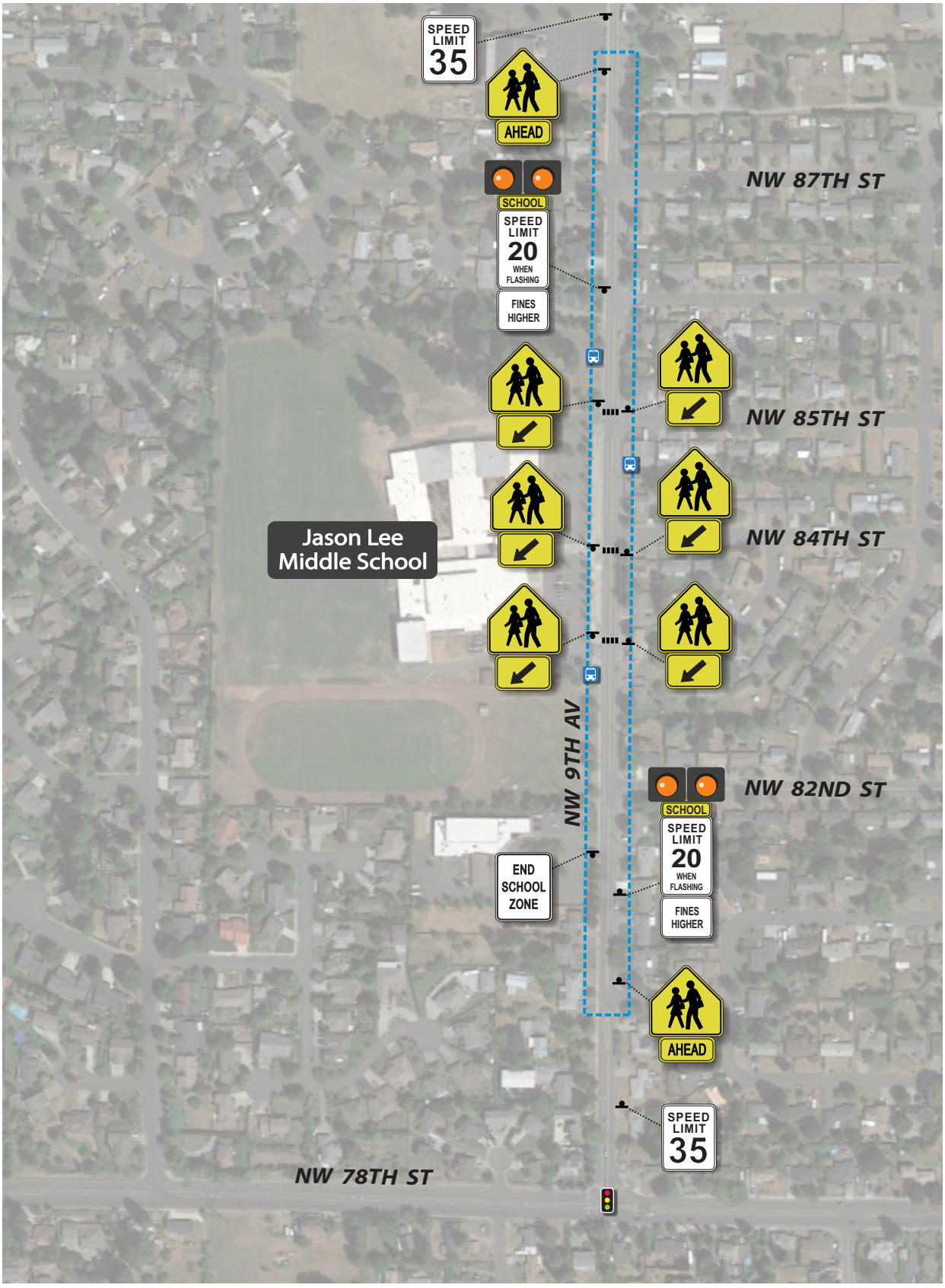
- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Signalized Intersection
- Sign Post Location
- Designated School Crosswalk
- Bus Stop

DKS

No Scale

Figure 7

Gaiser Middle School
SITE AREA
(Active Flashers)



LEGEND

- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Signalized Intersection
- Sign Post Location
- Designated School Crosswalk
- Bus Stop

DKS

No Scale

Figure **8**

Jason Lee Middle School
SITE AREA
(Active Flashers)

LEGEND

- School Zone Study Area
  (Figure only depicts study elements within defined study area.)
- Sign Post Location
- Designated School Crosswalk
- Bus Stop

DKS

No Scale

Figure **9**

Eisenhower Elementary School
SITE AREA
(Active Flashers)

As shown, the school zone signing is not always consistent with the Washington standard practice. Inconsistencies in signing make it more difficult for drivers to follow the law and recognize the correct driving behaviors. Additionally, inconsistent signing can make the school zone difficult to enforce. Examples of inconsistencies in signing include missing signs, incorrect sign location, and variation in signing by direction. Furthermore; there are some site specific characteristics that can affect driver speeds, such as the terrain, proximity to other school zones, public bus stop locations, location of speed limit signs, school zone length, or the presence of bike lanes and on-street parking.

The following includes unique site characteristics, signing features, and inconsistences with the standard school zone signing guidelines for each of the eight schools:

- **Chinook Elementary School** – Located adjacent to Alki Middle School and Skyview High School, bike lanes are present, the school zone continues to adjacent cross street (NW Bliss Road); however there is no indication that it continues, school zone length is approximately 650 feet.
- **Sunset Elementary School** – Located in a residential neighborhood, on street parking present on both sides of the roadway, school zone length is approximately 1,350 feet.
- **Hockinson Heights Primary School** – Located in a rural area, rolling roadway, two school speed limit assemblies for each direction of travel instead of one, school zone crossing at stop controlled intersection, "Speed Limit 40" sign located within the school zone, no reduced school speed zone ahead signs, school zone length is approximately 1,650 feet.
- **Columbia River High School** – Located near Eisenhower Elementary School, bike lanes present, bus stop, school zone includes a signalized intersection, school zone signage located along side street (NW 9th Avenue), wide cross section, "End School Zone" location does not match the beginning of the school zone in the opposite direction, flashing beacons should be vertically aligned, school zone length is approximately 2,000 feet.
- **Heritage High School** – Has an old style of school zone flasher than County standard, missing "End School Zone" sign and "Speed Limit" sign assembly in both directions, school zone should extend 300 feet from school boundary, school zone length is approximately 1,450 feet.
- **Gaiser Middle School** – Roadway slopes up going eastbound, bus stop, signalized intersection within school zone in addition to unsignalized marked school crosswalk, wide cross section, school zone extends beyond the 300 feet from school boundary, flashing beacons should be vertically aligned, school zone length is approximately 1,850 feet.
- **Jason Lee Middle School** – Located adjacent to Eisenhower Elementary School and near Columbia River High School, multiple bus stops, three unsignalized marked school crosswalks, missing "End School Zone" sign and "Speed Limit" sign assembly in the northbound direction, speed limit signs (35 mph) in advance of school zone, flashing beacons should be vertically aligned, school zone length is approximately 1,300 feet.
- **Eisenhower Elementary School** - Located adjacent to Jason Lee Middle School, multiple bus stops, two unsignalized marked school crosswalks, missing "End School Zone" sign and "Speed Limit" sign assembly in both directions, flashing beacons should be vertically aligned, school zone length is approximately 1,350 feet.

SPEED DATA RESULTS

The eight study sites were compared to each other in terms of number of vehicles, number of speeding violators, 85th percentile speeds, posted speeds, and the presence of static school speed zone signs or supplemental active flashers. The results during the morning school start time are shown in Figure 10 and for the afternoon school release time in Figure 11. The analysis time periods that were used correspond to the times summarized in Table 3. A driver was considered to be in violation if their speed was greater than 25 miles per hour, assuming a five mile per hour lenience from the 20 mile per hour law[6].

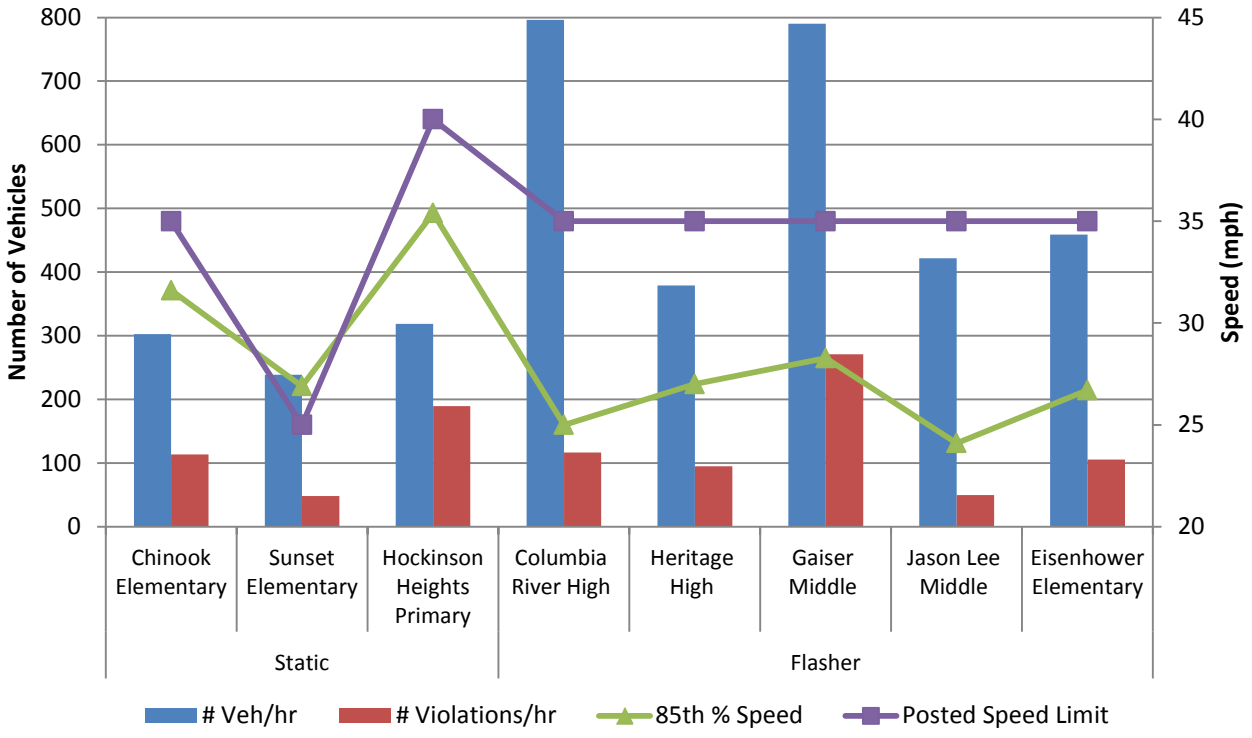


Figure 10. Morning School Zone Study Site Vehicles and Speeds

[6] Meeting with Clark County Sheriff's Office , August 29, 2014

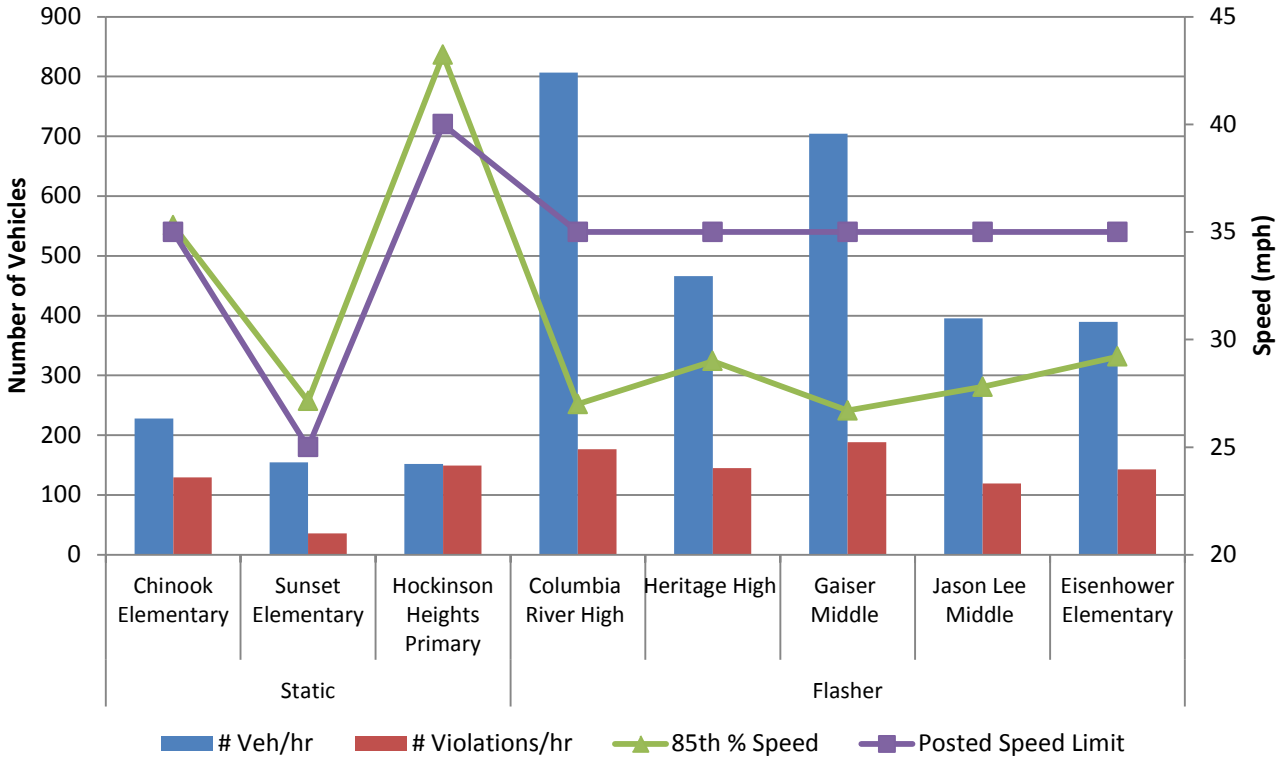


Figure 11. Afternoon School Zone Study Site Vehicles and Speeds

During the school pick up and drop off periods, the 85th percentile speeds are near the posted speeds for the schools with static school speed zone signing only. This may be because the active school zone speed limit only applies to when children are present; therefore it is the judgment of the driver to determine if the 20 mph speed limit is in force. However, for the schools with flashers, the 85th percentile speeds were consistently lower than the posted speed of 35 miles per hour when the flashers were active. Several of the schools with flashers are located along multi-lane roadways with a higher volume of vehicles. Results indicate that the two locations with the greatest volume and number of lanes had the lowest 85th percentile speed which could contribute to safer school zones. Speeds were greatest at Hockinson Heights Primary, which is the only school zone located in a rural setting. This along with the fact that this site has the highest posted speed limit at 40 mph may contribute to the higher speeds. Due to the speed differential (20 mph), reduced school speed zone ahead signs should be considered.

During non-school hours, the 85th percentile speeds follow the posted speed closely at all school sites, with the 85th percentile speeds typically within five miles per hour over the posted speed. The non-school speeds are higher than school hours due to the reduced school speed zones in place during school hours.

For further comparison, speeds were reviewed based on the morning and evening time periods as well by school level. The results are shown in Table 5. As listed, there are a lower percentage of violations and lower speeds for the locations with flashers as compared to the locations with static school zone signing. This holds true when all

eight study sites are grouped in this manner, and when the same comparison is done for only the elementary school sites when younger children are expected to be on the public streets.

Table 5. School Speed Zone Signing Static vs. Flasher

	Active School Zone Times					
	Morning			Afternoon		
	% Violations	Average Speed (mph)	85th Percentile Speed (mph)	% Violations	Average Speed (mph)	85th Percentile Speed (mph)
All Study Sites						
Static	41%	25.1	31.3	59%	28.9	35.2
Flasher	21%	22.2	26.2	28%	23.2	27.9
Difference	**-20%**	**-2.7**	**-5.1**	**-31%**	**-5.6**	**-7.3**
Only Elementary School Sites						
Static	41%	25.1	31.3	59%	28.9	35.2
Flasher	23%	22.1	26.7	37%	23.5	29.2
Difference	**-18%**	**-3.0**	**-4.6**	**-22%**	**-5.4**	**-6.0**

For both the morning and afternoon time periods, the speed data for the static study site sample was compared to the flasher study site sample using a two-sample t-test to determine if the means of each sample are equal. This statistical test confirmed that the mean values from each sample are not equal to each other at a 95% confidence level, indicating that the differences between static and active school speed zone signing are significant.

SCHOOL CROSSING GUARDS

School crossing guards are adults that help children safely cross the street at key locations, such as unsignalized school crossings. The crossing guards not only guide children, but they are role models in teaching students how to cross streets safely[7]. Clark County requires school crossing guards at all of their school crossings during key times of the day, right before school starts and when school is released, typically for twenty to thirty minutes. As defined in the Washington Administrative Code, school crossing guards shall only control school crossings which include the school crossing warning sign (S1-1 and S2-2), a marked crosswalk, and school speed limit signs. It is important that adequate safe stopping sight distance be provided to the crossing and guard. Additionally, the presence of school crossing guards can serve as an indication to drivers of the presence of children when active flashers are not provided.

[7] Safe Routes to School, Adult Crossing Guard Guidelines, http://guide.saferoutesinfo.org/crossing_guard/, accessed September 8, 2014

SCHOOL ZONE ENFORCEMENT

Clark County has a low number of enforcement personnel per person (0.08 /1,000 people), which results in a lower level of school zone enforcement than other nearby agencies, such as the City of Vancouver. Although enforcement within school zones is performed continually, Clark County typically stations more officers at the start of the school year for safety emphasis. The primary purpose of issuing tickets is to ensure the safety of children. Throughout the school year, Clark County officers can enforce school speed zones, as well as school resource officers. Over the past four years, there has been a decline in the number of school zone tickets issued throughout Clark County, as shown in Figure 12.

The four agencies that issue tickets within the County are the Vancouver Police Department, Clark County Sheriff's Office, the Washington State Patrol, and the Vancouver City Attorney. The Vancouver Police Department issues the highest number of tickets related to school zones[8]. Within Clark County, the number of school zone tickets issued was steady between 2011 and 2012, but declined in 2013, as shown in Figure 13. There were about half as many school zone tickets issued in 2013, as compared to 2012, with a decrease from 111 to 57. In 2013, the number of school zone ticket amounts to approximately 6 tickets per school month of the year.

The Revised Code of Washington (RCW) requires the speed limit to be 20 miles per hour or less for school speed zones. The speed zone extends 300 feet in either direction of the crosswalk, or border of the school[9] and should be defined through the use of signage. School zone speeding tickets are typically issued when the officer visually assesses a speeding condition, and is confirmed with a speed measurement via radar or lidar. The school boundary should be defined by the distance stated in Washington Law, but law enforcement typically uses the sign placement instead (these don't always match). When the officer writes the ticket, they must make note of either children being present or if the flasher is active to indicate that there was an active school zone. Officers keep a copy of the Clark County flasher schedule with them in order to assist with enforcement[10].

The fines are doubled in school zones, with ticket cost ranging between $187 and $400. The standard base fine is doubled regardless if additional signage (fines higher signs) is provided to warn drivers of this condition. The ticket cannot be mitigated or differed. The only manner in which a driver doesn't pay the fine is to contest the violation. Although speeding is the primary violation, there are several other violations that occur in school zones, including failing to yield to a pedestrian in a crosswalk, cell phone use, and not wearing a seat belt.

Based on conversation with law enforcement staff, the most common reasons for contestment of school zone speeding tickets include the following:

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[8] Meeting with Clark County Traffic Court Commissioner, August 26, 2014
[9] RCW 46.61.440
[10] Meeting with Clark County Sheriff's Office , August 29, 2014

- School speed zone sign was not visible
- Vehicle was not in the school zone when speed was recorded
- School zone boundary was not well defined
- Vehicle was entering an active school zone from a side street that wasn't signed or the flashers were not visible
- Validity of speed measurement (either radar or lidar)
- Children were not present
- Confusion with other speed limit signs located within the school zone

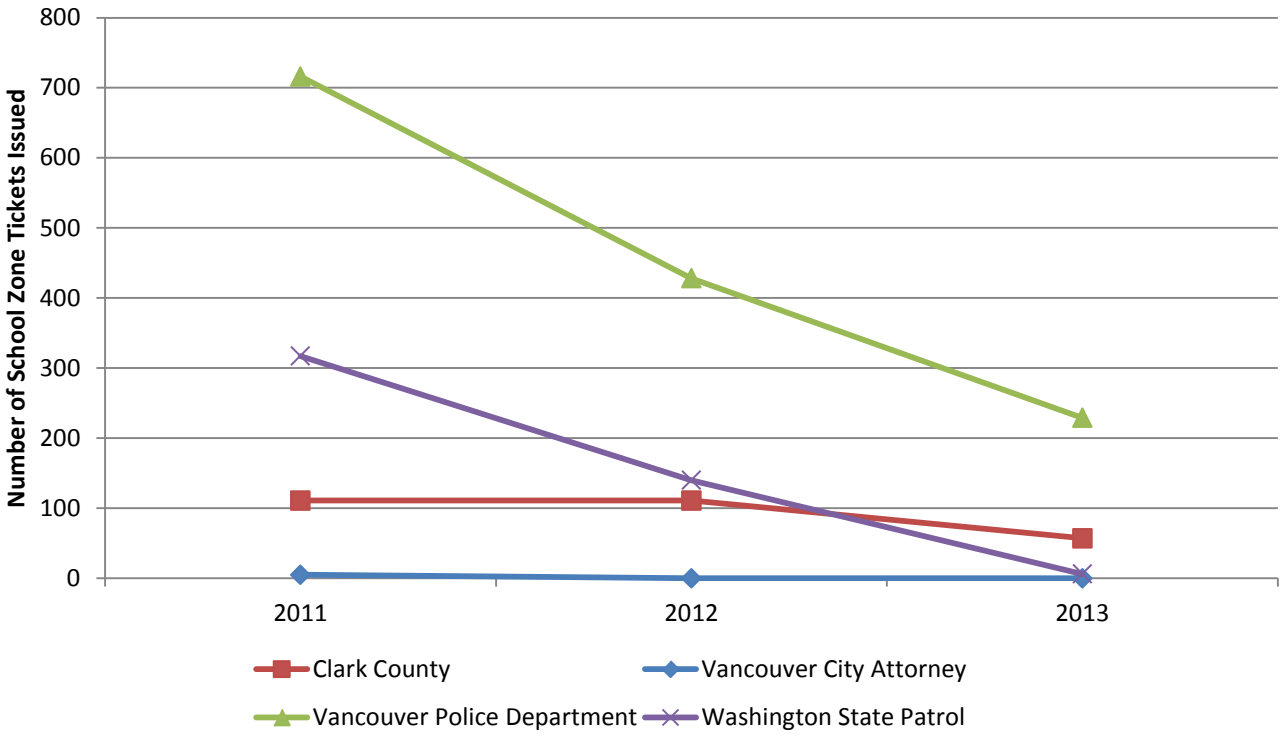

Figure 12. School Zone Ticket Trend Summary

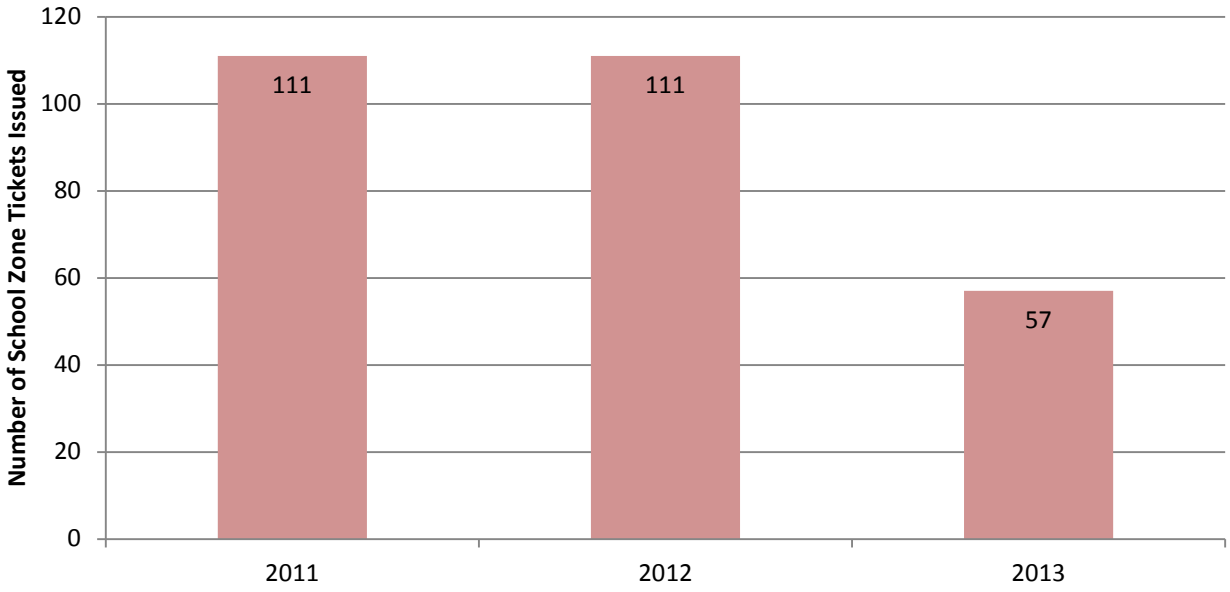

Figure 13. Clark County School Zone Ticket Trend

Clark County law enforcement provided guidance on school zone signing for easier enforcement, including the following recommendations:

- Shorter flasher duration seems to yield a higher compliance, less than an hour at a time.
- School zones with active flashers are easier to enforce.
- Additional flashers should be installed on the back side to assist with vehicles entering an active school zone from the side street.
- The enforcement legend that describes specific times of day when the school zone is active is clearer than when children are present. It is not always clear to determine "when children are present" should apply, and if this is only applicable on school days, who is defined as a child, and if children within fenced school area count.

RECOMMENDATIONS FOR SCHOOL ZONE SIGNING

Review of several existing school sites and conversation with law enforcement staff indicate that school zone signs should be located at the recommended locations. Law enforcement may use the school zone signs to define the school zone boundary. In order to improve the clarity in school zone signing that represents the boundaries, the "End School Zone" sign along with the posted speed limit sign should be used at the end and the school zone start and end zone signs should line up in both directions of travel, consistent with State standard practice. Additionally, school zone signage should be installed on side streets for school zones that cover many blocks, to ensure that the driver is aware that they are entering an active school zone. This is common contestment from drivers who may be unware that they are turning onto a facility with an active school zone.

The following are recommendations for use of active or static school speed zone signing, in reference to previous research that has been conducted, professional opinion from Clark County law enforcement, as well as the results from the speed study of the eight Clark County school sites.

- Active School Zone Flashers for use with Static School Speed Zone Signing
    - Results of the speed study indicate that flashers are more effective when the posted speed is 35 miles per hour or greater. Facilities with speeds of 40 mph or greater should be evaluated for additional treatment such as reduced school speed zone ahead signs.
    - Generally, flashers have lower 85th percentile speeds and higher compliance than the use of static signing alone as indicated in the Washington Study and supported by the results from speed study.
    - Flashers at the sites surveyed were found to be installed on roadways with an ADT of 5,000 or greater and/or a cross section of more than two lanes which is consistent with recommended guidance.
    - Observations by County law enforcement indicate that flashers with a shorter duration appear to have better compliance, less than an hour at a time.
    - County law enforcement indicates that school zones with active flashers are easier to enforce.
    - County law enforcement recommends that additional flashers be installed on the back side to assist with vehicles entering an active school zone from the side street.
- Static School Speed Zone Signing
    - Static signs are just as effective as flashers for lower posted speeds of 25 miles per hour or less as noted in the Washington Study. This finding is supported by the results at Sunset Elementary School, which had low 85th percentile speeds and static signing with a posted speed of 25 miles per hour.
    - The enforcement legend to be used at each school zone should be considered with careful consideration. The enforcement legend that describes specific times of day when the school zone is active instead of when children are present may be clearer for drivers and law enforcement, as noted by Clark County law enforcement. It is not always clear to determine “when children are present” should apply, and if this is only applicable on school days, who is defined as a child, and if children within fenced school area count.

MEMORANDUM

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DATE: October 8, 2014

TO: Marcela Rodriguez, Clark County
Matt Griswold, Clark County

FROM: Steve Boice, P.E., PTOE
Courtney Furman, E.I.T.

SUBJECT: Clark County School Zone Signing and Pavement Marking Policy
Task 2.1 School Zone Traffic Control Requirements & Recommendations
Task 2.2 Active School Zone Flashers P14085-002

This memorandum summarizes current practice and recommendations for signing and pavement markings along public roadways within Elementary, Junior High, and High Schools. The purpose is to determine current requirements for traffic control within school zones in Clark County, Washington. These requirements are set forth by national standards, Washington State law, and local agency standards. Additionally, the use of active school zone flashers within school zones was examined, including the current practice, a description of the existing system used by Clark County, and system technology available.

SCHOOL ZONE ROADWAY SIGNING AND PAVEMENT MARKING PRACTICES

Current roadway signing and pavement marking practices for school zones within Clark County are based on the *Manual on Uniform Traffic Control Devices* (MUTCD)[1], the Washington Administrative Code (WAC)[2], the Revised Code of Washington (RCW), and the *Traffic Manual*[3] and the *Sign Fabrication Manual*[4] from the Washington Department of Transportation (WSDOT).

Manual on Uniform Traffic Control Devices

The MUTCD sets national standards and guidelines for traffic control devices along facilities open to public travel. Traffic control devices for roadways that are located within school zones are covered in Part 7 (Traffic Control for School Areas) of the manual. Uniform application of school traffic control devices is one step to improving the safety within school zones. Uniformity avoids confusion among road users and promotes consistent behavior and expectation.

[1] Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition, U.S. DOT FHWA, December 2009.
[2] Chapter 468-95 Washington Administrative Code, Manual on Uniform Traffic Control Devices for Streets and Highways, 2011.
[3] *Traffic Manual*, WSDOT Traffic Operations, Engineering, and Regional Operations Division, Chapter 2: Signs and Chapter 3: Delineation.
[4] *Sign Fabrication Manual*, WSDOT Traffic Operations, Engineering, and Regional Operations Division.

The MUTCD therefore emphasizes the importance of uniformity by providing standards and guidance on many aspects of school zone signing and pavement markings, ranging from sign sizes, color, location, mounting height, retro-reflectivity, and when marked school crossings and pedestrian signals are recommended. It also provides examples of school zone or school crossing layouts, with the recommended signing and pavement markings (MUTCD Figures 7B-2 through 7B-5).

The MUTCD recommends that a school route plan be prepared for each school serving elementary to high school students 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 plan should consist of a map showing streets, the school, existing traffic controls, established school walk routes, and established school crossings. The criteria for marked school crossing placement and pedestrian signals includes factors such as, sidewalk, number of students, age level of students, vehicle traffic volume, and the total extra walking distance. The frequency of gaps in the traffic stream should be considered when determining appropriate crossing locations. If sufficient gaps are not present then measures that create sufficient gaps should be considered.

MUTCD S1-1

Importantly, traffic control devices and other signs or messages within the roadway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction.

Key elements defined in the MUTCD regarding school signage, pavement markings, and traffic signal devices include:

School Zone Signage

- Signing within school zones shall comply with general provisions 2A and 2B.06 of the MUTCD.
- The sizes of signs and plaques used in school areas shall comply with MUTCD Table 7B-1 unless an engineering judgment determines that a minimum or oversized sign size would be more appropriate.
- The signs used for school area traffic control shall be retro-reflectorized or illuminated.
- School warning signs, any supplemental sign/plaques, and the SCHOOL portion of any sign shall have a fluorescent yellow-green background with black legend and border.
- The school (S1-1) sign has the following four applications:
    - 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.
    - School Zone – the S1-1 sign can be used to identify the location of the beginning of a designated school zone.

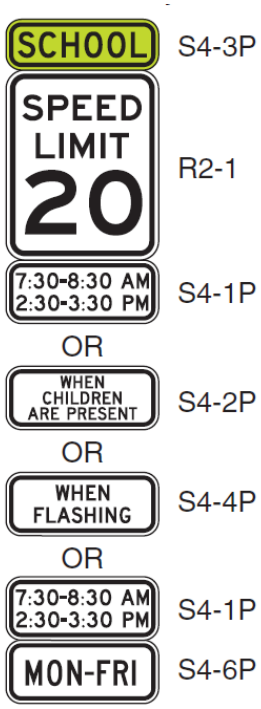

Figure 1. School Speed Limit Assembly

  - 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 school children cross the roadway.
  - School Crossing – if combined with a diagonal downward pointing arrow plaque (W16-7P) 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 school children cross the roadway.

- For cross streets that fall within a school area, a school sign (S1-1) with a supplemental arrow plaque (W16-5P or W16-6P) may be installed to provide the driver making a turn onto the cross street advance warning they will encounter a school zone.
- Higher fines zone signs (R2-10, R2-6P, R2-6aP, R2-6bP) shall be installed supplemental to the school sign where increased fines are imposed for traffic violations within the designated school zone. An END SCHOOL ZONE (S5-2) or END HIGHER FINES ZONE (R2-11) sign shall be installed at end of the school zone when the higher fine zone signs are used.
- A school speed limit sign (S5-1) or assembly (S4-1P, S4-2P, S4-3P, S4-4P, S4-6P, R2-1) shall be installed where a reduced school speed limit zone has been established. The sign or assembly shall be placed at or near as practical to the point where the reduced school speed limit zone begins. There are options for the enforceable times that go along with this sign, such as WHEN FLASHING (S4-4P), WHEN CHILDREN ARE PRESENT (S4-2P), or during designated school hours (S4-1P). A school sign (S1-1) shall be installed in advance of the first school speed limit sign or assembly that is encountered in each direction as traffic approaches the school speed limit zone. The school speed limit sign or assembly shall either be static or a changeable message sign.
- The school advance crossing assembly shall consist of a school sign (S1-1) supplemented with an AHEAD (W16-9P) or an XX FEET (W16-2P or W16-2aP) plaque. A school advance crossing assembly shall be used in advance of the first school crossing assembly that is encountered in each direction as traffic approaches a school crosswalk.
- A reduced speed limit sign (S4-5) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by 10 mph or more. The reduced speed limit ahead sign shall be followed by a school speed limit sign if used. The speed limit displayed shall be the same as the school speed limit sign.
- The school crossing assembly shall be installed at the school crossing or as close to it as possible, and shall consist of a school sign (S1-1) 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 at stop or yield controlled locations.

- The in-street pedestrian crossing sign (R1-6 or R1-6a) or in-street school children crossing sign (R1-6b or R1-6c) may be used at unsignalized crossings. A 12 x 4-inch SCHOOL (S4-3P) plaque may be mounted above the sign and the STATE LAW may be omitted.
- A 12-inch reduced in-street school (S1-1) sign with a 12 x 6-inch reduced diagonal downward pointing arrow (W16-7P) plaque may be used in place of the in-street pedestrian or school children crossing sign at unsignalized school crossings.

School Zone Pavement Markings

- Pavement markings within school zones shall comply with Part 3 (Markings) of the MUTCD.
- Crosswalk markings should be used at all intersections on established routes to school or where students are encouraged to cross between intersections (mid-block). Warning signs should be installed at all marked school crosswalks at non-intersection locations.
- The SCHOOL pavement marking can be used on approach lanes to guide, warn or regulate traffic. This marking may extend to the width of two approach lanes; however the marking should be 10 feet or more in height.

School Zone Traffic Signal Control Devices

- School area traffic signals shall comply with Part 4 (Highway Traffic Signals) of the MUTCD.
- Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has determined that adequate gaps need to be created in the traffic stream. A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in the Traffic Control Devices Handbook. The MUTCD outlines qualifications, uniform requirements, and operating procedures for adult crossing guards.
- Traffic signal warrant 5 (School Crossing) provides guidance to determine the justification for traffic signal control at a particular school crossing location. The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream meets the warrant requirements. The traffic signal warrant for school crossings is met when the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the school children are using the crossing is less than the number of minutes in the same period (MUTCD Section 7A.03) and there are a minimum of 20 school children during the highest crossing hour. School children refer to elementary through high school students.
- The school crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.
- Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

Washington Administrative Code

Washington State has amended the MUTCD to comply with their state laws and policies. These amendments are documented in the Washington Administrative Code, Title 468-95. The following are the standard MUTCD policies and the Washington State modification for school zone related signing/pavement markings:

- **WAC 468-95-325: In-street signs in school areas.** Deletes signs R1-6 and R1-6b from MUTCD Figure 7B-6, which are the yield to pedestrians within crosswalk signs and keep the stop for pedestrian signs. Amends the first option of MUTCD Section 7B.08 to read:

  A 12 inch reduced size in-street school advance warning (S1-1) sign (see Figure 7B-4), installed in compliance with the mounting height and breakaway requirements for in-street pedestrian crossing (R1-6a) signs (see Section 2B.12), may be used in advance of a school crossing to supplement the ground-mounted school warning signs. A 12 inch x 6 inch reduced size AHEAD (W16-9p) plaque may be mounted below the reduced size in-street school advance warning (S1-1) sign.

- **WAC 468-95-327: Higher fines zone signs.** Replaces the first paragraph of MUTCD section 7B.10 with the following option:

  Where increased fines are imposed for traffic violations within a designated school zone, a BEGIN HIGHER FINES ZONE (R2-10) sign (see Figure 7B-1) or a FINES HIGHER (R2-6P), FINES DOUBLE (R2-6aP), or $XX FINE(R2-6bP) plaque (see Figure 2B-3) may 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).

- **WAC 468-95-328: School Crossing Assembly.** Replaces the fourth, sixth, and seventh paragraphs of MUTCD section 7B.10 with the following:

  The in-street pedestrian crossing (R1-6a) sign (see Section 2B.12 and Figure 7B-6) or the in-street school children crossing (R1-6c) sign (see Figure 7B-6) may be used at unsignalized school crossings. If used at a school crossing, a 12 inch x 4 inch SCHOOL (S4-3P) plaque (see Figure 7B-6) may be mounted above the sign. The STATE LAW legend on the R1-6 series signs may be omitted.

  A 12 inch reduced size in-street School (S1-1) sign (see Figure 7B-6) may be used at an unsignalized school crossing instead of the in-street pedestrian crossing (R1-6a) sign or the in-street school children crossing (R1-6c) sign. A 12 inch x 6 inch reduced size diagonal downward pointing arrow (W16-7P) plaque may be mounted below the reduced size in-street School (S1-1) sign.

  If an in-street pedestrian crossing sign, an in-street school children crossing sign, or a reduced size in-street School (S1-1) sign is placed in the roadway, the sign support shall comply with the mounting height and special mounting support requirements for in-street pedestrian crossing (R1-6a) signs

- **WAC 468-95-3285: In-street signs in school areas.** Deletes signs R1-6 and R1-6b from MUTCD Figure 7B-6, which are the yield to pedestrians within crosswalk signs and keep the stop for pedestrian signs.
- **WAC 468-95-330: School speed limit assembly.** Replaces paragraph 7 in MUTCD section 7B.15 to the following:

Applicable to state highways, county roads, or city streets, the reduced school or playground speed zone shall extend for 300 feet in either direction from the marked crosswalk when the marked crosswalk is fully posted with standard school speed limit signs or standard playground speed limit signs.

Applicable to county roads or city streets, the school or playground speed zone may extend up to 300 feet from the border of the school or playground property when fully posted with standard school speed limit signs or standard playground speed limit signs. However, the speed zone may only include the area consistent with active school or playground use.

No school or playground speed zone may extend less than 300 feet from a marked school or playground crosswalk, but may extend by traffic regulation beyond 300 feet based on a traffic and engineering investigation.

The speed limit signs shown in Figure 7B-5 shall be located per RCW 46.61.440.

- **WAC 468-95-335: When children are present.** Adds the following to paragraph seven of MUTCD section 7B.15:

  The supplemental or lower panel of a School Speed Limit 20 sign which reads WHEN CHILDREN ARE PRESENT shall indicate to the motorist that the 20 mile per hour school speed limit is in force under any of the following conditions:

  - School children are occupying or walking within the marked crosswalk.
  - School children are waiting at the curb or on the shoulder of the roadway and are about to cross the roadway by way of the marked crosswalk.
  - School children are present or walking along the roadway, either on the adjacent sidewalk or, in the absence of sidewalks, on the shoulder within the posted school speed limit zone extending 300 feet, or other distance established by regulation, in either direction from the marked crosswalk.

- **WAC 468-95-340: School speed limit assembly.** Amends MUTCD Figure 7B-1 to include the WHEN FLAGGED (S4-501) sign and amends paragraphs eight and nine of MUTCD section 7B.15 with the following:

  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 (S4-3) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1, S4-2, S4-4, S4-6, or S4-501) indicating the specific periods of the day and/or days of the week that the special school speed limit is in effect (see Figure 7B-1).

- **WAC 468-95-360: Crosswalk markings.** Amends paragraph 4 of MUTCD section 7C.02 with the following:

  If used, the diagonal or longitudinal lines should form a 24-inch wide marking pattern consisting of two 8-inch wide markings separated by an 8-inch wide gap or a 24-inch wide solid marking pattern. The

marking patterns should be spaced 12 to 60 inches apart but with the maximum gap between marking patterns not to exceed 2.5 times the marking pattern width. Longitudinal marking patterns should be located to avoid the wheel paths and should be oriented parallel with the wheel paths.

Additional WAC's apply to general provisions for public schools. Those that apply to school zone signing and pavement markings are listed below.

- **WAC 392-151-025: Route plans.** Requires that all elementary schools shall have a suggested route plan for students walking to and from school. The plan shall recommend routes based on traffic patterns and traffic controls that limit the number of crossings. Route options shall be provided to students and parents along with instructions.
- **WAC 392-151-030: Controlled crossings.** Defines school patrol controlled crosswalks as those that use an adult crossing guard, and do not have a traffic signal or stop sign. At a minimum, these types of crossings should have school crossing warning signs (S1-1 and S2-1), marked crosswalks, and a school speed limit sign (S5-1). Crosswalks that use a crossing guard, traffic signal, stop sign, or a law enforcement officer for control are called school patrol controlled crosswalks. School patrol is required to assist children in using the crosswalk when school officials and/or the safety advisory committee determine that vehicular traffic volumes are such that adequate safe gaps in the traffic flow do not occur in reasonable frequent intervals to allow safe crossings by students. This condition, as well as any other related traffic issues, shall be evaluated cooperatively with the traffic engineering authorities having jurisdiction in order that necessary studies can be conducted for the purpose of developing possible alternative measures.

Washington State Law

The Revised Code of Washington (RCW) is a compilation of permanent laws in the state of Washington. Title 46 is related to motor vehicle laws and section 61 is specific to rules of the road. There are several RCW's that apply to school zones, including the following:

- **RCW 46.61.050: Obedience to and required traffic control devices.** Drivers, bicyclists, and pedestrians shall obey traffic control devices.
- **RCW 46.61.065: Flashing signals.** When a yellow lens is illuminated with rapid intermittent flashes, drivers of vehicles may proceed through the intersection or pass such signal only with caution.
- **RCW 46.61.126: Pedestrians and bicyclists – Legal duties.** Pedestrians and bicyclists have legal duties while traveling on public highways.
- **RCW 46.61.230: Pedestrians subject to traffic regulations.** Pedestrians shall obey traffic-control signals at intersections.
- **RCW 46.61.235: Crosswalks.** Drivers shall stop and remain stopped for pedestrians or bicyclists crossing at an unmarked or marked crosswalk when the pedestrian or bicyclist is within one lane of the half of the roadway the vehicle is traveling in or turning onto. Pedestrians and bicyclists shouldn't suddenly cross.

- **RCW 46.61.240: Crossing at other than crosswalks.** Pedestrians crossing at locations other than crosswalks shall yield to vehicles. Pedestrians shall not cross midblock between traffic-control signals except at a marked crosswalk.
- **RCW 46.61.245: Drivers to exercise care.** Drivers shall exercise due care to avoid collisions as much as possible and provide warning when necessary.
- **RCW 46.61.261: Sidewalks, crosswalks – Pedestrians, bicycles.** Drivers shall yield right-of-way to any pedestrian or bicycle on a sidewalk. The rider of a bicycle shall yield right-of-way to a pedestrian on a sidewalk or crosswalk.
- **RCW 46.61.385: School patrol – Appointment – Authority – Finance - Insurance.** The school board can appoint adults to be on school patrol. Members of the school patrol must wear uniforms, which indicate to drivers that they must obey what the school patrol directs them to do.
- **RCW 46.61.400: Basic rule and maximum limits.** Drivers shall drive at a reasonable speed for the conditions and not exceed specific speeds for types of roadways.
- **RCW 46.61.440: Maximum speed limit when passing school or playground crosswalks – Penalty, disposition of proceeds.** Driver of a vehicle shall not exceed 20 miles per hour in a school speed zone, which is defined as:
    - **At a marked school crosswalk** (RCW 46.61.440 (1)): 300 feet in both directions from a designated school crosswalk which is indicated with the standard signage, including a school sign (S1-1) and an arrow plaque (W16-7P) with standard school speed limit signs.
    - **Bordering a school** (RCW 46.61.440 (2)): 300 feet from the school boundary, school zone shall include standard school speed limit signs and may only include the area within active school use (which is defined as children being present).

The penalty is doubled for infractions committed under RCW's 46.61.440, 46.61.261, 46.61.245, and 46.61.235. The penalty may not be waived, reduced, or suspended. Fifty percent of money collected for these infractions must be deposited into the school zone safety account. This account is created in the custody of the State Treasurer and expenditures may only be used by the Washington Traffic Safety Commission for school zone safety projects in local communities.

WSDOT Traffic Manual & Sign Fabrication Manual

The Washington State Department of Transportation (WSDOT) Traffic Manual and Sign Fabrication Manual have guidance on school zone signing and pavement markings as illustrated in Figure 2.

- New school warning signs and any supplemental plaques shall have a fluorescent yellow-green background with black legend and border.
- School (S-series signs) shall have ASTM Specification D 4956 type VIII or IX background sheeting.
- Reduced school speed zones shall be approved by the State Traffic Engineer.
- Standard reduced school zone speed limit signing at a marked school crosswalk is:
    - The school sign (S1-1) with arrow plaque (W16-7P) should be placed at the crosswalk.
    - The school sign (S1-1) with the AHEAD plaque (W16-9P) should be placed at a maximum distance of 700 feet from the school boundary or crosswalk.

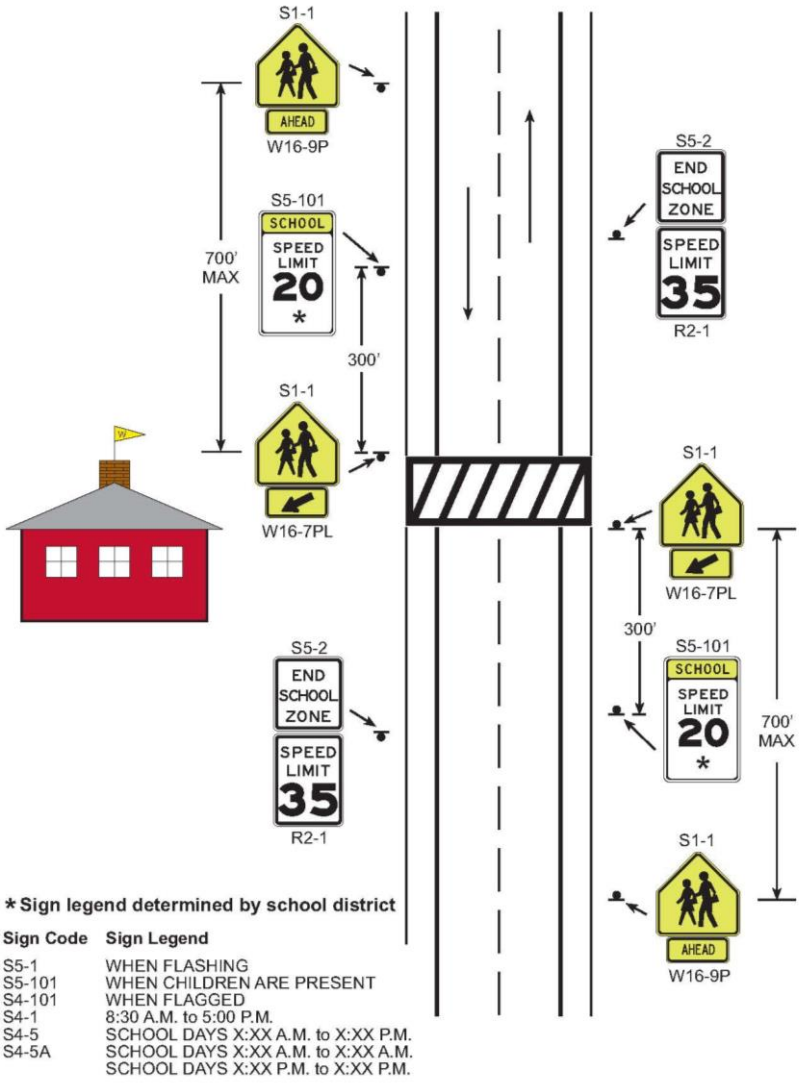

Figure 2. WSDOT Traffic Manual – Reduced School Speed Zone Signing (Appendix 2-12)

- The school speed limit assembly (S5-101) should be placed 300 feet from school boundary or crosswalk, which consists of the SCHOOL legend, a 20 mph speed limit sign, and the window of enforcement legend.
- The window of enforcement legend is determined by the school district and can be any of the following options:
    - WHEN FLASHING (S5-1)
    - WHEN CHILDREN ARE PRESENT (S5-101) - only used when there is a crosswalk
    - WHEN FLAGGED (S5-102)
    - X:XX AM to X:XX PM (S4-5)

    - The school speed zone is ended with the END SCHOOL ZONE sign (S5-2) sign and the subsequent speed limit sign (R2-1) below.

- WSDOT has the following standard S-series signs illustrated in WSDOT Sign Fabrication Manual. This manual provides sign fabrication details for signs used within the State in order to maintain uniformity in appearance.
    - School Zone (S1-1)
    - SCHOOL BUS STOP AHEAD (S3-1)
    - SCHOOL BUS TURN AROUND (S3-201)
    - X:XX AM TO X:XX PM (S4-1)
    - WHEN CHILDREN ARE PRESENT (S4-2)
    - SCHOOL (S4-3)
    - WHEN FLASHING (S4-4)
    - SCHOOL DAYS X:XX AM TO X:XX PM (S4-5 and S4-5A)
    - WHEN FLAGGED (S4-501)
    - School speed limit assembly for use with flashing beacons (S5-1)
    - School speed limit assembly for use with WHEN CHILDREN ARE PRESENT (S5-101)
    - END SCHOOL ZONE (S5-2)
- Responsibility (finance, construct, maintain, and operate) for school traffic control devices along city streets that are part of the State highway system is assigned based on the population of the city (RCW 47.24.020).
    - Population ≥ 25,000 = City
    - Population <25,000 = State
- All school bus stops requiring advanced signing must be reviewed and approved by the Region Traffic Operations staff. The Region Traffic Engineer must approve any school bus stops on limited access facilities. A SCHOOL BUS STOP AHEAD (S3-1) sign should be installed when there is less than 500 feet of available sight distance to the bus stop.
- The SCHOOL BUS TURNAROUND (S3-201) may be installed where there is limited sight distance to the school bus turnaround.
- The school speed zone sign assembly may be supplemented with flashing beacons or flags to draw attention and increase compliance with the reduced speed zone. A Washington State Traffic Safety Commission study noted that WHEN FLASHING school zone signs were more effective in slowing vehicles than either WHEN CHILDREN ARE PRESENT or WHEN FLAGGED signs. The study notes that where the approach speed to a school speed zone is 35 mph or above, schools with WHEN FLASHING signs had significantly fewer vehicles travelling in excess of 35 mph (only 3 percent) than WHEN CHILDREN ARE PRESENT signs (30 percent) and WHEN FLAGGED signs (23 percent).

- The use of flashing beacons above the SCHOOL SPEED ZONE assembly should be considered where the approach speed to a school speed zone is 35 mph or more, or where a wide roadway increases children's exposure.
- Beacons are generally paid for by the school district requesting the speed zone.
- School crossings may be established adjacent to the school or along a school pedestrian route. The SCHOOL (S1-1) sign may be installed at a crossing controlled by a traffic signal, however should not be installed at a crossing under stop or yield control.
- The OVERHEAD CROSSWALK (W11A-301) sign shall only be used at marked school crosswalks where a traffic engineering analysis has determined that conventional traffic control measures are not adequate. It is installed in addition to the standard school crosswalk signing. The OVERHEAD CROSSWALK sign must include pedestrian or school activated flashing lights. The STOP FOR PEDESTRIANS overhead sign (R1-9a) may be used in place of the OVERHEAD CROSSWALK sign. Costs associated with installing and maintaining this traffic control device are generally the responsibility of the requesting school district. The following factors should be considered when determining the installation of this sign:
    - Approach speed of traffic.
    - Width of crossing.
    - Number of lanes.

Crosswalk guidelines include:

- Crosswalk markings should not be used where the speed limit exceeds 35 miles per hour, unless protection is provided by a traffic signal or stop bar. Studies show that marked crosswalks have higher accident rates than unmarked crossings, thus crosswalks should not be considered safety devices.
- Marked crosswalks should only be located at signalized locations or at designated school crossings, where crossing guards are provided, or where the pedestrian volumes meet the criteria for signal Warrant 4 (Pedestrian Volume) in Section 4C-5 of the MUTCD.

Surrounding Agency Practices

There are three other agencies within and near Clark County[5] that have their own practices related to school zone signing and pavement markings, including the cities of: Vancouver, Camas, and Battle Ground. These practices are summarized below with standard details attached.

City of Vancouver

Vancouver has a standard detail for school zone signing, including a school speed limit sign located 300 feet in either direction from the school property line, a school ahead sign located 100 feet before the school speed limit sign, and speed enforcement signs including WHEN CHILDREN ARE PRESENT or WHEN FLASHING (Standard Details T29-22 and T29-23 for with and without a raised crosswalk).

[5] There are no school zone signing and pavement marking policies for Washougal, Woodland, Ridgefield, La Center, Yacolt, Evergreen, Hockinson, and Green Mountain

For pavement marking, there is a standard detail for traditional and ladder style crosswalks, as well as the SCHOOL legend (Standard Details T29-41 and T29-58). Traditional crosswalks are 12 feet wide using 12 inch lines and ladder style crosswalks are 10 feet wide minimum and are made up of markings that are 12 to 24 inches wide.

City of Camas

Camas has two standards for crosswalks (intersection and midblock), recommending an 8 foot width, made up of 12 to 24 inches wide markings (Standard Details ST30 and ST31).

City of Battle Ground

Battle Ground has one standard related to school zones, which is for ladder stripe crosswalks, recommending an 8 foot minimum width, made up of 24 inch markings with spacing of no more than 5 feet (Standard Detail TR-8.01).

Safe Routes to School

Safe Routes to School (SRTS) was established in 2006 to assist states and communities in promoting children to safely walk and bike to school. The program examines conditions around the school and provides guidelines for establishing a safe route to school. Washington was part of the pilot project in 2004, and has reached 230 schools since then. Additionally, the number of children walking and bicycling has increased by over 20 percent[6].

As part of Safe Routes to School projects, various engineering improvements can be installed if warranted, including sidewalk improvements, traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street bicycle and pedestrian facilities, and secure bicycle parking facilities. The recommended practices for signing and pavement markings within school zones would follow the WSDOT design criteria previously mentioned for the Safe Routes to School projects within Washington.

There have been many projects within Clark County through the Washington Safe Routes to School program, from 2004 through 2015, as summarized in Table 1.

[6] WSDOT, Safe Routes to School, http://www.wsdot.wa.gov/localprograms/saferoutes/

Table 1. Safe Route to Schools – Projects within Clark County

Year	Safe Routes to School Projects within Clark County	
	Location	**Agency**
2004 (Pilot)	SE 136th Improvements	Evergreen School District
2007	Hathaway Crosswalk Lighting	Washougal
	Fircrest Elementary School, Riverview Elementary, Eleanor Roosevelt Elementary, Ogden Area Safe Routes to School, and NE 104th Street Phase II	Vancouver
	NE 159th Street Walkway	Hockinson School District
2009-2011	MacArthur Blvd/Mill Plain Blvd to Lieser Rd School Safety Improvements, and Image Elementary Pedestrian Safety Improvements	Vancouver
	Grass Valley Trail Extension	Camas
2011-2013	NW 18th Ave Safety Improvements and NE 43rd Ave Safety Improvements	Camas
	Walnut Grove Elementary	Vancouver
	Pacific Middle School Walkway	Clark County (Evergreen Public Schools)
2013-2015	Sacajawea Elementary Pedestrian Safety	Clark County
	Endeavour Elementary Pathway and Safety Improvement Program	Vancouver
	South Woodland Safe Walking Route	Woodland
	School Zone Safety Improvements, City Wide	Battle Ground

SCHOOL ZONE RECOMMENDATIONS BY TYPE

There is little guidance regarding varying practices for school zone signing and pavement markings by school type or level. Different states have their own policies, yet little research has been done to determine if the same school zone policies are applicable at an elementary school, junior high school, or high school. A review of five states indicates that school zone signing and pavement marking within High Schools are generally not provided unless an engineering study determines that there is a need for enhanced safety. The school zone recommendations by school type are summarized for Oregon, Alaska, Arizona, Florida, and New York in Table 2.

Table 2. School Zone Recommendations by School Type

	School Type	
	Elementary & Junior High School (K-8)	**High School (9-12)**
Oregon[7]	Schools zones are encouraged when: • There is at least one marked school crosswalk within the proposed school zone that is not protected by a signal or STOP sign • The posted speed is 40 mph or below **School zone includes:** a marked crosswalk, advance and crossing school signs, 20 mph speed limit enforced when flashing or school days from 7 am to 6 pm adjacent to school grounds, and when flashing or when children are present away from school grounds	An engineering study would be necessary to justify requiring a school zone
Alaska[8]	School zones are encouraged when: • There are no STOP signs or traffic signals at crossing **School zone includes:** a marked crosswalk, advance and crossing school signs, 20 mph speed limit when flashing	**School zone includes:** a marked crosswalk, advance and crossing school signs
Arizona[9]	School zones are encouraged when: • There are no STOP signs or traffic signals within 600 feet on the same street **School zone includes:** a marked crosswalk, advance and crossing school signs, stop when children in crosswalk, no passing, 15 mph school speed limit assemblies	No school crossings used
Florida[10]	**School zone includes:** a marked crosswalk, advance and crossing school signs, 20 mph speed limit enforced only during 30 minutes before, during, and 30 minutes after periods of time when pupils are arriving/leaving	No school zones or crossings used
New York[11]	**School zone includes:** a marked crosswalk, advance and crossing school signs, 20 mph speed limit enforced from 7 am to 6 pm during school days, a portion of those hours, or when flashing	

CURRENT PRACTICE FOR ACTIVE SCHOOL ZONE FLASHERS

Active school zone flashers are used for school speed limit zones and marked school crossings to provide additional guidance to the driver that reduced speeds and awareness are required for school safety. A speed limit sign beacon shall only be used to supplement a speed limit sign while a warning beacon may be used for other applications to provide warning. Beacons do not always accompany school speed limit signs, but should be

[7] Oregon Department of Transportation, A Guide to School Area Safety, February 2009
[8] Alaska Traffic Manual Supplement to the 2009 Edition of the MUTCD, Part 7, Effective 2012
[9] Arizona Department of Transportation, Traffic Safety for School Areas Guidelines, 2006
[10] Florida, Establishing School Zones and School Crossings, 2006
[11] New York State Regulation for posting a speed limit within a school zone, 2003

considered based on site specific information, such as traffic volume, vehicle types, speed, crash history, roadway conditions, and number of students walking to school[12].

The beacons must be in compliance with the MUTCD requirements outlined in section 4L. The MUTCD states that beacons shall have a flash rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall be a minimum of half and a maximum of two-thirds of the total cycle.[13] Warning beacons may be used to warn users of obstructions, emphasize the presence of midblock crosswalks, and supplement warning signs and regulatory signs that include the phrase WHEN FLASHING. Warning beacons shall not be used to supplement STOP, DO NOT ENTER, WRONG WAY, and SPEED LIMIT signs. A speed limit beacon shall only be used to supplement a speed limit sign. The following items are required of the beacon depending on its use:

A warning beacon shall:

- Consist of one or more signal sections of a standard traffic signal face with a flashing circular yellow signal indication in each signal section.
- Be used only to supplement an appropriate warning or regulatory sign or marker.
- Have a minimum clearance of 15 feet and a maximum of 19 feet above the pavement, if the beacon is suspended over the roadway.
- Be operated only during those periods of time when the condition or regulation exists.

A speed limit beacon shall:

- Be used only to supplement a fixed or variable speed limit sign.
- Have circular yellow signal indications that have a nominal diameter of not less than 8 inches.
- Be vertically aligned, unless the speed limit sign is longer horizontally than vertically.
- Be alternately flashed if two signal indications are used.
- Be accompanied by appropriate signing indicating that the displayed speed is in effect.

A speed limit beacon may be included within the border of a School Speed Limit (S5-1) sign. There are no Washington modifications to the MUTCD related to flashing beacons. However, there is a school speed limit sign for use with flashing beacons (S5-1) in the Washington Sign Fabrication Manual. According to the WSDOT Traffic Manual, the school speed zone sign assembly may be supplemented with flashing beacons to draw attention and increase compliance with the reduced speed zone. If a flashing beacon is used, then the school speed enforcement legend should be the WHEN FLASHING sign. A study conducted by the Washington State Traffic Safety Commission noted that WHEN FLASHING school zone signs are more effective in slowing vehicles than either WHEN CHILDREN ARE PRESENT or WHEN FLAGGED enforcement signs.

The only surrounding agency that has specific information for beacons is the City of Vancouver, which has a standard detail for a sign and flasher assembly (Standard Detail T20-14).

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[12] Seattle Department of Transportation criteria for selecting sites to have a school zone flashing beacon, http://www.seattle.gov/transportation/ped_srts_sign.htm
[13] MUTCD 2009, Chapter 4L, Flashing Beacons

CLARK COUNTY SCHOOL FLASHER SYSTEM

Clark County's existing school zone flasher system is manufactured by Eltec and is shown in Figure 3. The County manages school zone flasher systems at 35 schools throughout the County (a total of 70 flasher units). The typical school zone flasher assembly consists of:

- School speed limit sign (S5-1) combined into one sign panel
- FINES HIGHER sign as requested (R2-6P)
- Dual 12-inch yellow LED beacons located horizontally side by side at the top including back plates and visors
- Spun aluminum poles with frangible square base
- Stainless steel terminal cabinet with circuit breaker and time clock
- Hard wired power source (occasionally solar is used if needed)

Figure 3. Clark County School Zone Speed Limit Flasher System

This configuration is currently not in compliance with the MUTCD due to the horizontal alignment of the beacons. According to the MUTCD these beacons should be aligned vertically, unless the horizontal width of the sign is greater than the height.

The current communications to the flashers are run through a paging system, which has few subscribers and could lose service in the future[14]. Therefore; the County is interested in updating their school zone flasher system due to the risk of loss in communications. Conversation with County staff has identified the following features to meet their needs:

- Handles large number of scheduled timing plans (large strings of data).
- Provides meaningful diagnostics (time sync, flasher status - on/off).
- Operates on County owned communication network, such as 900 Mega Hertz or other low cost radio frequency. The County does not prefer leased lines such as cellular service, so these should be kept to a minimum if needed.
- Ability to update calendars remotely.
- Hard wired service connection. Solar power is not preferred.
- Single vendor.

[14] Meeting with Clark County Signal Engineers on August 20, 2014

SCHOOL FLASHER TECHNOLOGY

Various vendors manufacture school zone flashers, and the technology is constantly changing. There are several vendors that offer school zone flasher systems that would meet the features previously identified. The school zone flasher component options that are currently available with different vendors are summarized in Table 3.

Table 3. School Flasher Component Options

School Flasher Components	Options Available
Number of Beacons	Single, dual
Beacon Mounting Options	Front, top, side
Power Options	Hard wired, solar
Type of Communication	Wireless, cellular modem, fiber optic cable or twisted copper pair cable
Central Control	Software, agency network
Diagnostics	Unit's status (on/off)
Radar Signs	Separate system, integrated with beacon
Cost	$3,200 - $4,500/per unit

RECOMMENDATIONS

Certain criteria must be met in order to establish a school zone or a school crossing, the following summarizes those guidelines:

- *School zones are encouraged when:*
  - The roadway is adjacent to the school grounds
  - There is at least one marked school crosswalk within the proposed school zone that is not protected by a signal or STOP sign
  - The posted speed is 40 mph or below
- Reduced school speed zones shall be approved by the State Traffic Engineer
- *School crossings are encouraged when:*
  - Factors such as, sidewalk, number of students, age level of students, vehicle traffic volume, and the total extra walking distance, justify the crossing.
  - The frequency of gaps in the traffic stream should be considered when determining appropriate crossing locations. If sufficient gaps are not present then measures that create sufficient gaps should be considered.
  - A school route plan map shows that the need for a school crossing. School route plan maps need to show streets, the school, existing traffic controls, established school walk routes, and established school crossings, and shall be prepared for each school serving elementary school students. The plan is recommended, but not required beyond elementary schools.
- When school zones or school crossings are established, pavement markings and signing must be used to delineate those school areas. Additionally, flashers can be used as a supplemental device to provide additional warning, and traffic control devices can be used to regulate traffic when needed.
- *Pavement markings should meet the following requirements:*

- Pavement markings within school zones shall comply with MUTCD Part 3 (Markings).
- Crosswalk markings should be used at all intersections on established routes to school or where students are encouraged to cross between intersections (mid-block). Warning signs should be installed at all marked school crosswalks at non-intersection locations.
- Crosswalk markings should not be used in multilane roadways where the speed limit exceeds 35 miles per hour, unless other pedestrian enhancements are provided such as pedestrian island or active pedestrian crossing enhancements.
- Marked crosswalks should only be located at signalized locations, where crossing guards are provided, or where the pedestrian volumes meet the criteria for signal Warrant 4 in Section 4C-5 of the MUTCD.
- The SCHOOL word marking can be used on approach lanes to guide, warn or regulate traffic. If the marking extends to the width of two approach lanes it should be 10 feet or more in height.

- *Signing should meet the following requirements:*
  - School warning signs and any supplemental plaques shall have a fluorescent yellow-green background with black legend and border. School (S-series) signs shall have ASTM Specification D 4956 type VIII or IX background sheeting. The size of school signs shall be per MUTCD Table 7B.01 and the general provisions in MUTCD sections 2A and 2B.06 shall apply to school zone signing.
  - Traffic control devices and other signs or messages within the roadway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction.
  - Required Signs:
    - A school sign (S1-1) shall be installed to identify the beginning point of designated school zone. The school (S1-1) sign may be used to warn road users that they are approaching a school area, identify the location of the beginning of a designated school zone, warn road users that they are approaching a crossing where school children cross the roadway, or warn approaching road users of the location of a crossing where school children cross the roadway. The school sign (S1-1) may be installed at a crossing controlled by a traffic signal, however should not be installed at a crossing under stop or yield control.
    - A school speed limit sign (S5-1) shall be installed where a reduced school speed limit zone has been established. The school speed limit sign should be placed 300 feet from school boundary or crosswalk. A school sign (S1-1) shall be installed in advance of the school limit sign.
    - The options for the enforceable times to be used with the speed limit sign (S5-1) are:
      - WHEN FLASHING (S5-1)
      - WHEN CHILDREN ARE PRESENT (S5-101) - only used when there is a crosswalk
      - WHEN FLAGGED (S5-102)
      - X:XX AM to X:XX PM (S4-5)
    - The WHEN CHILDREN ARE PRESENT (S4-2P) plaque is defined as:
      - School children are occupying or walking within the marked crosswalk.

- School children are waiting at the curb or on the shoulder of the roadway and are about to cross the roadway by way of the marked crosswalk.
- School children are present or walking along the roadway, either on the adjacent sidewalk or, in the absence of sidewalks, on the shoulder within the posted school speed limit zone extending 300 feet, or other distance established by regulation, in either direction from the marked crosswalk.

  - Optional Signs:
    - An advance school sign (S1-1) may be installed to provide warning for the first school crossing. When used it should be placed 700 feet from the school boundary or crosswalk and shall be supplemented an AHEAD (W16-9P) or XX FEET (W16-2P or W16-2aP) plaque.
    - A reduced speed limit sign (S4-5) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by 10 mph or more. When used, the reduced speed limit ahead sign shall be followed by a school speed limit sign if used.
    - The penalty is doubled for infractions committed within a designated school zone. Higher fines zone signs (R2-10, R2-6P, R2-6Pa, or R2-6bP) may be installed supplemental to the school sign (S1-1) to identify the beginning point of the designated school zone where increased fines are imposed.
    - An END SCHOOL ZONE sign (S5-2) may be used to identify the end of a designated school zone. The END SCHOOL ZONE (S5-2) sign shall be installed at end of school zone when higher fines zone signs (R2-10, R2-6P, R2-6Pa, or R2-6bP) are used.
    - Side street school zone warning can be installed with a school sign (S1-1) and an arrow plaque (W16-6P).

- *School zone flashers should meet the following requirements:*
  - Flashing beacons should be considered where the approach speed to a school speed zone is 35 mph or more, or where a wide roadway increases children's exposure.
  - Beacons are generally paid for by the school district requesting the speed zone.
  - A warning beacon shall:
    - Consist of one or more signal sections of a standard traffic signal face with a flashing circular yellow signal indication in each signal section.
    - Be used only to supplement an appropriate warning or regulatory sign or marker.
    - Have a minimum clearance of 15 feet and a maximum of 19 feet above the pavement, if the beacon is suspended over the roadway.
    - Be operated only during those periods of time when the condition or regulation exists.
  - A speed limit beacon shall:
    - Be used only to supplement a fixed or variable speed Limit sign.
    - Have circular yellow signal indications that have a nominal diameter of not less than 8 inches.
    - Be vertically aligned, unless the speed limit sign is longer horizontally than vertically

        - Be alternately flashed if two signal indications are used.
        - Be accompanied by appropriate signing indicating that the displayed speed is in effect
    - The County's current school zone flashing beacon configuration is currently not in compliance with the MUTCD due the horizontal alignment of the beacons.

- *School traffic control devices should meet the following requirements:*
    - Traffic signal control devices located within school zones shall comply with MUTCD Part 4 (Highway Traffic Signals).
    - Traffic Signal Warrant 5 (School Crossing) provides guidance to determine the justification for traffic signal control at a particular school crossing location. The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the school children are using the crossing is less than the number of minutes in the same period (MUTCD Section 7A.03) and there are a minimum of 20 school children during the highest crossing hour. School children refer to elementary through high school students.
    - Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has determined that adequate gaps need to be created in the traffic stream. The MUTCD outlines qualifications, uniform requirements, and operating procedures for adult crossing guards.
    - The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

APPENDIX D:
REVISED CODE OF WASHINGTON (RCW)

Revised Code of Washington (RCW) Summary

RCW Number	Name	Description
46.61.050	Obedience to and required traffic control devices	Drivers, bicyclists, and pedestrians shall obey traffic control devices.
46.61.065	Flashing signals	When a yellow lens is illuminated with rapid intermittent flashes, drivers of vehicles may proceed through the intersection or pass such signal only with caution.
46.61.126	Pedestrians and bicyclists – Legal duties	Pedestrians and bicyclists have legal duties while traveling on public highways.
46.61.230	Pedestrians subject to traffic regulations	Pedestrians shall obey traffic-control signals at intersections.
46.61.235	Crosswalks	Drivers shall stop and remain stopped for pedestrians or bicyclists crossing at an unmarked or marked crosswalk when the pedestrian or bicyclist is within one lane of the half of the roadway the vehicle is traveling in or turning onto. Pedestrians and bicyclists shouldn't suddenly cross.
46.61.240	Crossing at other than crosswalks	Pedestrians crossing at locations other than crosswalks shall yield to vehicles. Pedestrians shall not cross midblock between traffic-control signals except at a marked crosswalk.
46.61.245	Drivers to exercise care	Drivers shall exercise due care to avoid collisions as much as possible and provide warning when necessary.
46.61.261	Sidewalks, crosswalks – Pedestrians, bicycles	Drivers shall yield right-of-way to any pedestrian or bicycle on a sidewalk. The rider of a bicycle shall yield right-of-way to a pedestrian on a sidewalk or crosswalk.
46.61.385	School patrol – Appointment – Authority – Finance - Insurance	The school board can appoint adults to be on school patrol. Members of the school patrol must wear uniforms, which indicate to drivers that they must follow school patrol orders.
46.61.400	Basic rule and maximum limits	Drivers shall drive at a reasonable speed for the conditions and not exceed specific speeds for types of roadways.
46.61.440	Maximum speed limit when passing school or playground crosswalks – Penalty, disposition of proceeds.	Driver of a vehicle shall not exceed 20 miles per hour in a school speed zone, which is defined as: **At a marked school crosswalk** (RCW 46.61.440 (1)): 300 feet in both directions from a designated school crosswalk which is indicated with the standard signage, including a school sign (S1-1) and an arrow plaque (W16-7P) with standard school speed limit signs. **Bordering a school** (RCW 46.61.440 (2)): 300 feet from the school boundary, school zone shall include standard school speed limit signs and may only include the area within active school use (which is defined as children being present).

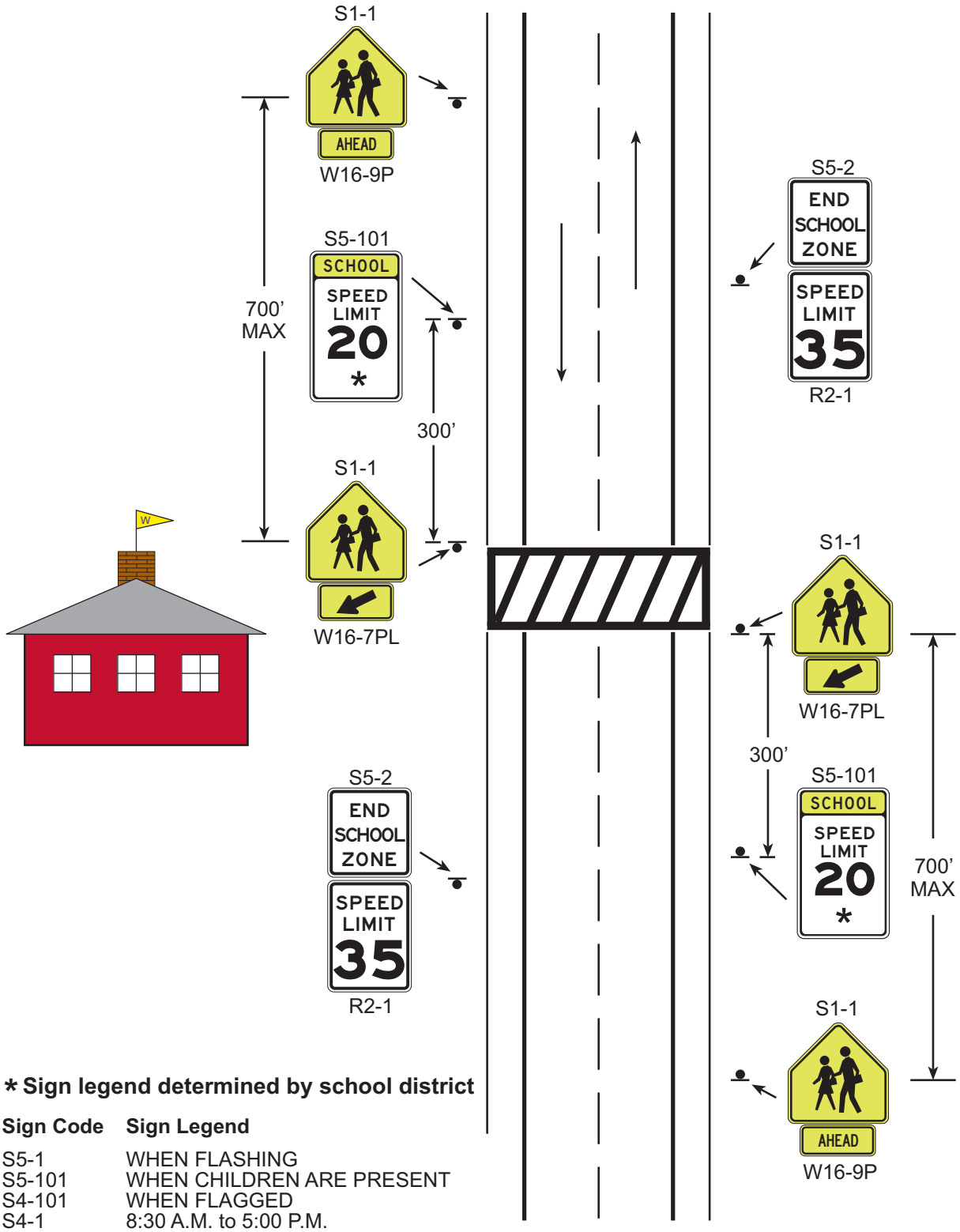
APPENDIX E:
WASHINGTON ADMINISTRATIVE CODE (WAC)

Washington Administrative Code (WAC) Summary

WAC Number	Name	Description
468-95-325	In-street signs in school areas	MUTCD Figure 7B-6 **Action:** Delete signs R1-6 and R1-6b (yield to pedestrians within crosswalk signs) MUTCD Section 7B.08 (first option) **Action:** Add the use of a 12 inch reduced size in-street school advance warning (S1-1) sign, and a 12 inch x 6 inch reduced size AHEAD (W16-9p) plaque mounted below, in advance of a school crossing to supplement the ground-mounted school warning signs.
468-95-327	Higher fines zone signs	MUTCD section 7B.10 (first paragraph) **Action:** Change the wording from shall be installed to may be installed for higher fines zone signs and plaques in school zones.
468-95-328	School Crossing Assembly	MUTCD section 7B.12 (fourth, sixth, and seventh paragraphs) **Action:** Remove the in-street pedestrian crossing signs for yield (R1-6 and R1-6b) from text
468-95-3285	In-street signs in school areas	MUTCD Figure 7B-6 **Action:** Delete signs R1-6 and R1-6b (yield to pedestrians within crosswalk signs)
468-95-330	School speed limit assembly	MUTCD section 7B.15 (seventh paragraph) **Action:** Change the distance from 200 feet to 300 feet for the beginning point of a reduced school speed limit from the school grounds or school crossing. MUTCD Figure 7B-5 **Action:** Move speed limit signs to be located per RCW 46.61.440.
468-95-335	When children are present	MUTCD section 7B.15 (seventh paragraph) **Action:** Add the following: *The supplemental or lower panel of a School Speed Limit 20 sign which reads WHEN CHILDREN ARE PRESENT shall indicate to the motorist that the 20 mile per hour school speed limit is in force under any of the following conditions:* • *School children are occupying or walking within the marked crosswalk.* • *School children are waiting at the curb or on the shoulder of the roadway and are about to cross the roadway by way of the marked crosswalk.* • *School children are present or walking along the roadway, either on the adjacent sidewalk or, in the absence of sidewalks, on the shoulder within the posted school speed limit zone extending 300 feet, or other distance established by regulation, in either direction from the marked crosswalk.*

468-95-340	School speed limit assembly	MUTCD Figure 7B-1 **Action:** Add the WHEN FLAGGED (S4-501) sign MUTCD section 7B.15 (eighth and ninth paragraphs) **Action:** Changes in the school speed zone sign assembly, including the top SCHOOL plaque (S4-3) and the bottom enforcement legend plaque (S4-1, S4-2, S4-4, S4-6, or S4-501).
468-95-360	Crosswalk markings	MUTCD section 7C.02 (fourth paragraph) **Action:** Add the following: *If used, the diagonal or longitudinal lines should form a 24-inch wide marking pattern consisting of two 8-inch wide markings separated by an 8-inch wide gap or a 24-inch wide solid marking pattern. The marking patterns should be spaced 12 to 60 inches apart but with the maximum gap between marking patterns not to exceed 2.5 times the marking pattern width. Longitudinal marking patterns should be located to avoid the wheel paths and should be oriented parallel with the wheel paths.*
392-151-025	Route plans	Requires that all elementary schools shall have a suggested route plan for students walking to and from school. The plan shall recommend routes based on traffic patterns and traffic controls that limit the number of crossings. Route options shall be provided to students and parents along with instructions.
392-151-030	Controlled crossings	Defines school patrol controlled crosswalks as those that use an adult crossing guard, and do not have a traffic signal or stop sign. At a minimum, these should have school crossing warning signs (S1-1 and S2-1), marked crosswalks, and a school speed limit sign (S5-1). School patrol assisted crosswalks use a crossing guard, traffic signal, stop sign, or a law enforcement officer for control. When crossing is controlled by a stop sign, the S2-1 sign can be omitted, when controlled by a traffic signal or stop sign, the use of a school speed limit may be necessary. School patrol is required when school officials and/or the safety advisory committee determine that vehicular traffic volumes are such that adequate safe gaps in the traffic flow do not occur in reasonable frequent intervals to allow safe crossings by students. This condition, as well as any other related traffic issues, shall be evaluated cooperatively with the traffic engineering authorities having jurisdiction in order that necessary studies can be conducted for the purpose of developing possible alternative measures.

APPENDIX F:
WSDOT SCHOOL ZONE LAYOUT & SIGN FABRICATION DETAILS

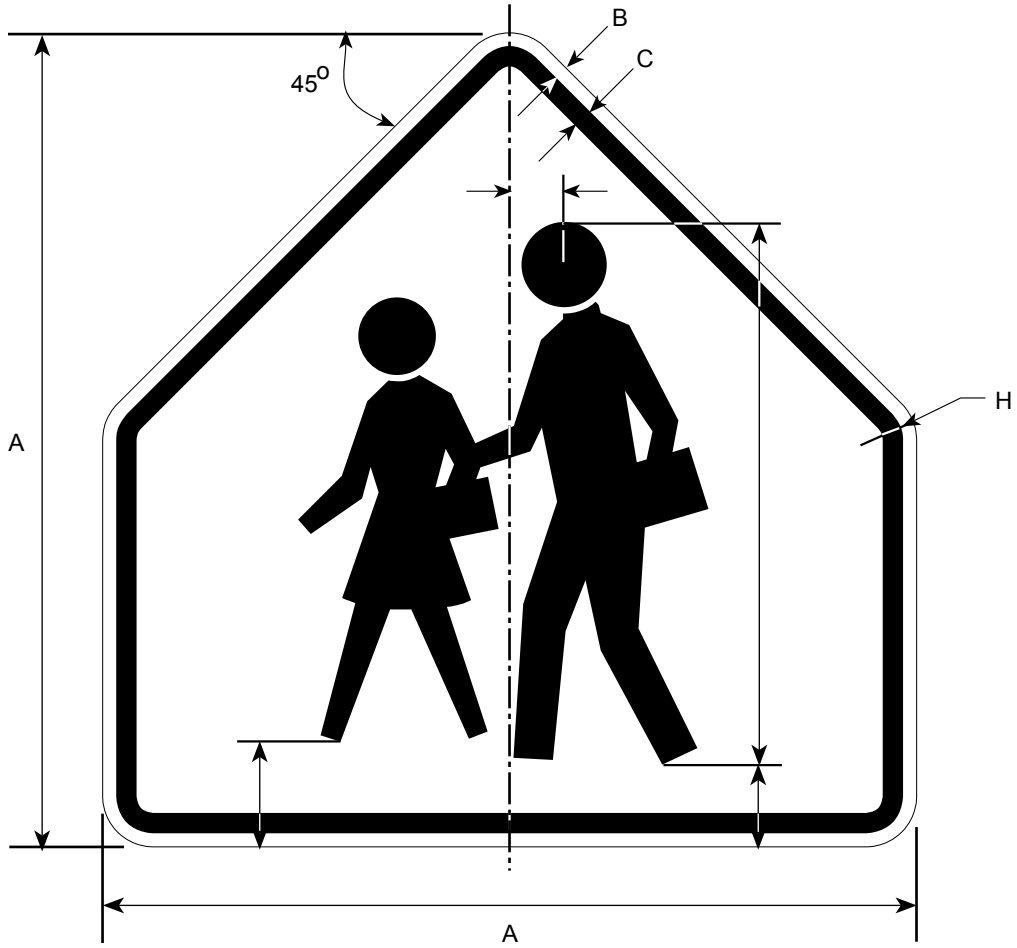


*** Sign legend determined by school district**

Sign Code	Sign Legend
S5-1	WHEN FLASHING
S5-101	WHEN CHILDREN ARE PRESENT
S4-101	WHEN FLAGGED
S4-1	8:30 A.M. to 5:00 P.M.
S4-5	SCHOOL DAYS X:XX A.M. to X:XX P.M.
S4-5A	SCHOOL DAYS X:XX A.M. to X:XX A.M. SCHOOL DAYS X:XX P.M. to X:XX P.M.

S1-1

6/00



* SEE APPENDIX FOR SYMBOL DESIGN

DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
750	13	19	50	500	75	94	47
900	16	22	63	600	88	113	56
1200	19	33	81	800	125	150	75

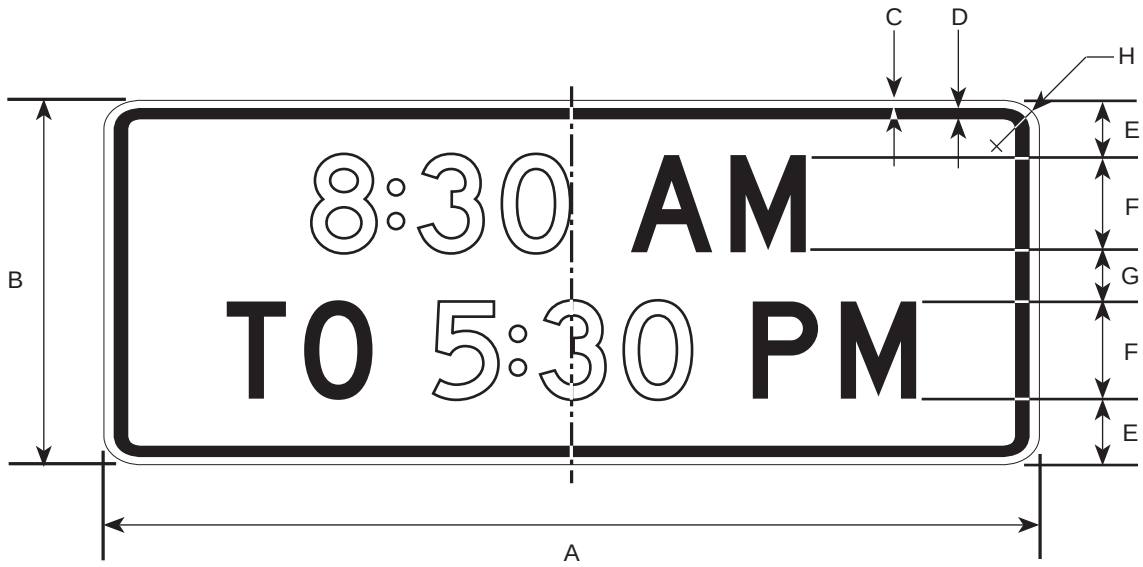
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
30	1/2	3/4	2	20	3	3 3/4	1 7/8
36	5/8	7/8	2 1/2	24	3 1/2	4 1/2	2 1/4
48	3/4	1 1/4	3 1/4	32	5	6	3

COLORS

LEGEND— BLACK (NON-REFL)
BACKGROUND -- FLUORESCENT YELLOW GREEN (REFL)

S4-1

11/97



DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
600	300	9	16	50	87D	25	38
900	450	16	22	81	125D	38	56
1200	600	19	31	11	150	62	75

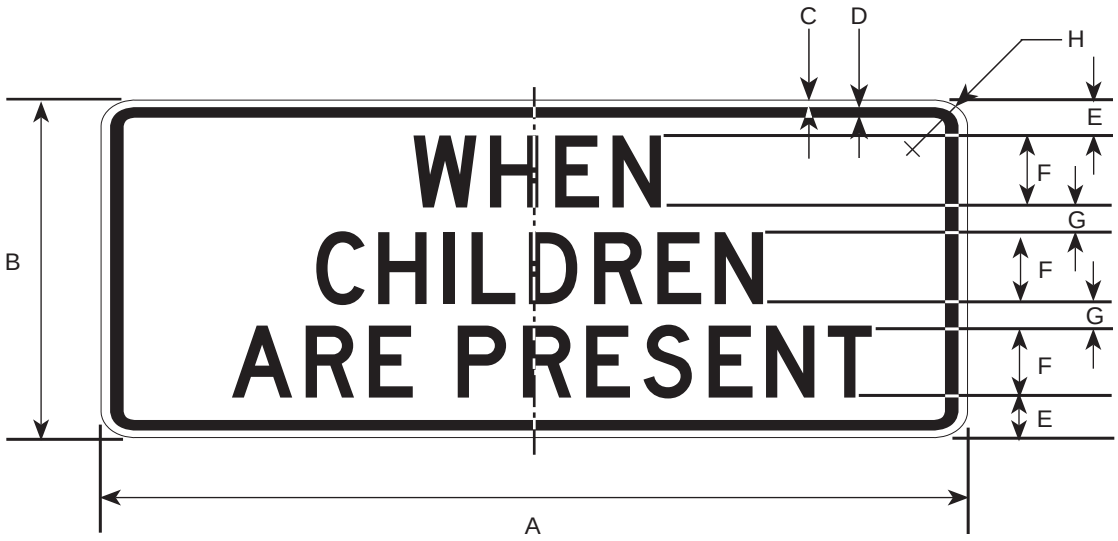
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
24	12	5/8	5/8	2	3 1/2D	1	1 1/2
36	18	3/4	7/8	3.25	5D	1 1/2	2 1/4
48	24	1 1/4	1 1/4	4.75	6D	2 1/2	3

COLORS

LEGEND -- BLACK (NON-REFL.)
BACKGROUND -- WHITE (REFL.)

S4-2

6/00



DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
600	250	9	16	37	50D	13	38
900	375	16	22	56	75D	19	56
1200	500	19	31	75	100D	25	75

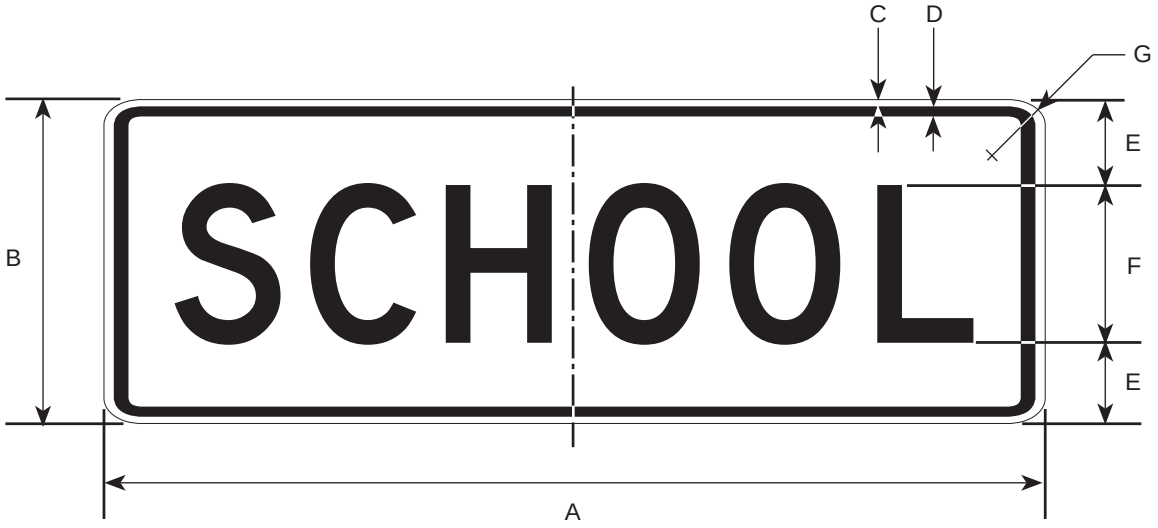
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
24	10	3/8	5/8	1 1/2	2D	1/2	1 1/2
36	15	5/8	7/8	2 1/4	3D	3/4	2 1/4
48	20	3/4	1 1/4	3	4D	1	3

COLORS

LEGEND -- BLACK (NON-REFL.)
BACKGROUND -- WHITE (REFL.)

S4-3

6/00



DIMENSIONS (MILLIMETERS)						
A	B	C	D	E	F	G
600	200	9	16	50	100D	38
900	300	16	22	75	150D	56
1200	400	19	31	100	200D	75

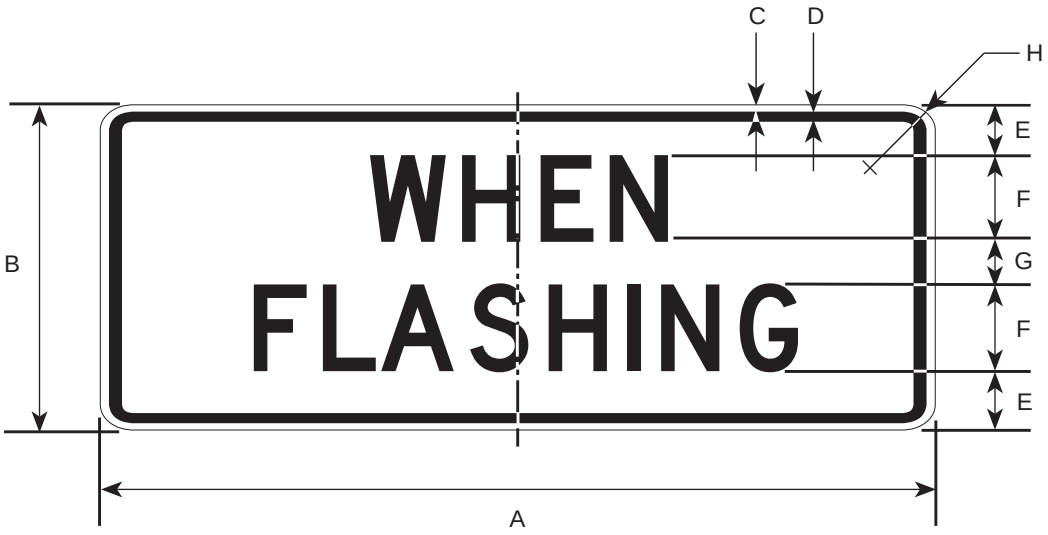
DIMENSIONS (INCHES)						
A	B	C	D	E	F	G
24	8	3/8	5/8	2	4D	1 1/2
36	12	5/8	7/8	3	6D	2 1/4
48	16	3/4	1 1/4	4	8D	3

COLORS

LEGEND -- BLACK (NON-REFL.)
BACKGROUND -- FLUORESCENT YELLOW GREEN (REFL.)

S4-4

6/00



DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
600	250	9	16	50	62.5D	25	38
900	375	16	22	69	100D	38	56
1200	500	19	31	100	125D	50	75

DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
24	10	3/8	5/8	2	2 1/2D	1	1 1/2
36	15	5/8	7/8	2 3/4	4D	1 1/2	2 1/4
48	20	3/4	1 1/4	4	5D	2	3

COLORS

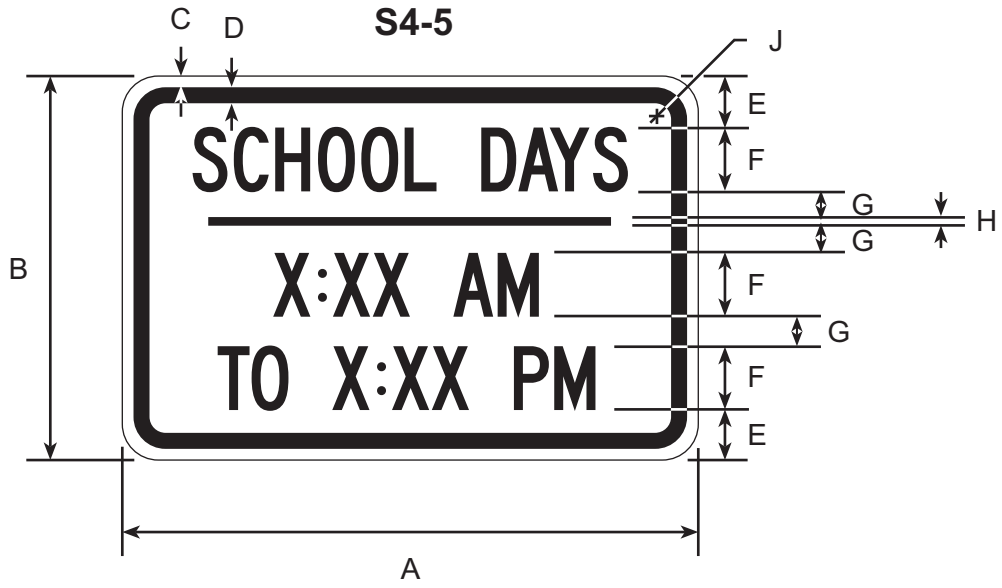
LEGEND -- BLACK (NON-REFL.)

BACKGROUND -- WHITE

S4-5 & S4-5A

5/06

S4-5



S4-5A

DIMENSIONS (MILLIMETERS)								
A	B	C	D	E	F	G	H	J
600	450	9	16	69	63C	38	16	38
900	600	16	22	81	100C	38	22	56

DIMENSIONS (INCHES)								
A	B	C	D	E	F	G	H	J
24	18	3/8	5/8	2 3/4	2 1/2C	1 1/2	5/8	1 1/2
36	24	5/8	7/8	3 1/4	4C	1 1/2	7/8	2 1/4

COLORS

LEGEND & BORDER - BLACK (NON-REFL)
BACKGROUND - WHITE (REFL)

S4-501

11/97

DIMENSIONS (MILLIMETERS)						
A	B	C	D	E	F	G
600	250	9	16	63D	25	47
900	375	16	22	100D	38	56
1200	500	19	31	125D	50	75

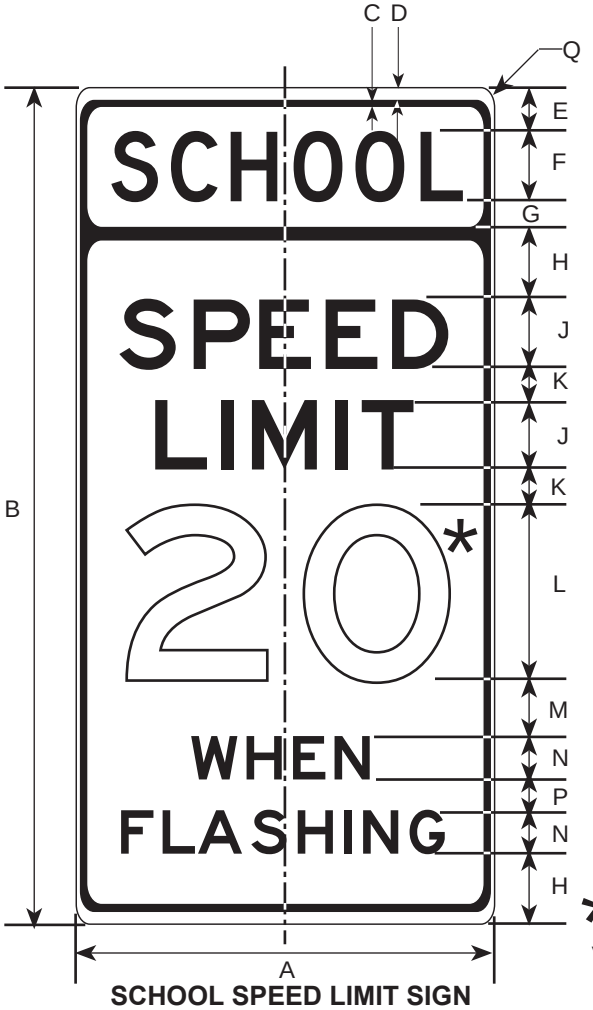
DIMENSIONS (INCHES)						
A	B	C	D	E	F	G
24	10	3/8	5/8	2 1/2D	1	1 1/2
36	15	5/8	7/8	4D	1 1/2	2 1/4
48	20	3/4	1 1/4	5D	2	3

COLORS

LEGEND -- BLACK (NON-REFL.)
BACKGROUND -- WHITE (REFL.)

S5-1

6/00



SCHOOL SPEED LIMIT SIGN
(FOR USE WITH FLASHING BEACON)

DIMENSIONS (MILLIMETERS)														
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
600	1200	9	16	62.5	100D	37.5	100	100E	50	250E	75	62.5D	50	38
900	1800	16	22	94	125D	56	150	150E	100	350E	100	100D	50	56
1200	1400	22	31	125	200D	75	200	200E	150	450E	150	125D	100	75

DIMENSIONS (INCHES)														
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
24	48	3/8	5/8	2 1/2	4D	1 1/2	4	4E	2	10E	3	2 1/2D	2	1 1/2
36	72	5/8	7/8	3 3/4	6D	2 1/4	6	6E	4	14E	4	4D	2	2 1/4
48	96	7/8	1 1/4	5	8D	3	8	8E	6	16E	6	5D	4	3

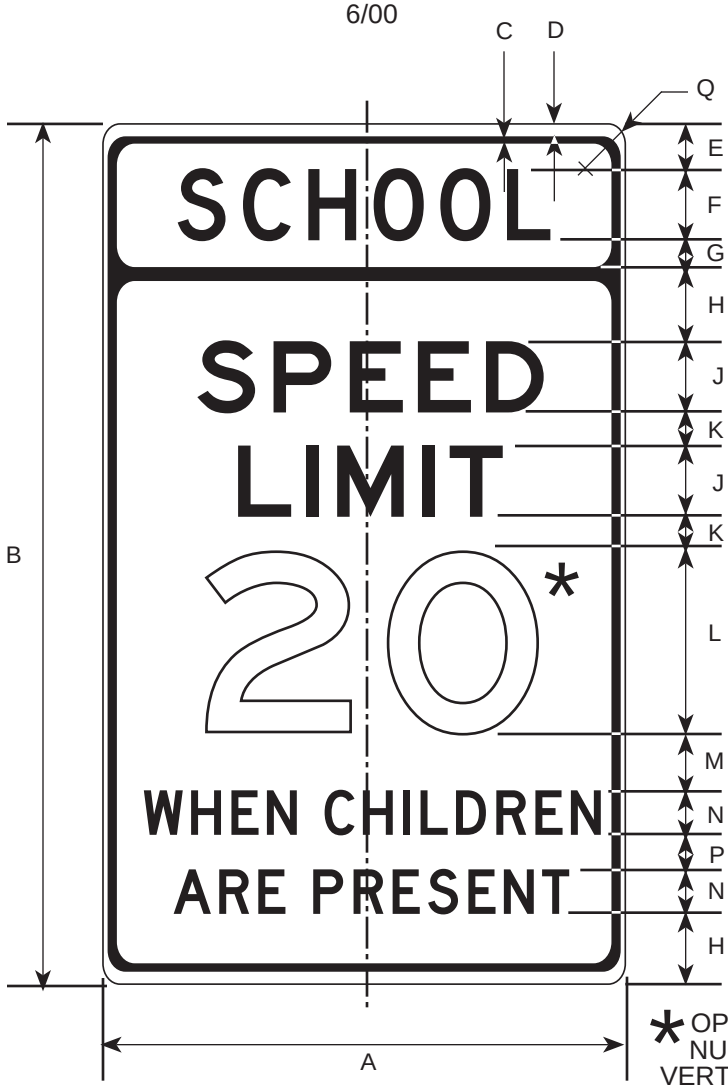
COLORS

TOP
LEGEND - BLACK (NON-REFL)
BACKGROUND - FLUORESCENT YELLOW GREEN (REFL)

BOTTOM
LEGEND - BLACK (NON-REFL)
BACKGROUND - WHITE (REFL)

S5-101

6/00



* OPTICALLY SPACE NUMERALS ABOUT VERTICAL CENTERLINE

DIMENSIONS (MILLIMETERS)														
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
750	1200	9	16	62.5	100D	37.5	100	100E	50	250E	75	62.5D	50	38
1200	1800	16	22	94	150D	56	150	150E	100	350E	100	100D	50	56
1500	2400	22	31	125	200D	75	200	200E	150	400E	150	125D	100	75

DIMENSIONS (INCHES)														
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
30	48	3/8	5/8	2 1/2	4D	1 1/2	4	4E	2	10E	3	2 1/2D	2	1 1/2
48	72	5/8	7/8	3 3/4	6D	2 1/4	6	6E	4	14E	4	4D	2	2 1/4
60	96	7/8	1 1/4	5	8D	3	8	8E	6	16E	6	5D	4	3

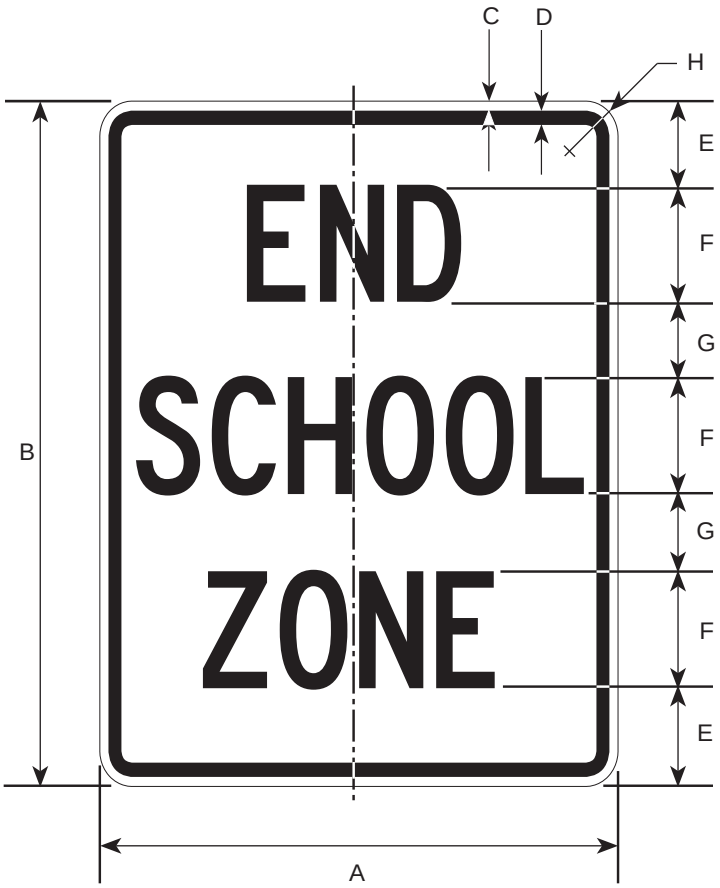
COLORS

TOP
LEGEND - BLACK (NON-REFL)
BACKGROUND - FLUORESCENT YELLOW GREEN (REFL)

BOTTOM
LEGEND - BLACK (NON-REFL)
BACKGROUND - WHITE (REFL)

S5-2

11/97



DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
450	600	9	16	88	100C	63	38
600	750	9	16	100	125C	88	38
900	1200	16	22	163	200C	138	56

DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
18	24	3/8	5/8	3 1/2	4C	2 1/2	1 1/2
24	30	3/8	5/8	4	5C	3 1/2	1 1/2
36	48	5/8	7/8	6 1/2	8C	5 1/2	2 1/4

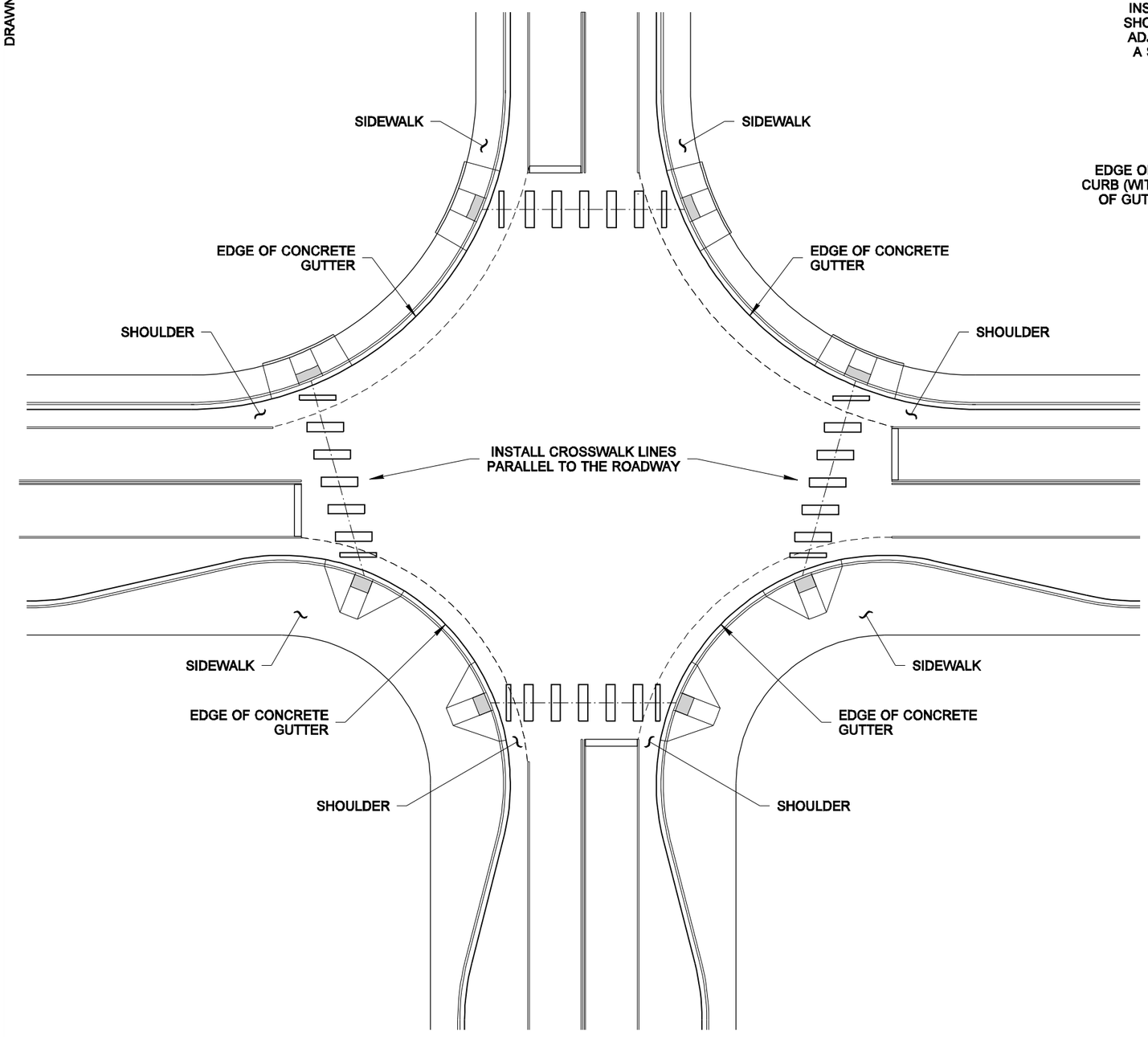
COLORS

LEGEND -- BLACK (NON-REFL.)

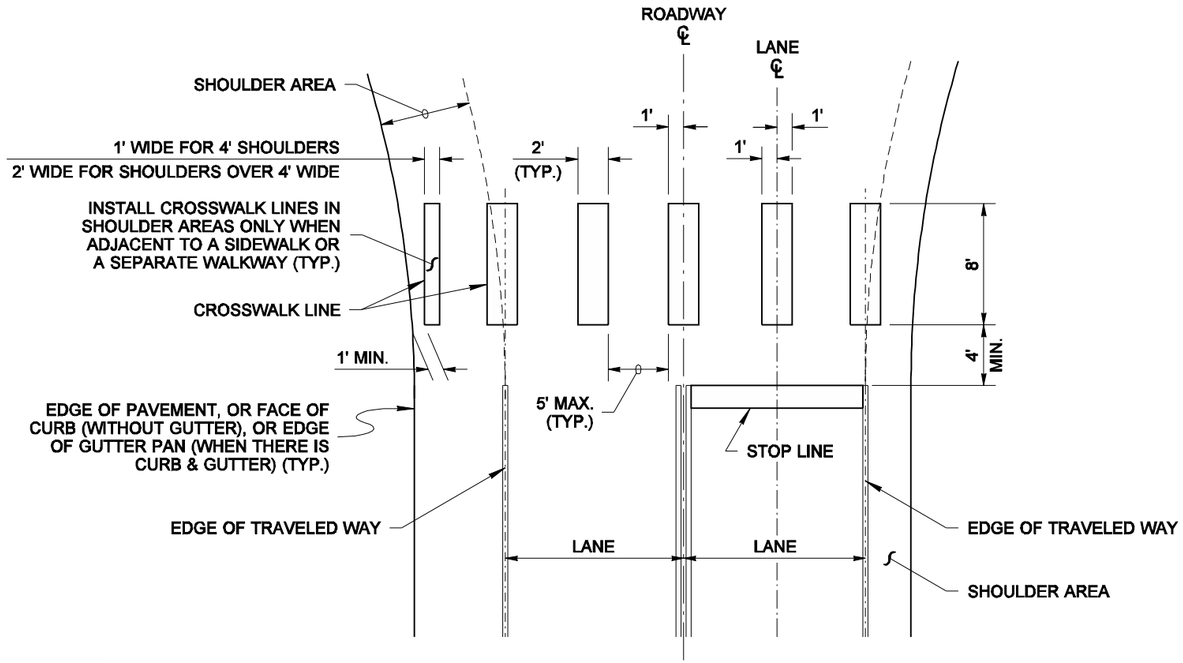
BACKGROUND -- WHITE (REFL.)

APPENDIX G:
WSDOT STANDARD DETAILS

DRAWN BY: FERN LIDDELL



TYPICAL APPLICATIONS



DETAIL

NOTES

1. See the Contract Plans for locations of crosswalk centerlines.
2. To the maximum extent possible, curb ramp centerline should be perpendicular to the crosswalk centerline.
3. To the maximum extent possible, crosswalks should be perpendicular to the centerline of the traveled way.

THEODORE J. TREPANIER
STATE OF WASHINGTON
25335
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES AUGUST 9, 2007

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

CROSSWALK LAYOUT

STANDARD PLAN M-15.10-01

SHEET 1 OF 1 SHEET

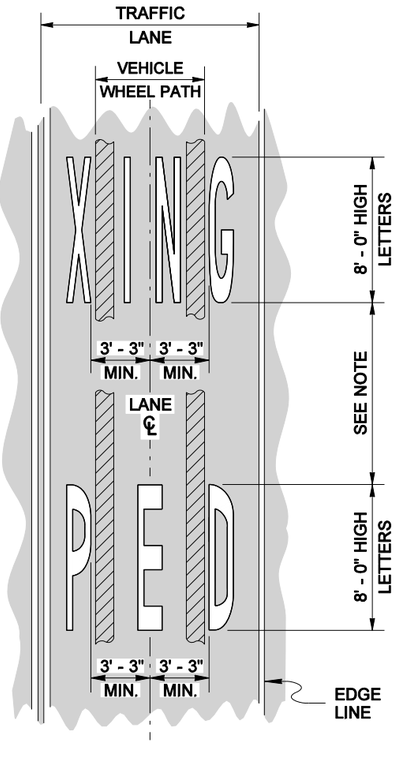
APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER

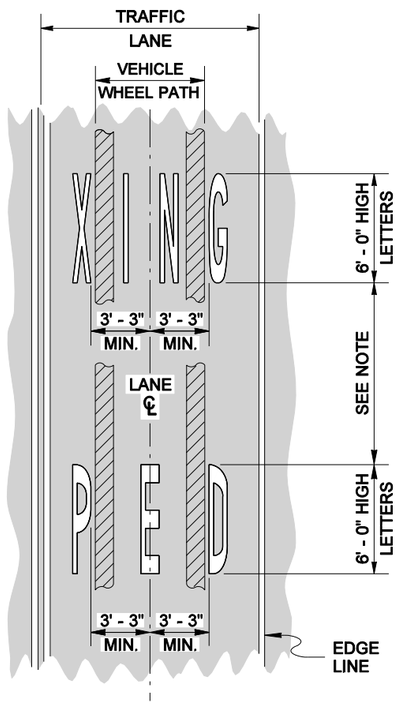
02-06-07 — DATE

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



HIGH-SPEED APPLICATION



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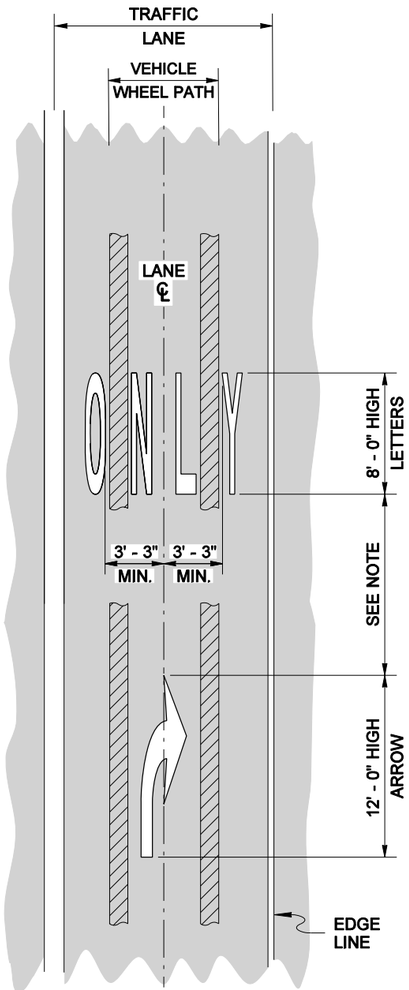

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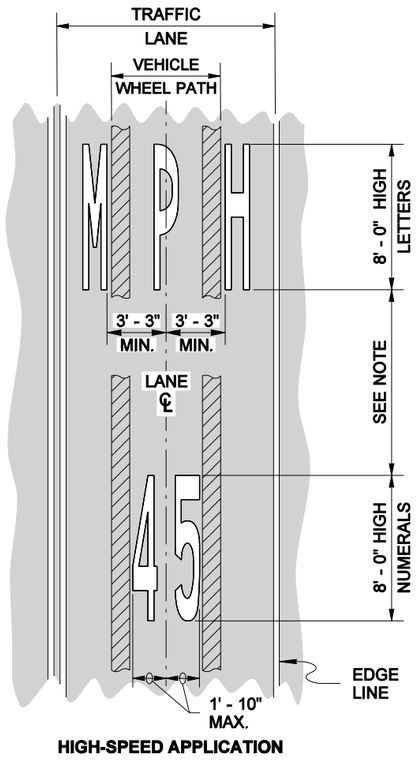

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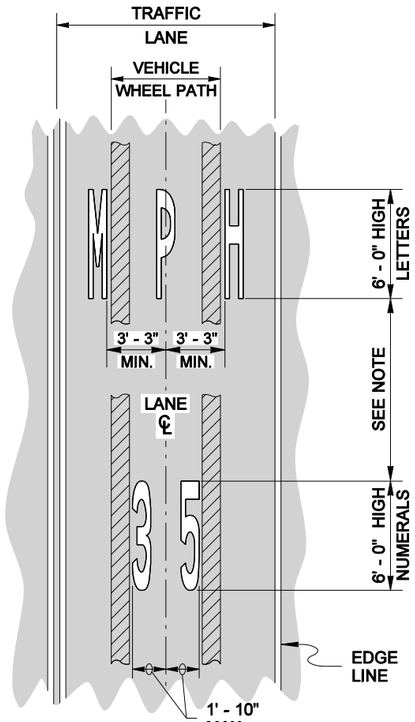
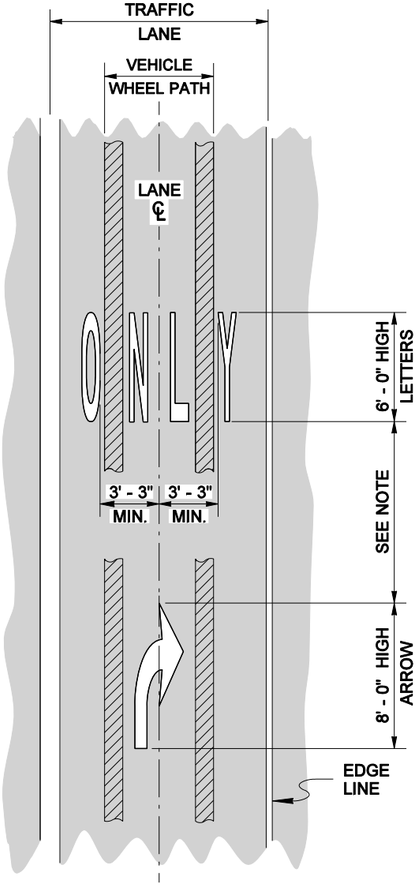


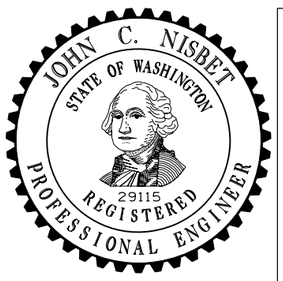
LOW-SPEED APPLICATION

NOTE

1. Typically, four times the letter or numeral height ~ minimum, up to ten times ~ maximum, or according to Plans.



LOW-SPEED APPLICATION



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TRAFFIC LETTER AND NUMERAL APPLICATIONS

STANDARD PLAN M-80.10-01

SHEET 1 OF 2 SHEETS

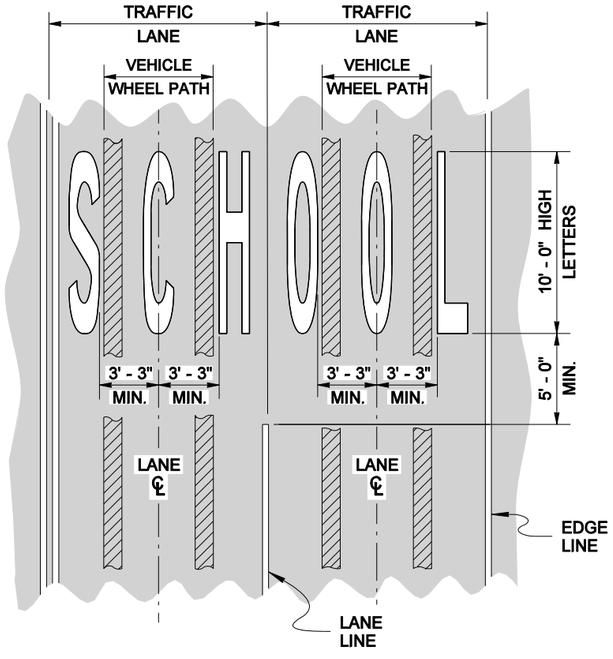
APPROVED FOR PUBLICATION

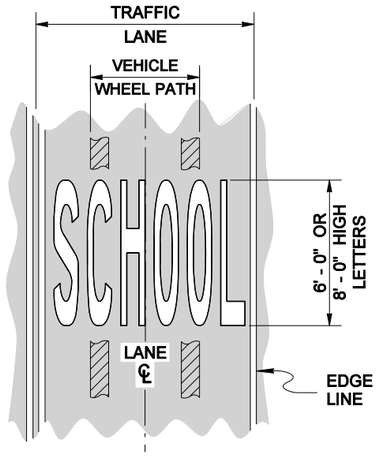
Pasco Bakotich III — STATE DESIGN ENGINEER

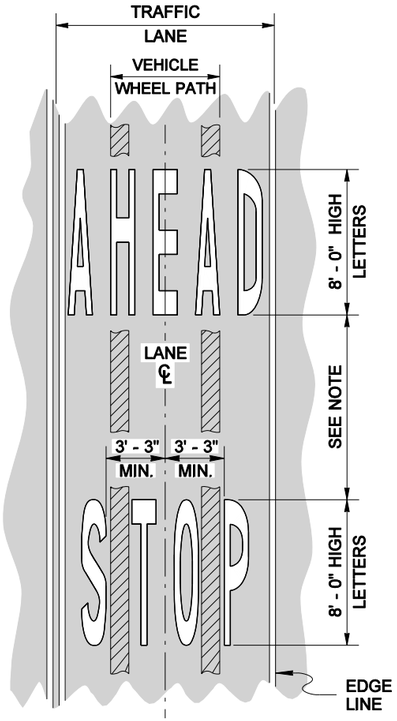
06-03-11 — DATE

Washington State Department of Transportation

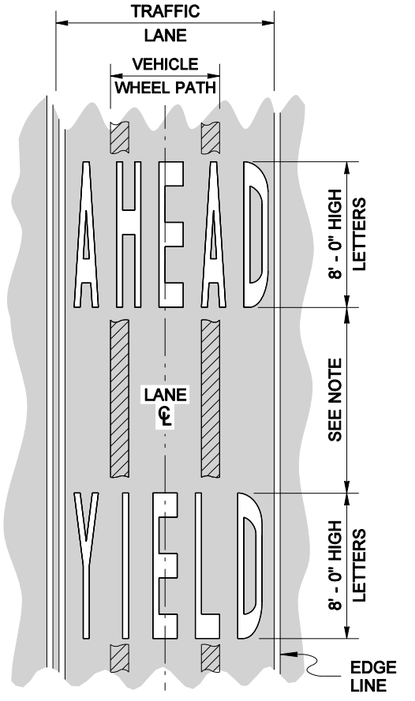
DRAWN BY: LISA CYFORD







HIGH-SPEED APPLICATION



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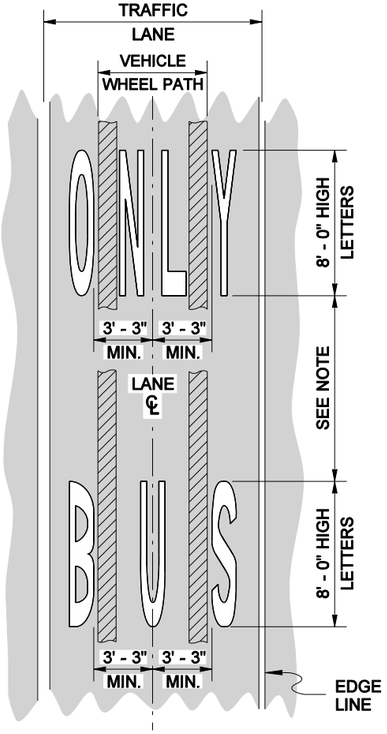
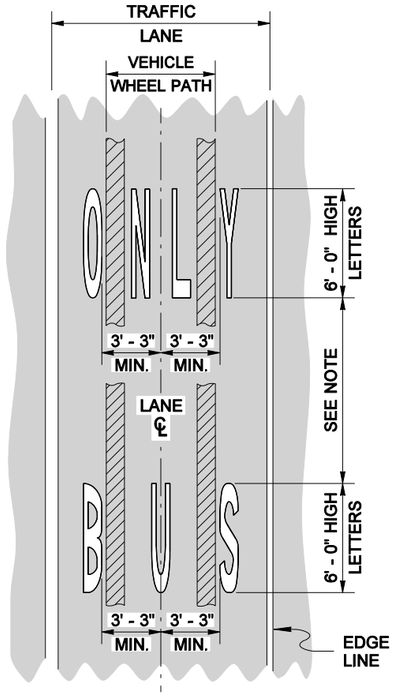
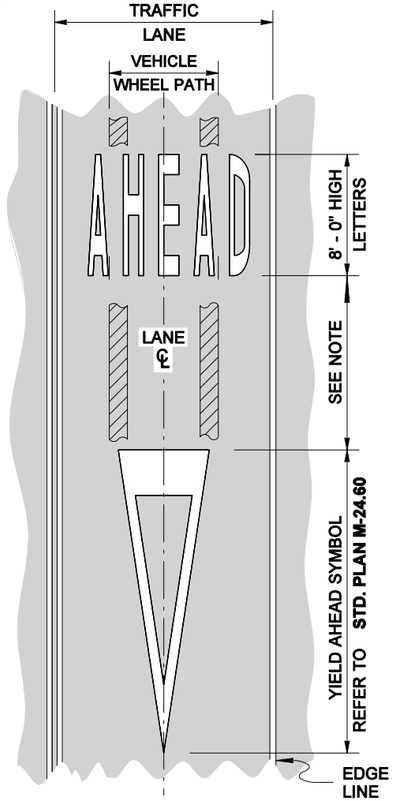


HIGH-SPEED APPLICATION



LOW-SPEED APPLICATION



HIGH-SPEED APPLICATION

JOHN C. NISBET
STATE OF WASHINGTON
29115
REGISTERED
PROFESSIONAL ENGINEER

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TRAFFIC LETTER AND NUMERAL APPLICATIONS

STANDARD PLAN M-80.10-01

SHEET 2 OF 2 SHEETS

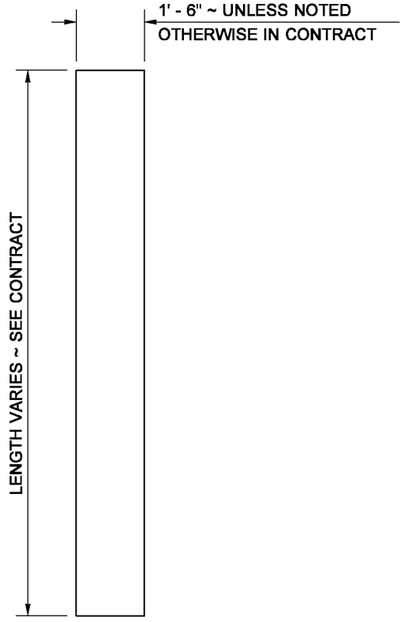
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

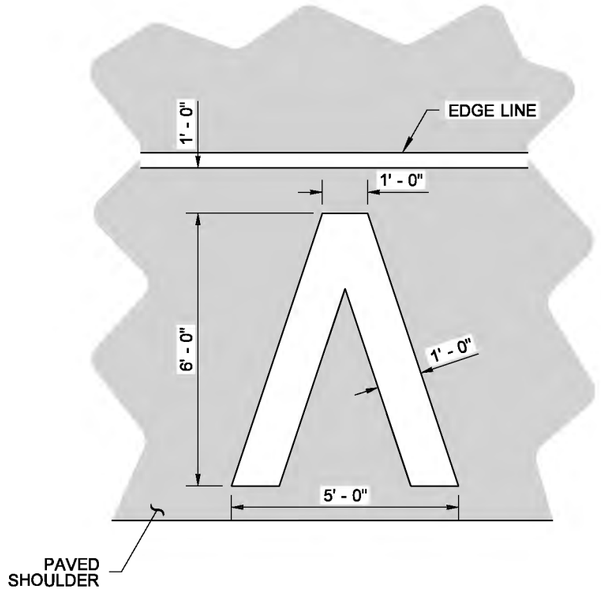
06-03-11 — DATE

Washington State Department of Transportation

DRAWN BY: LISA CYFORD

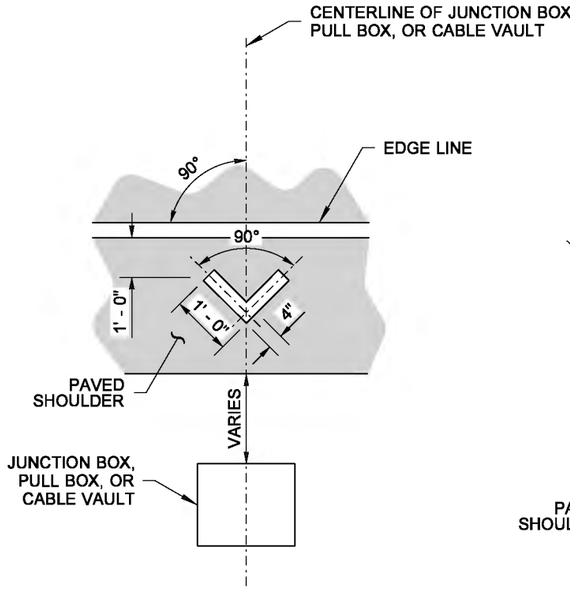


STOP LINE



MARKING AREA = 11.73 SQ.FT.

HALF-MILE MARKER

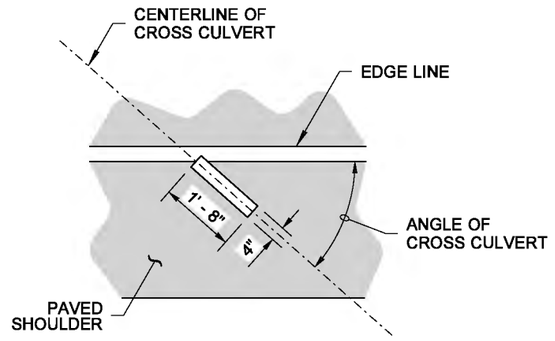


MARKING AREA = 0.56 SQ. FT.

JUNCTION BOX, PULL BOX, OR CABLE VAULT MARKINGS

NOTE

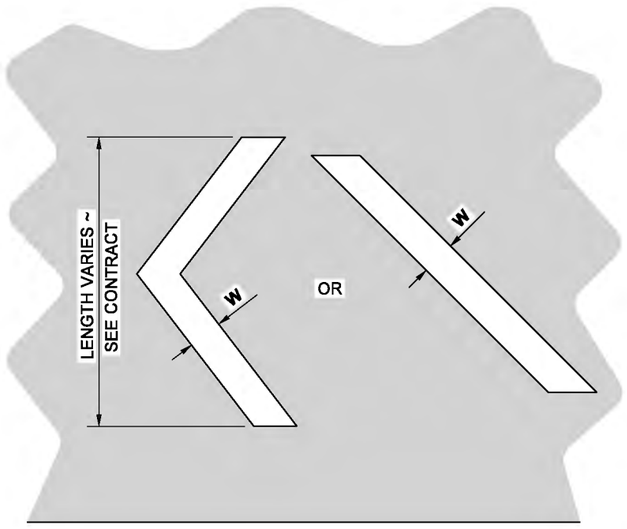
1. If Rumble Strips are present, install marking outside of the Rumble Strip.



MARKING AREA = 0.56 SQ.FT.

CROSS CULVERT

DRAINAGE MARKING

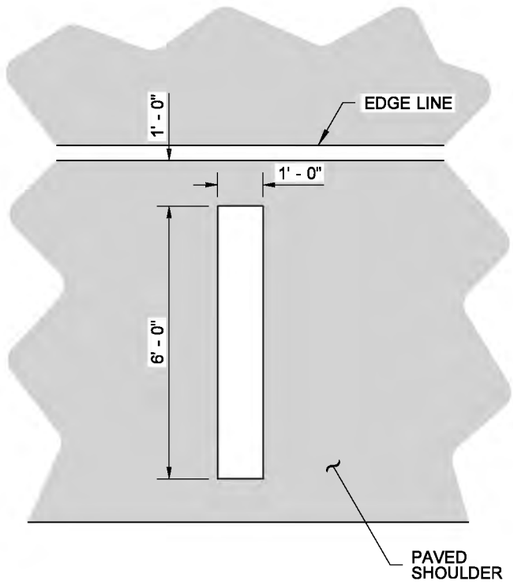


WHITE OR YELLOW ~ SEE CONTRACT

CHEVRON OR DIAGONAL

CROSSHATCH MARKING

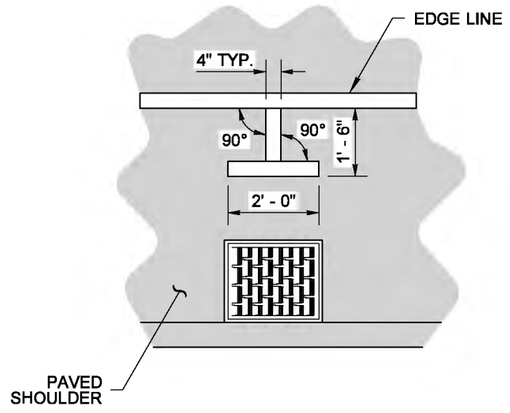
W = 8" (IN) FOR POSTED SPEED LIMIT OF 40 MPH OR LOWER
W = 12" (IN) FOR POSTED SPEED LIMIT OF 45 MPH OR HIGHER



MARKING AREA = 6.00 SQ.FT.

FULL MILE MARKER

AERIAL SURVEILLANCE MARKERS



MARKING AREA = 1.06 SQ.FT.

DRAINAGE STRUCTURE INLET

DRAINAGE MARKING

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

SYMBOL MARKINGS MISCELLANEOUS

STANDARD PLAN M-24.60-04

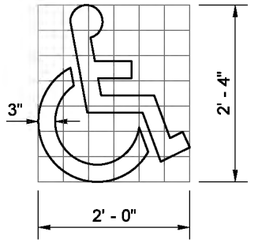
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

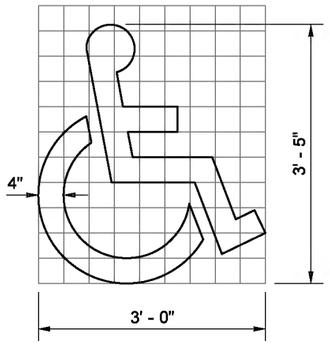
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



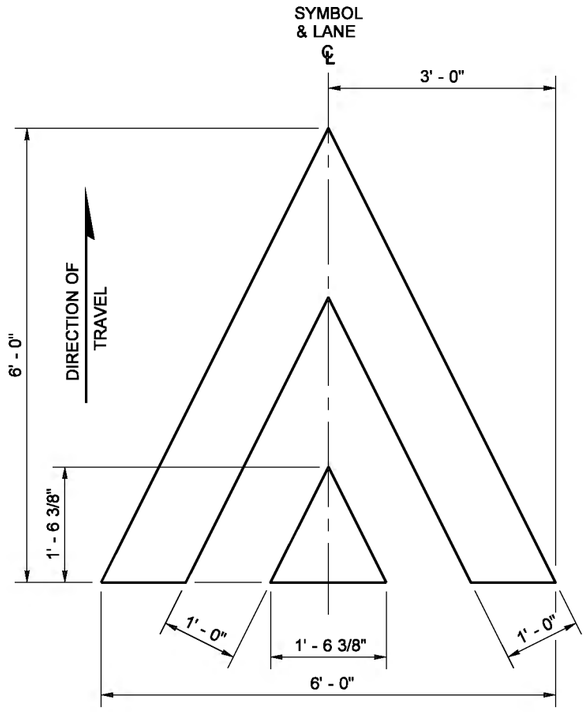
GRID IS 4" (IN) SQUARE MARKING AREA = 1.41 SQ.FT.

ACCESS PARKING SPACE SYMBOL (MINIMUM)



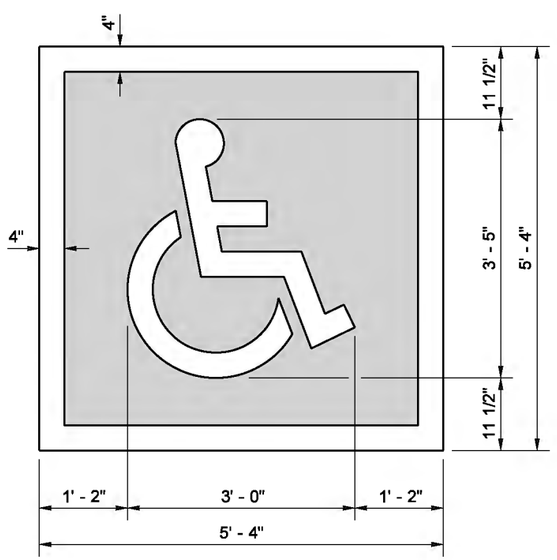
GRID IS 4" (IN) SQUARE MARKING AREA = 3.09 SQ.FT.

ACCESS PARKING SPACE SYMBOL (STANDARD)



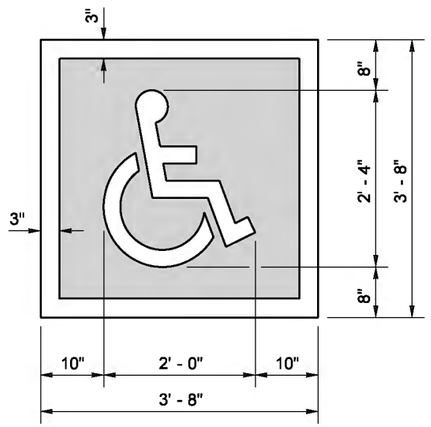
MARKING AREA = 12.08 SQ.FT.

SPEED BUMP SYMBOL



TOTAL MARKING AREA = 28.44 SQ.FT.
WHITE = 9.76 SQ.FT. BLUE = 18.69 SQ.FT.

ACCESS PARKING SPACE SYMBOL (STANDARD)
WITH BLUE BACKGROUND AND WHITE BORDER
(REQUIRED FOR CEMENT CONCRETE SURFACES)

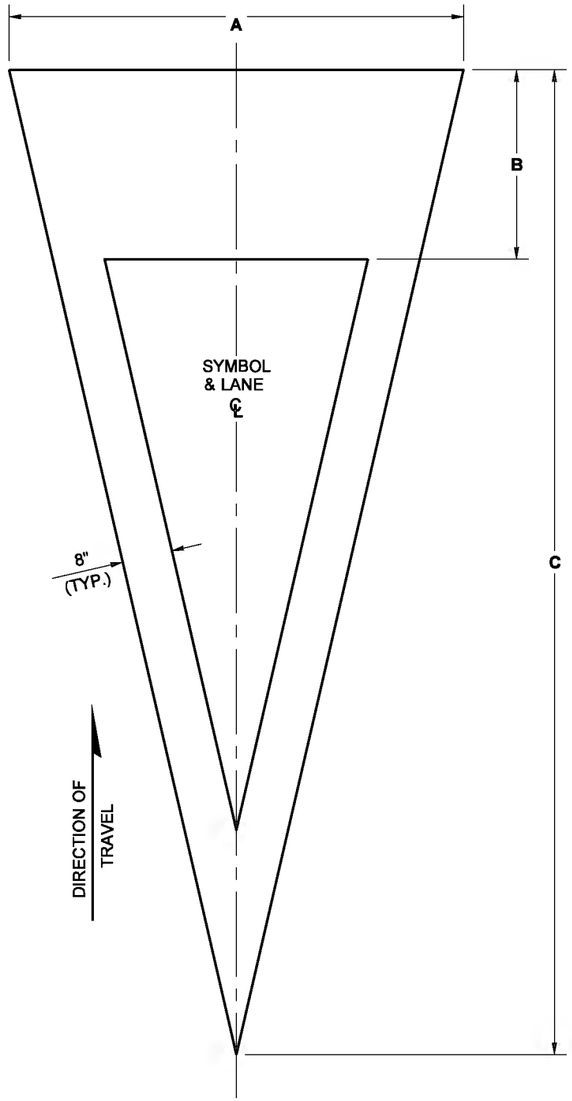


TOTAL MARKING AREA = 13.44 SQ.FT.
WHITE = 4.82 SQ.FT. BLUE = 8.62 SQ.FT.

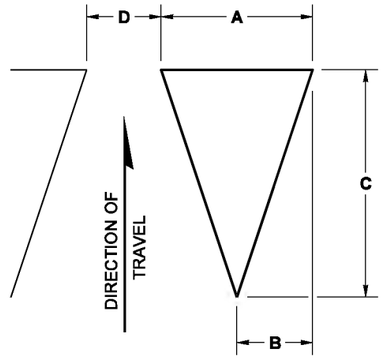
ACCESS PARKING SPACE SYMBOL (MINIMUM)
WITH BLUE BACKGROUND AND WHITE BORDER
(REQUIRED FOR CEMENT CONCRETE SURFACES)

SYMBOL MARKING		A	B	C	D	USE	MARKING AREA
YIELD AHEAD SYMBOL	TYPE 1	6' - 0"	2' - 6"	13' - 0"	N/A	LESS THAN 45 MPH	25.90 SQ.FT.
	TYPE 2	6' - 0"	3' - 0"	20' - 0"	N/A	45 MPH OR GREATER	36.54 SQ.FT.
YIELD LINE SYMBOL	TYPE 1	1' - 0"	6"	1' - 6"	6"	LESS THAN 45 MPH	0.75 SQ.FT.
	TYPE 2	2' - 0"	1' - 0"	3' - 0"	1' - 0"	45 MPH OR GREATER	3.00 SQ.FT.
	TYPE 2	2' - 0"	1' - 0"	3' - 0"	1' - 0"	ROUNDABOUT ENTRY *	3.00 SQ.FT.

* MINIMUM OF 4 IN LANE



YIELD AHEAD SYMBOL



YIELD LINE SYMBOL
(MULTIPLE SYMBOLS REQUIRED FOR TRANSVERSE YIELD LINE ~ SEE CONTRACT)

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

SYMBOL MARKINGS MISCELLANEOUS

STANDARD PLAN M-24.60-04

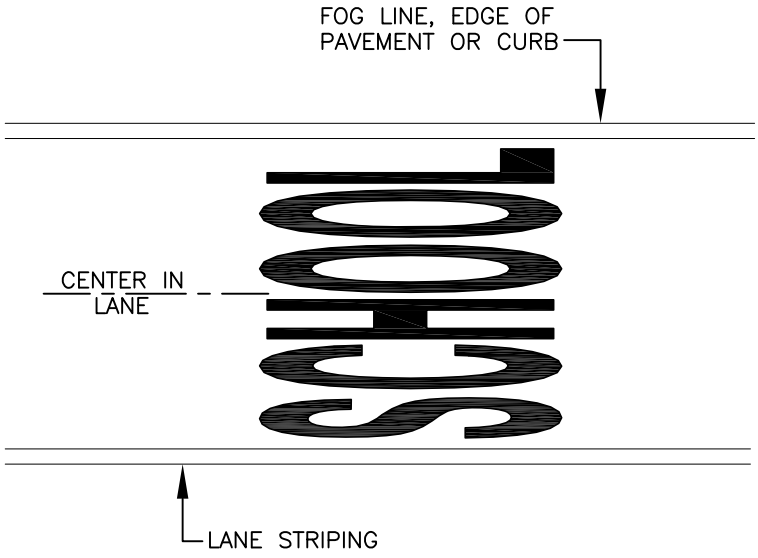
SHEET 2 OF 2 SHEETS

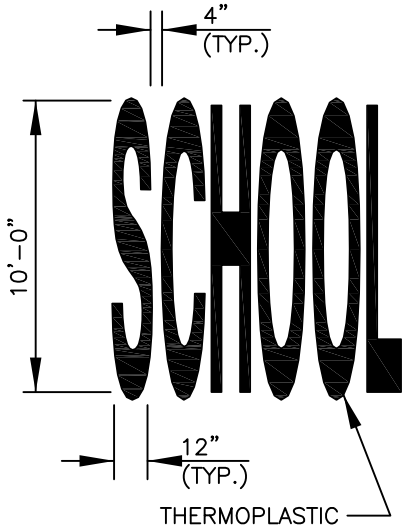
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

Washington State Department of Transportation

APPENDIX H:
LOCAL AGENCY STANDARD DETAILS





"SCHOOL" ZONE LEGEND

REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES

APPROVED BY: _____ TRAFFIC ENGINEER MANAGER

APPROVED DATE: 8/15/2008

CITY OF VANCOUVER WASHINGTON

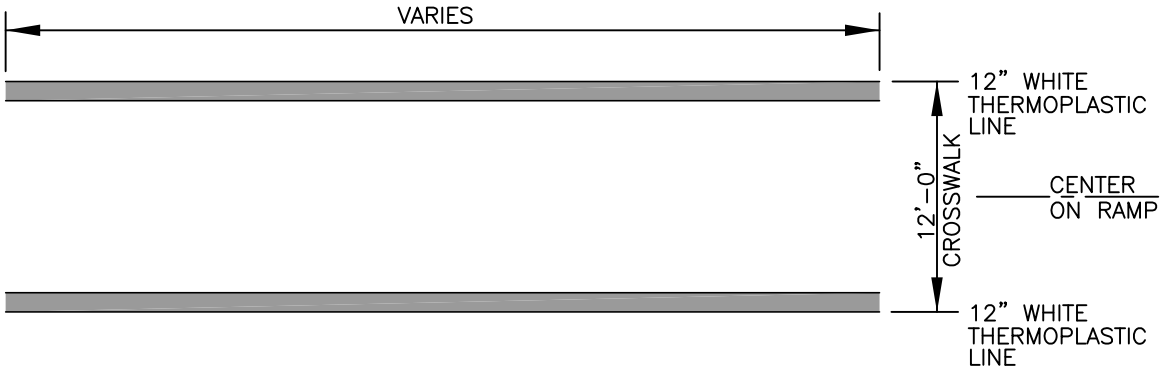
CITY OF VANCOUVER

"SCHOOL" LEGEND MARKINGS

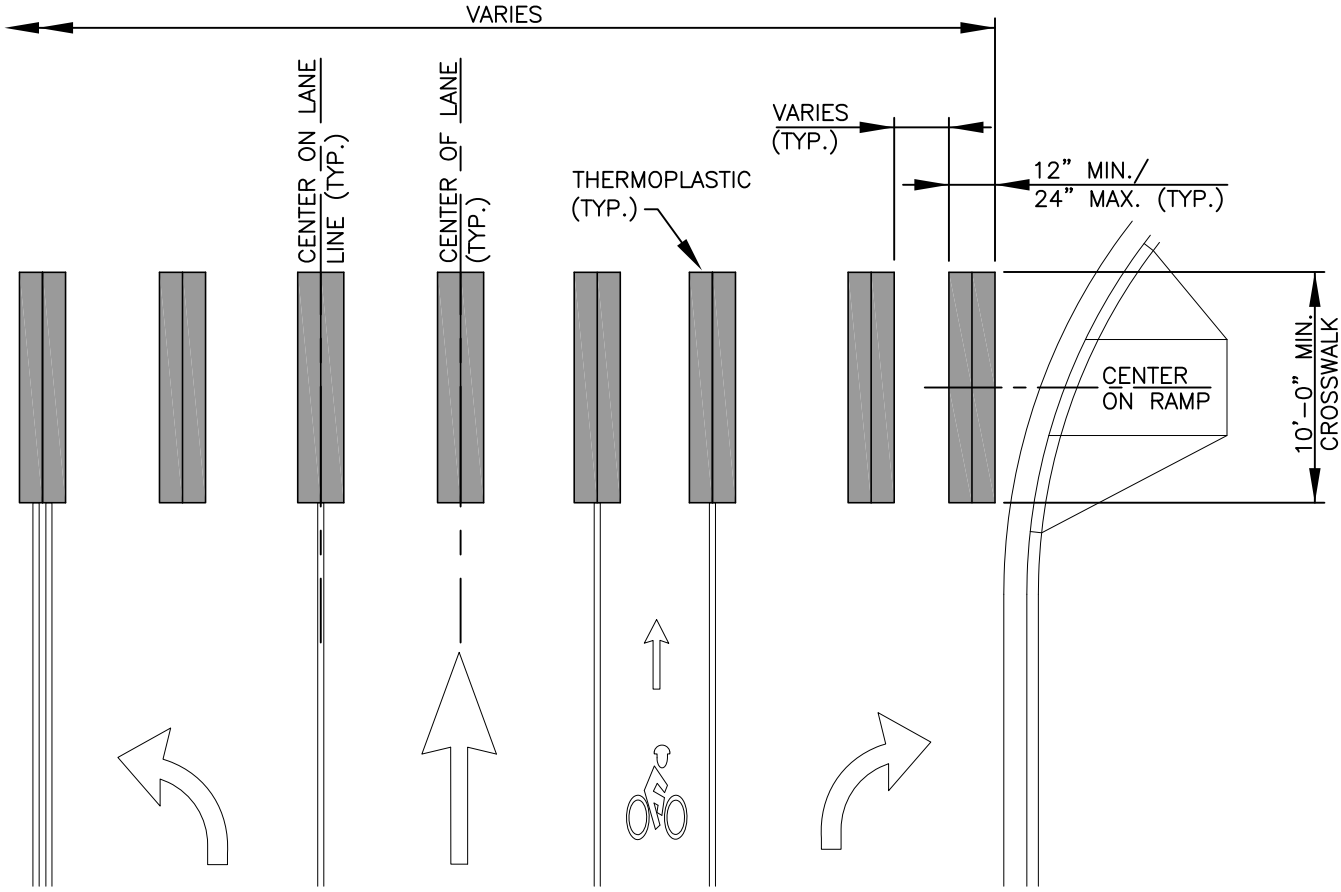
STANDARD PLAN NUMBER

T29-58

I:\CITYAPPS\AUTOCAD\STD_DETAILS\DRAWING_FILES\T29-58.DWG



CROSSWALK



LADDER STRIPE CROSSWALK

GENERAL NOTE:

LOCATE CROSSWALKS CENTERED ON WHEELCHAIR RAMP LOCATIONS OR 5' BACK OF EXTENDED FOG LINE, EDGE OF PAVEMENT OR CURB FACE.

REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES

APPROVED BY: _____ TRAFFIC ENGINEER MANAGER

APPROVED DATE: 8/15/2008

CITY OF VANCOUVER WASHINGTON

CITY OF VANCOUVER

CROSSWALKS LINE MARKINGS

STANDARD PLAN NUMBER

T29-41

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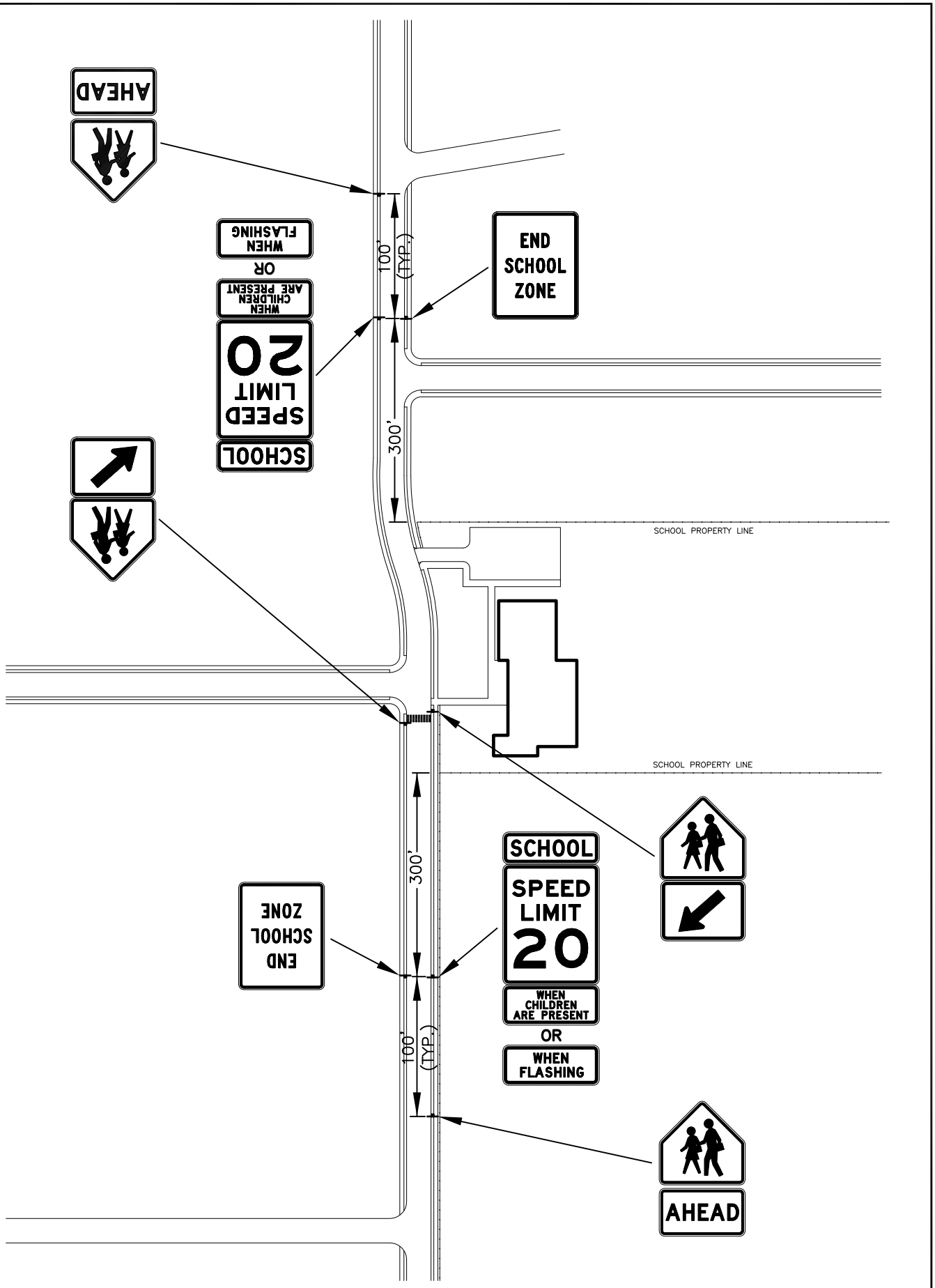

REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES

APPROVED BY: _____ TRAFFIC ENGINEER MANAGER

APPROVED DATE: 8/15/2008

CITY OF VANCOUVER WASHINGTON

CITY OF VANCOUVER

TYPICAL SIGNING FOR SCHOOL AREA TRAFFIC CONTROL

STANDARD PLAN NUMBER

T29–23

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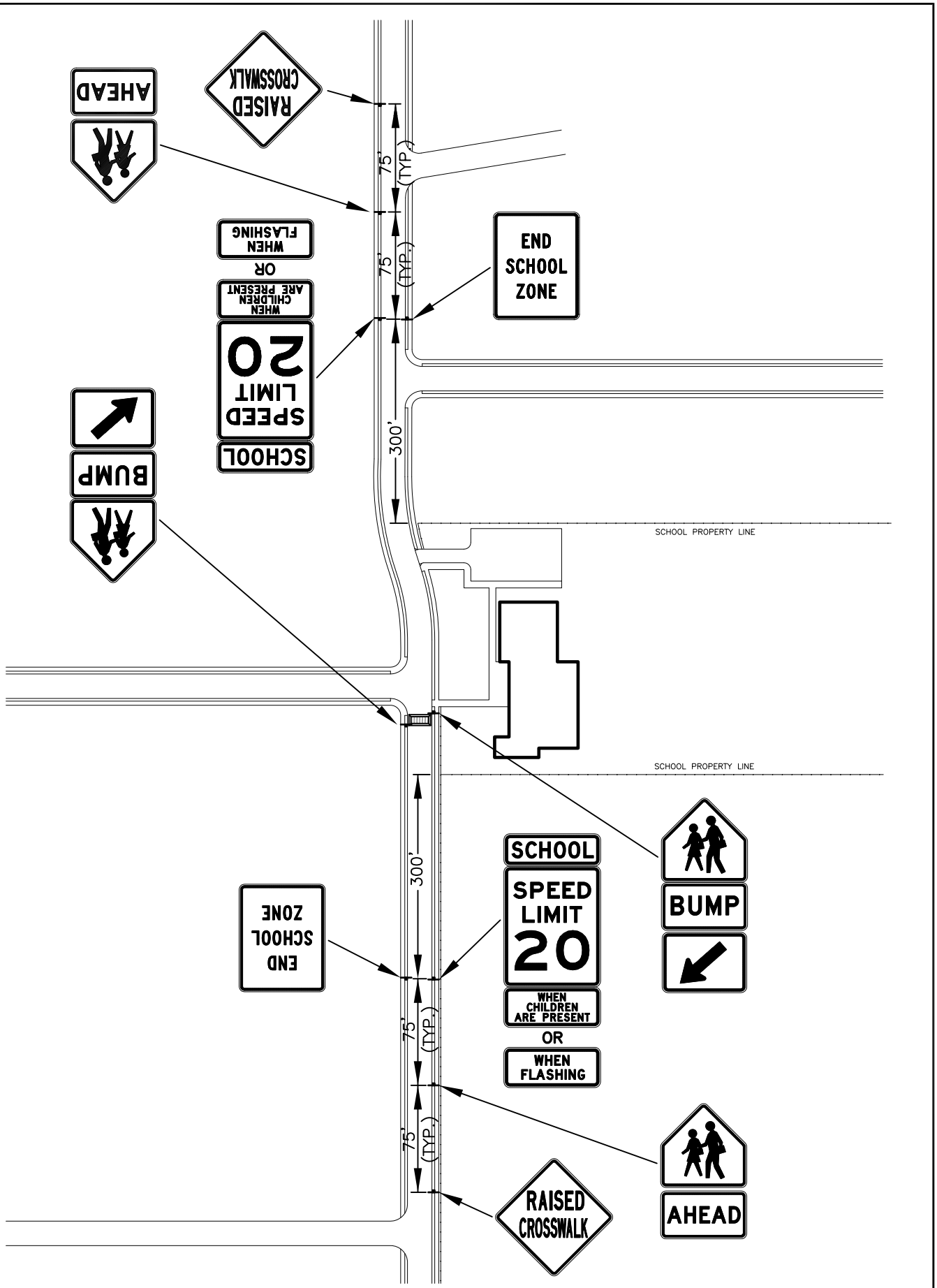


REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES

APPROVED BY: _____ TRAFFIC ENGINEER MANAGER

APPROVED DATE: 8/15/2008

CITY OF VANCOUVER WASHINGTON

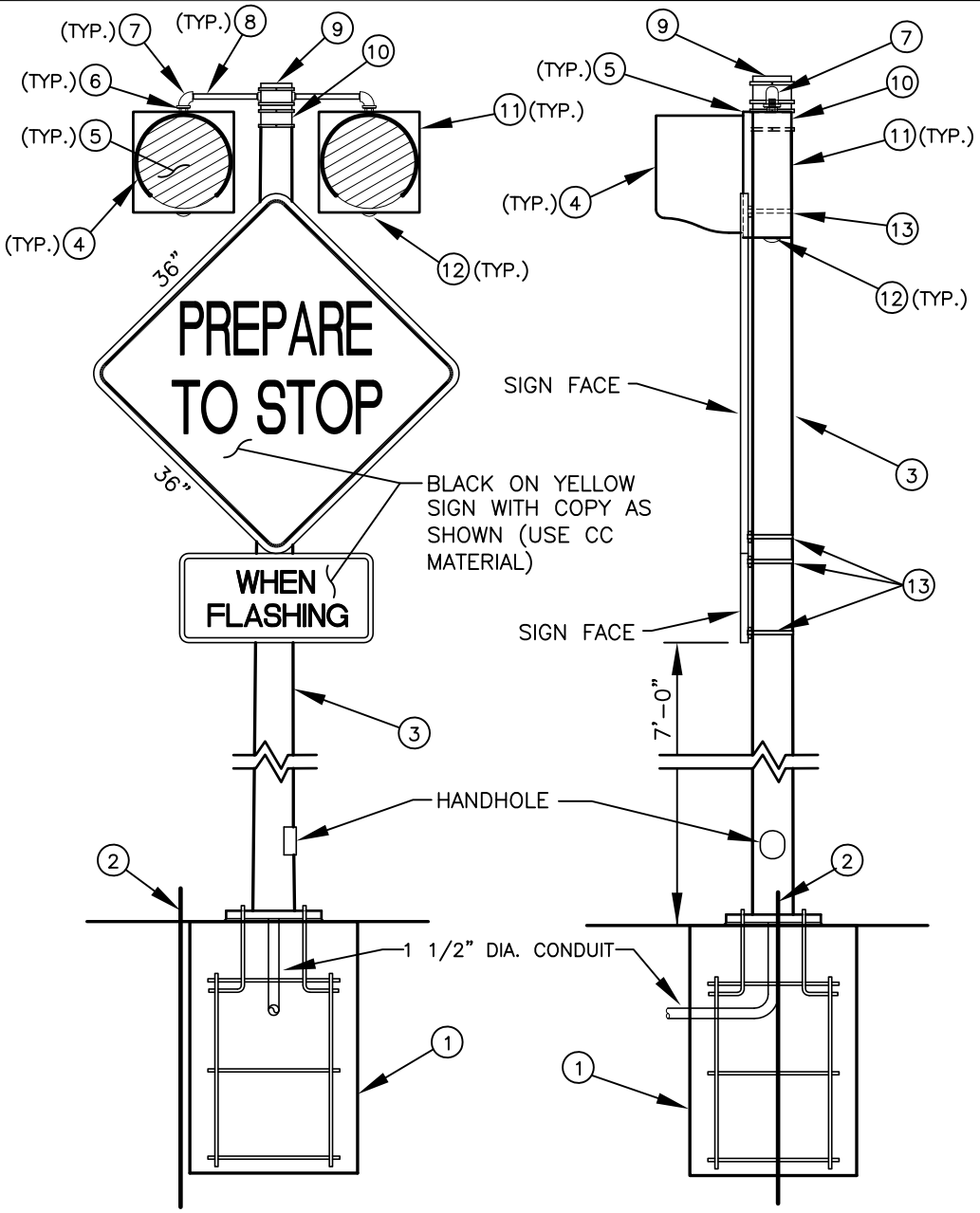
CITY OF VANCOUVER

TYPICAL SIGNING FOR SCHOOL AREA TRAFFIC CONTROL WITH RAISED CROSSWALK

STANDARD PLAN NUMBER

T29–22

I:\CITYAPPS\AUTOCAD\STD_DETAILS\DRAWING_FILES\T29-22.DWG



NOTES:

1. SEE **TYPE PS, TYPE I AND TYPE PPB TRAFFIC SIGNAL POLE FOUNDATION DETAIL T20-16** AND SPECIFICATIONS FOR FOUNDATION INFORMATION.
2. 8' GROUND ROD – CONNECT TO BASE.
3. CITY OF VANCOUVER TYPE I STANDARD (12'-6" IN LENGTH) OR EXISTING LIGHT STANDARD.
4. 1-WAY, 1-SECTION, 12" YELLOW LED MOUNTED ABOVE SIGN..
5. TUNNEL VISOR.
6. LOCKNIPPLE, 1 1/2" DIA. WITH GASKET, WASHER AND CONDUIT LOCKNUT.
7. SERRATED OR FLANGED ELBOW.
8. CONDUIT NIPPLE, 1 1/2" DIA.
9. TOP MOUNT SEE WSDOT DETAIL J-21.16.xx AND J-21.17.xx. IF SIGN IS MOUNTED ON LIGHT POLE USE MODIFIED TYPE K MOUNT.
10. SLIPFITTER.
11. ALUMINUM CASING.
12. END CAP.
13. MOUNTING BRACKET.

REFERENCES TO WSDOT STANDARD PLANS, USE THE MOST CURRENT VERSION OF THESE STANDARD PLANS.

REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE
5	7/14	RAW	CJC

PUBLIC WORKS TRANSPORTATION

APPROVED BY: _____ TRAFFIC ENGINEER MANAGER

APPROVED DATE: 7/1/2014

Vancouver WASHINGTON

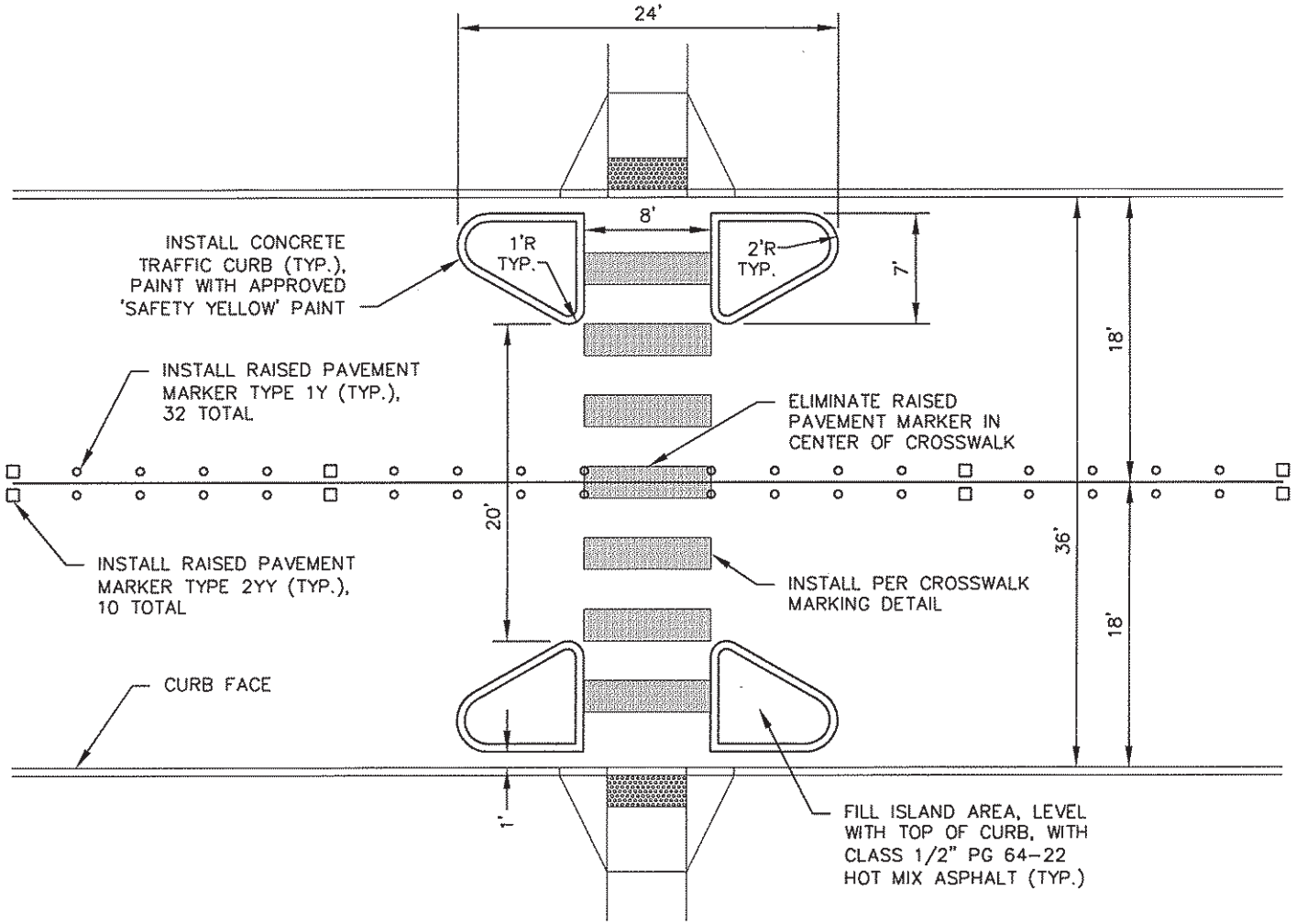
CITY OF VANCOUVER

SIGN AND FLASHER ASSEMBLY

STANDARD PLAN NUMBER

T20-14

I:\CITYAPPS\AUTOCAD\STD_DETAILS\DRAWING_FILES\T20-14



NOTES:

1. CROSSWALK MARKINGS SHALL BE WHITE PRE-MARK THERMOPLASTIC MATERIAL, OR APPROVED EQUAL.
2. SPACING OF STRIPES SHALL BE SELECTED TO AVOID WHEEL PATH.
3. CROSSWALK MARKINGS SHALL BE ALIGNED WITH THE CENTERLINE OF THE SIDEWALK.
4. ADVANCE SIGNAGE FOR UNSIGNALIZED MIDBLOCK CROSSINGS SHALL BE PER THE MUTCD AND USED AT THE DISCRETION OF THE ENGINEER.
5. RAISED PAVEMENT MARKERS ARE PER THE WSDOT STANDARD PLANS.

REV. NO.	DATE	BY	APPR.
1	5/1/07	SCD	JC
2	1/1/11	SCD	JC

CITY OF CAMAS ~ STREET DETAIL

TRAFFIC CALMING BULB-OUT

Jean E. Carothers 1-4-11

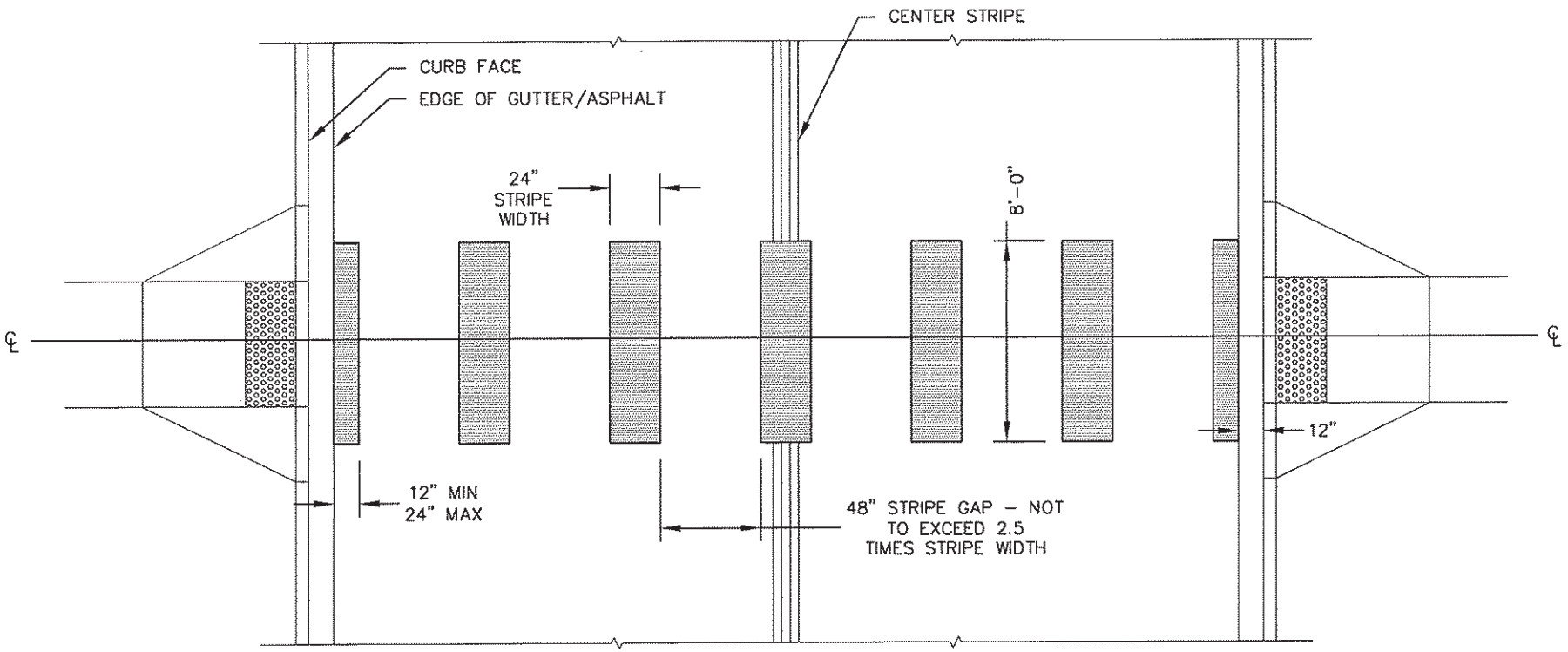
DETAIL APPROVED BY DATE

NOT TO SCALE

DETAIL NO.

ST32

ST-MARKING.DWG



NOTES:

1. CROSSWALK MARKINGS SHALL BE WHITE PRE-MARK THERMOPLASTIC MATERIAL, OR APPROVED EQUAL.
2. SEE CROSSWALK MARKING DETAIL FOR LOCATION OF CORNER CROSSWALK MARKINGS.
3. SPACING OF STRIPES SHALL BE SELECTED TO AVOID WHEEL PATH.
4. CROSSWALK MARKINGS SHALL BE ALIGNED WITH THE CENTERLINE OF THE SIDEWALK.
5. ADVANCE SIGNAGE FOR UNSIGNALIZED MIDBLOCK CROSSINGS SHALL BE PER THE MUTCD AND USED AT THE DISCRETION OF THE ENGINEER.

REV. NO.	DATE	BY	APPR.
1	5/1/07	SCD	JC
2	1/1/11	SCD	JC

CITY OF CAMAS ~ STREET DETAIL

MIDBLOCK CROSSWALK MARKINGS

James E. Carothers 1-4-11

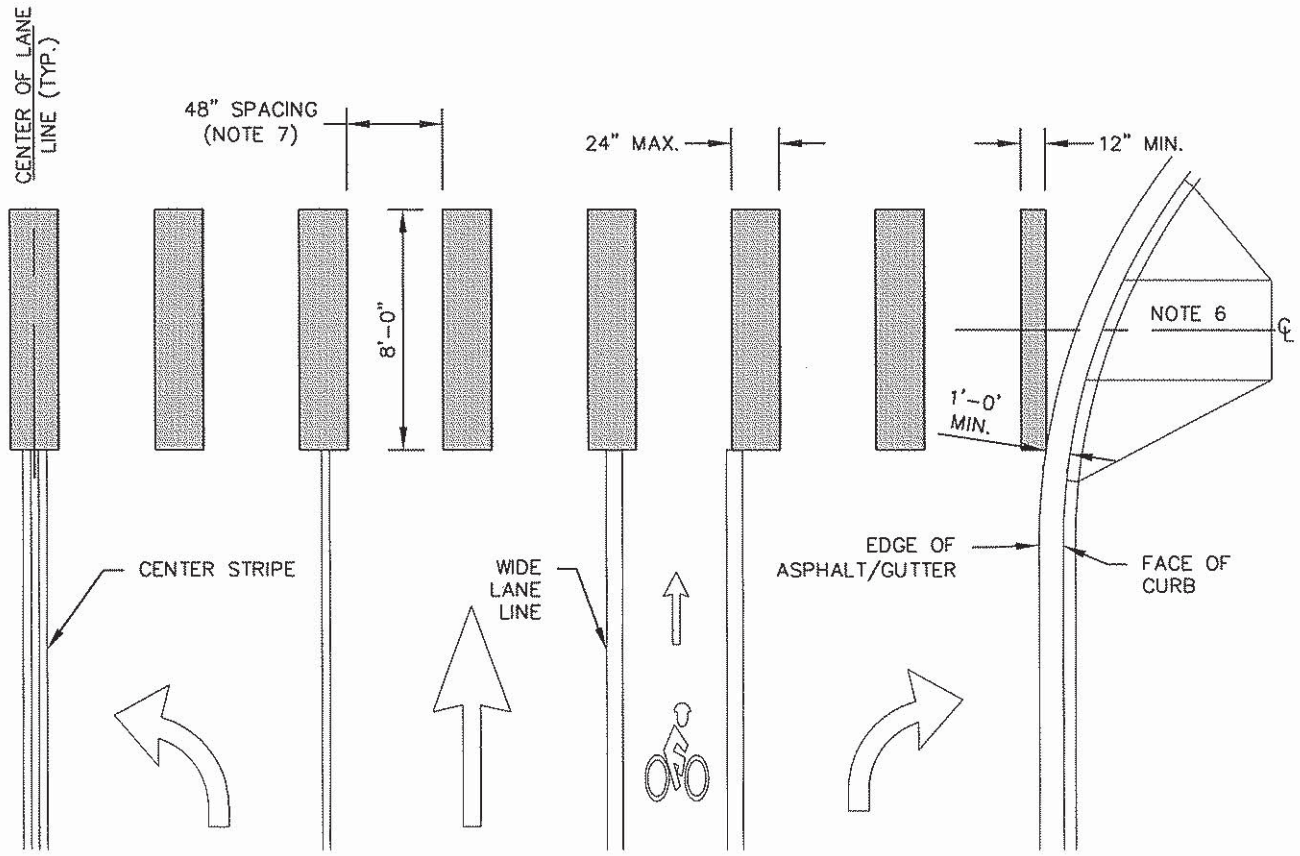
DETAIL APPROVED BY DATE

NOT TO SCALE

DETAIL NO.

ST31

ST-MARKING.DWG



LONGITUDINAL LINE CROSSWALK

NOTES:
1. ALL PAVEMENT MARKINGS SHALL BE APPLIED PER SECTION 8-22 OF THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION.
2. CROSSWALK MARKINGS SHALL BE WHITE PRE-MARK THERMOPLASTIC MATERIAL, OR APPROVED EQUAL.
3. MARKING DIMENSIONS ARE PER THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
4. SEE APPLICABLE CURB RAMP DETAIL FOR LOCATION OF CORNER CROSSWALK MARKINGS.
5. SPACING OF STRIPES SHALL BE SELECTED TO AVOID WHEEL PATH.
6. CROSSWALK MARKINGS SHALL BE ALIGNED WITH THE CENTERLINE OF THE SIDEWALK.
7. LONGITUDINAL STRIPE GAP NOT TO EXCEED 2.5 TIMES STRIPE WIDTH

REV. NO.	DATE	BY	APPR.
1	5/1/07	SCD	JC
2	1/1/11	SCD	JC

CITY OF CAMAS ~ STREET DETAIL

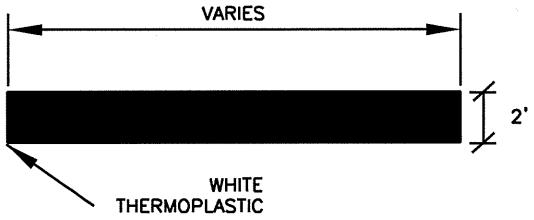
CROSSWALK MARKINGS

DETAIL APPROVED BY: Jan E. Cauthen DATE: 1-4-11

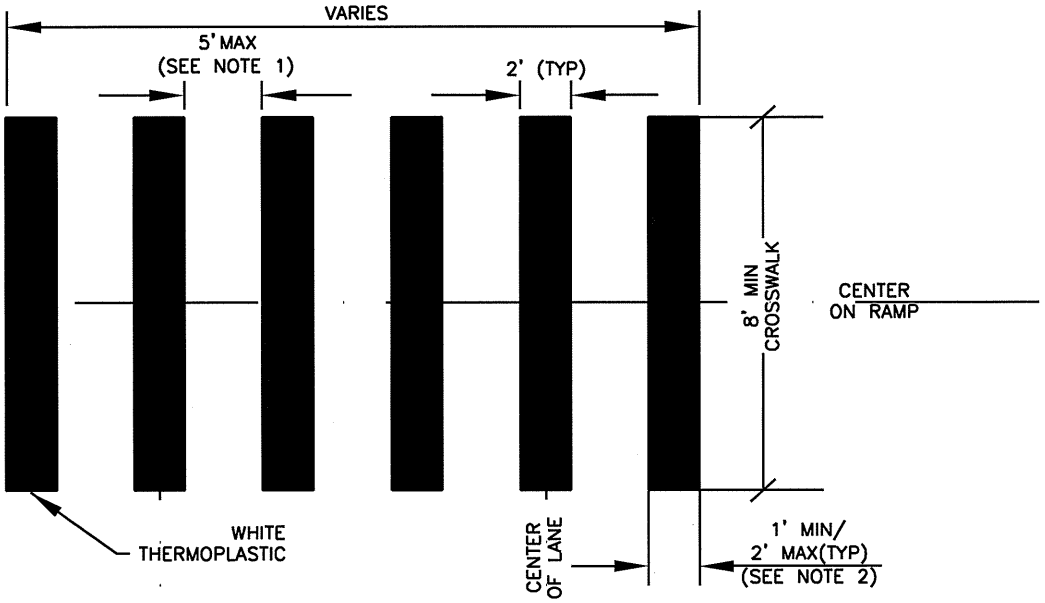
NOT TO SCALE

DETAIL NO. ST30

ST-MARKING.DWG



STOP BAR



LADDER STRIPE CROSSWALK

NOTES:

1. BARS TO BE SPACED TO AVOID WHEEL PATH BUT NO MORE THAN 5'.
2. APPLIES TO LAST BAR PRIOR TO CURB RAMP ONLY.
3. SEE STOP BAR & CROSSWALK PLACEMENT DETAIL TR-8.00 FOR PLACEMENT.

NOTES:
ALL MARKINGS WILL BE THERMOPLASTIC UNLESS OTHERWISE NOTED ON PLANS.

N.T.S.

STOP BAR & CROSSWALK MARKINGS

PLAN #

CITY OF BATTLE GROUND
APPROVED

6/11/08

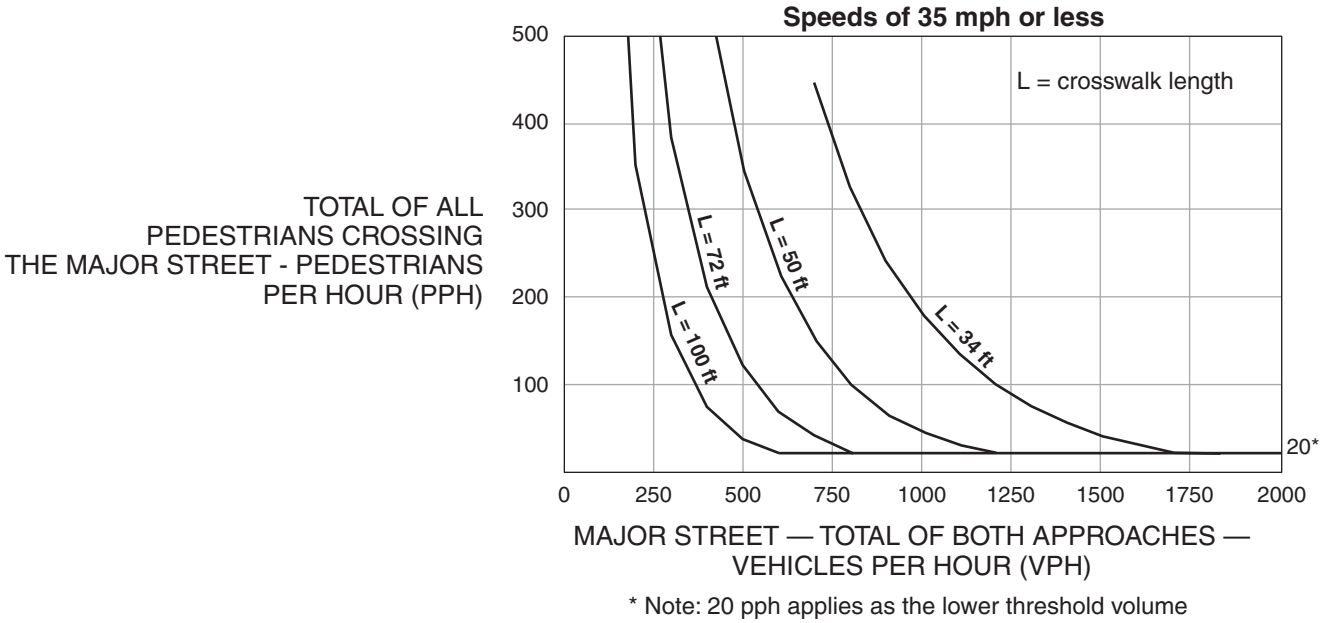
CITY ENGINEER DATE

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	3/31/08	JMH	MCH
2	6/11/08	JMH	MCH

TR-8.01

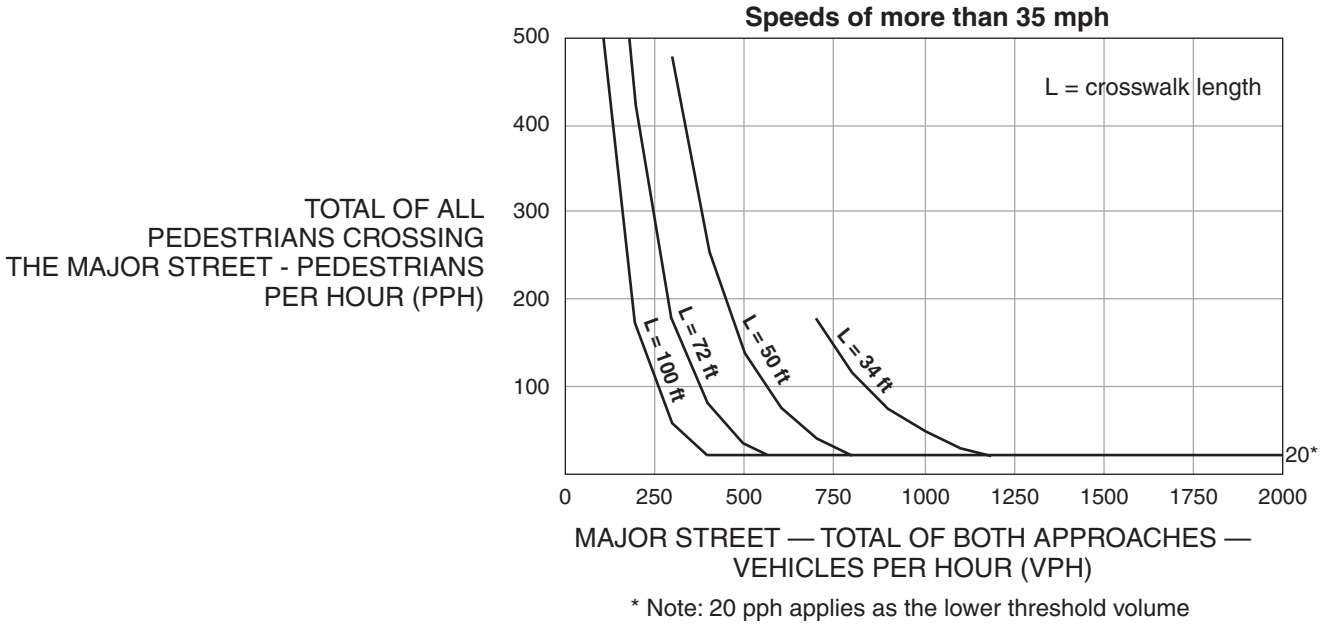
APPENDIX I:
PEDESTRIAN CROSSING ENHANCEMENT GUIDELINES

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

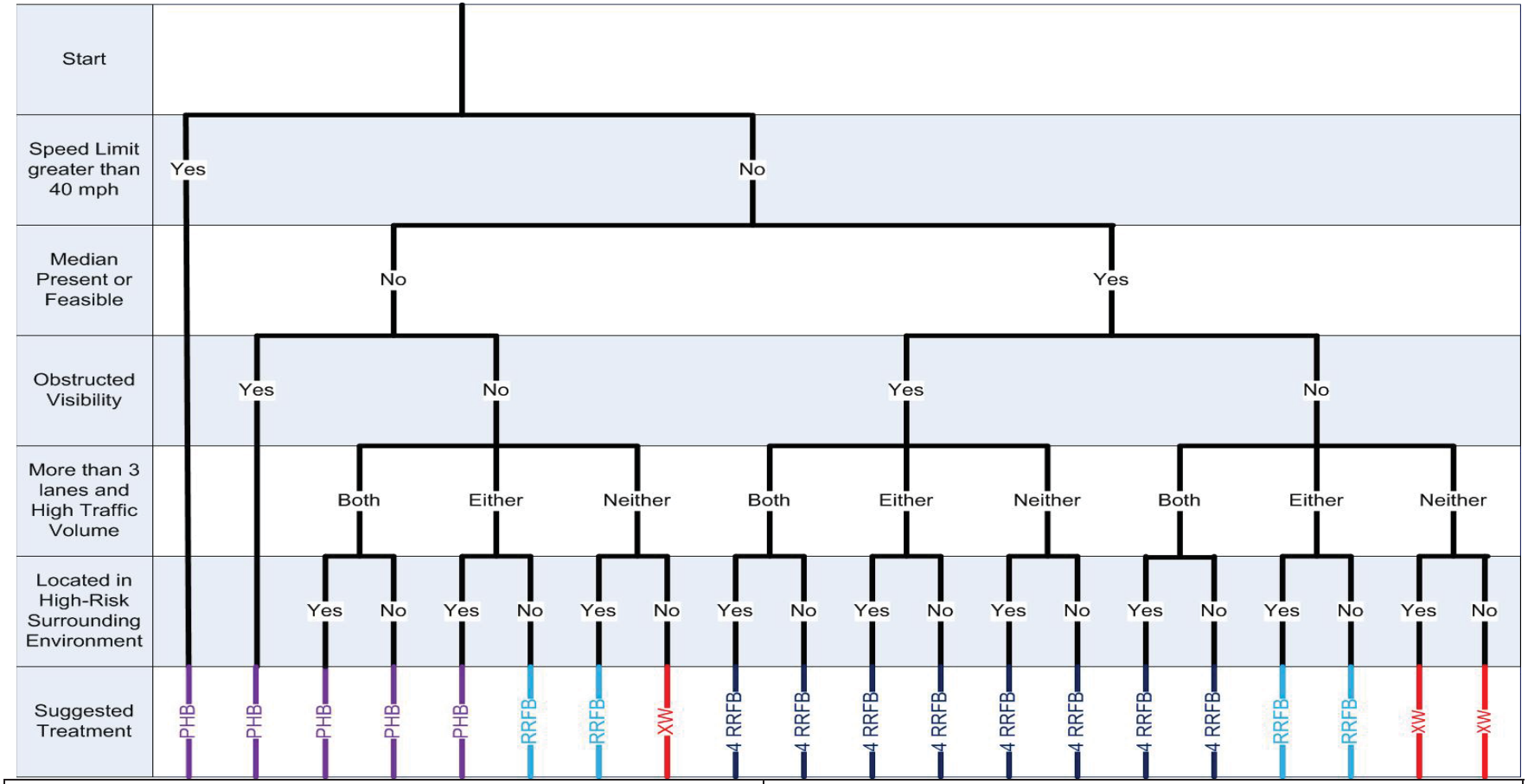


* Note: 20 pph applies as the lower threshold volume

Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



* Note: 20 pph applies as the lower threshold volume



High Risk Surrounding Environment (check those that apply) □ Near Side Transit Stop □ Visual Clutter □ Schools □ Senior/Recreation Center □ Shopping	PHB: Pedestrian Hybrid Beacon RRFB: Non-median installation of RRFB 4 RRFB: Median installation of RRFB XW: Crosswalk

Figure 7.2: Crosswalk treatment decision matrix

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

This spreadsheet combines Worksheet 1 and Worksheet 2 (Appendix A, pages 69-70) of TCRP Report 112/NCHRP Report 562 (*Improving Pedestrian Safety at Unsignalized Intersections*) into an electronic format. This spreadsheet should be used in conjunction with, and not independent of, Appendix A documentation.

This spreadsheet is still under development, please inform TTI if errors are identified.

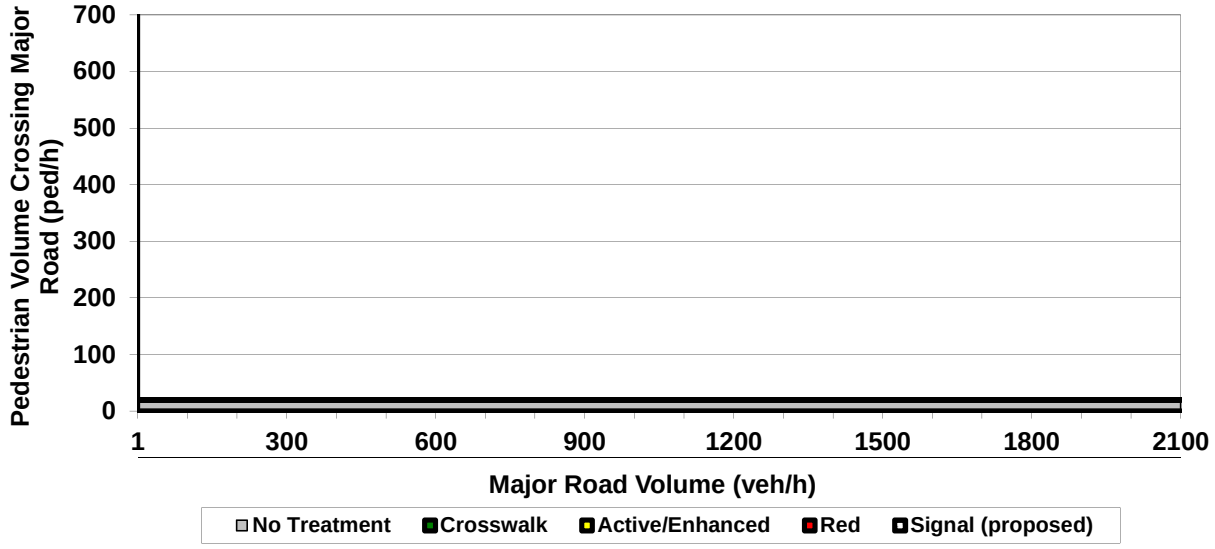
Key

- Blue fields contain descriptive information.
- Green fields are required and must be completed.
- Tan fields are adjustments that are filled out only under certain conditions (follow instructions to the left of the cell).
- Gray fields are automatically calculated and should not be edited.

Analyst and Site Information			
Analyst		Major Street	
Analysis Date		Minor Street or Location	
Data Collection Date		Peak Hour	

Step 1: Select worksheet:		
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)	*1a*	
Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***)	*1b*	
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?		
Peak-hour pedestrian volume (ped/h), V_p	*2a*	
Result:		
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?		
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$	*3a*	
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant	*3b*	
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant	*3c*	
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***)	*3d*	
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — % rate of reduction for *3c* (up to 50%)	*3e*	0%
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. — Reduced value or *3c*	*3f*	
Result:		
Step 4: Estimate pedestrian delay.		
Pedestrian crossing distance, curb to curb (ft), L	*4a*	
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)	*4b*	
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)	*4c*	
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c	*4d*	
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj\text{-}d}$	*4e*	
Major road flow rate (veh/s), v	*4f*	
Average pedestrian delay (s/person), d_p	*4g*	
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.	*4h*	
	4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.		
Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance***	*5a*	

Treatment Category:	**STEP 1 INCOMPLETE**



This worksheet provides general recommendations on pedestrian crossing treatments to consider at unsignalized intersections; in all cases, engineering judgment should be used in selecting a specific treatment for installation. This worksheet does not apply to school crossings. In addition to the results provided by this worksheet, users should consider whether a pedestrian treatment could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex geometrics, or nearby traffic signals.

APPENDIX J:
SCHOOL ZONE SAFETY RESOURCES

National Resources

The University of North Carolina Highway Safety Research Center (HSRC) maintains a clearinghouse of national-level information, highway safety data and tools, and national and international events. This can be found at http://www.hsrc.unc.edu/websites/index.cfm.

The National Center for Safe Routes to School contains information about the Safe Routes to School (SRTS) programs and strategies at a national level. It is on the internet at http://www.saferoutesinfo.org/. The site has information on how to start a Safe Routes to School program, how to apply for funding, events and training opportunities, and has data available regarding case studies, evaluation tools, and data collection forms.

Safe Routes to School Toolkit is available from the National Highway Traffic Safety Administration (NHTSA) on their website at: http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/index.html. It is a handbook for developing a Safe Routes to School program and is based on the successful model created in Marin County, California.

Walk to School, maintained by the University of North Carolina Highway Safety Research Center (HSRC) and the National Center for Safe Routes to School, provides information about walking and biking to school. It has details for the Bike to School Day and the Walk to School Day events held annually. The website located at http://www.walktoschool-usa.org/, includes information to make the event fun and get the community involved.

America Walks is a national nonprofit coalition of local advocacy groups dedicated to promoting walkable communities. The mission is to make America a great place for walking for everyone by sharing knowledge, advance policies and implementing effective campaigns to promote safe, convenient and accessible walking conditions. America Walks has developed a strategic plan to accomplish their goals. See http://www.americawalks.org/.

Pedestrian and Bicycle Information Center (PBIC) is a clearinghouse for information about pedestrian and bicycles within health, safety, engineering, education, enforcement and access and mobility areas. The PBIC is funded by the Federal Highway Administration and housed within the University of North Carolina Highway Safety Research Center (HSRC). PBIC serves planners, engineers, private citizens, advocates, educators, police enforcement and the health community. http://www.pedbikeinfo.org/.

Washington Resources

The Washington State Department of Transportation (WSDOT) Safe Routes to School located at http://www.wsdot.wa.gov/LocalPrograms/SafeRoutes/, includes information on the International Walk to School (IWALK) Month and the Safe Routes to School Program conducted through WSDOT.

Washington Bikes runs a statewide bicycle safety education program that teaches youth grades 4th to 8th bicycle safety in partnership with the Washington Department of Transportation and Safe Routes to School. The program focuses on bicycle training where students learn traffic rules and ride bicycles on the street. Their web site is http://wabikes.org/.

Safe Kids Washington is led by Washington State Department of Health. The coalition implements safety workshops and car-seat checkups. Their web site is http://www.safekids.org/coalition/safe-kids-washington.

The School Zone Safety Curriculum Kit & Resource Guide developed by the Washington Traffic Safety Commission can be found at http://www.seattle.gov/transportation/docs/srts/School-Zone-Safety-Kit.pdf. It contains safety patrol guidance, student application and permission, and school zone solutions and safety tips.

Local Agency Programs in Washington State

King County in partnership with Public Health for the county and Seattle as well as local communities provides walking maps in the county, which include options for walking routes.

Pierce County Sheriff's Department provides school resource officers for the schools in the county. The officers are uniformed deputies that perform law enforcement on school campuses.

Spokane County Engineer's Office provides School Zone Flashing Beacons at some school locations, due to the reduction in speed as compared to static signs.

City of Seattle provides a Pedestrian Master Plan, which focuses on safety, equity, vibrancy, and health. It includes a pedestrian toolbox that addresses common issues in the areas of design and engineering, education, enforcement, and planning.

Other Resources

The National Highway Traffic Safety Administration (NHTSA) sponsored the development of a pedestrian safety program to protect school bus riders in elementary grades (kindergarten through 6th grade). ***Walk-Ride-Walk: Getting to School Safely*** was developed by Dunlap and Associates. The safety behaviors included in the seven lessons are:

- The Danger zone - identifies areas by the school bus where the driver and child can't see each other.
- Walking Near and Evacuating the Bus - bus drill that reviews danger zones and emergency evacuation procedures.
- Crossing the Street - for young children, crossing the street mid-block with and without parked cars, and, for older children, procedures to follow at intersections and in parking lots.
- Walking to the Bus Stop - getting ready for school and walking to the bus stop.
- Arrival of the Bus - waiting at the bus stop, the meaning of the bus signal lights, and boarding the bus.
- Riding the Bus - safe bus riding procedures.
- Crossing to and from the Bus - crossing the street to the bus, leaving the bus, and crossing the street from the bus. To order program materials, contact the National Safety Council, 1-800-621-7619.

National Safety Town Center

Provides a comprehensive preschool-early childhood safety education program - **SAFETY TOWN** - that teaches children through real life situations as presented in a layout of a miniature town. The program started in 1964 and was founded by a policeman in Ohio. The website is http://nationalsafetytown.com/.