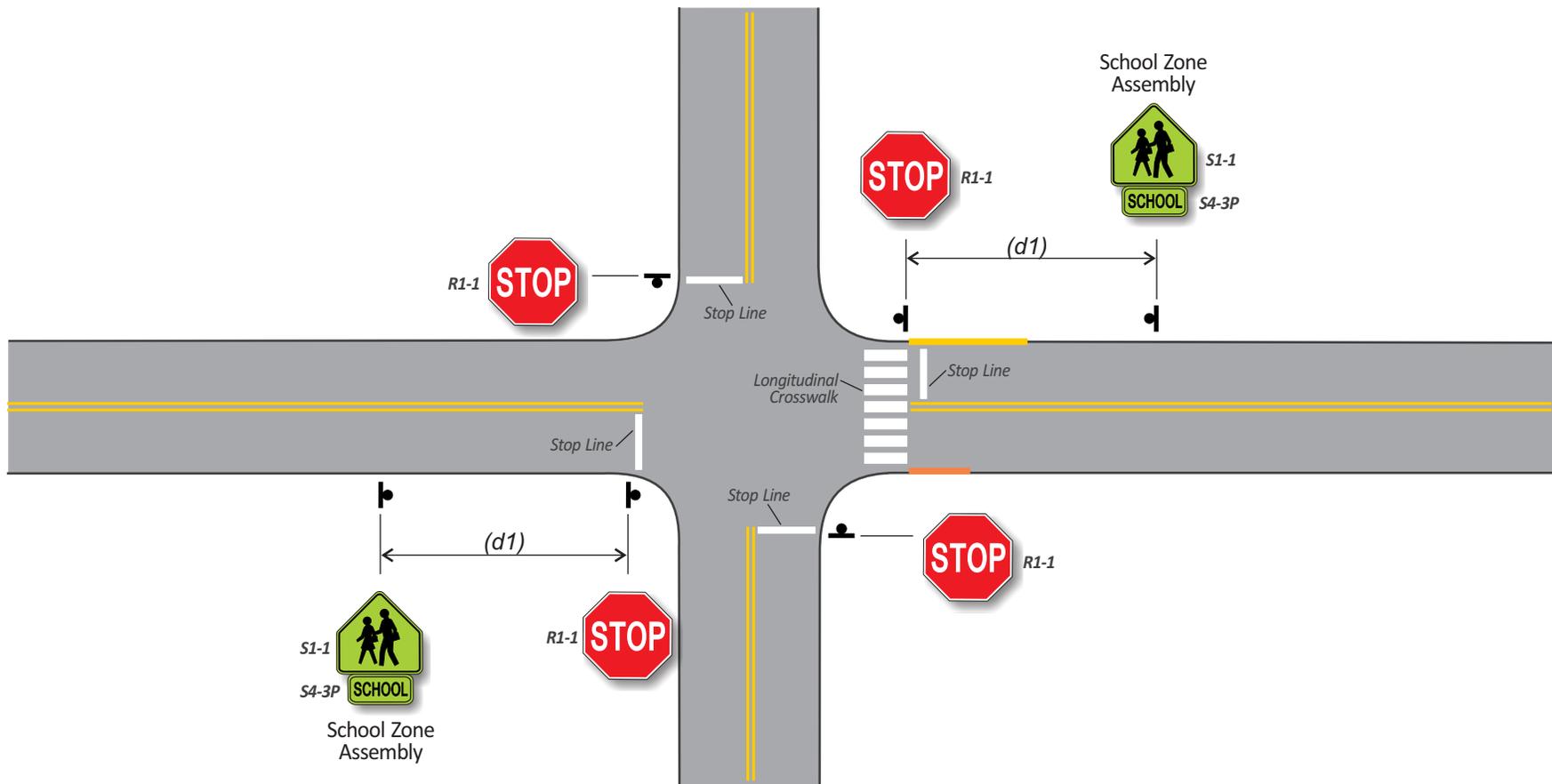


APPENDIX A:
SCHOOL AREA LAYOUTS

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

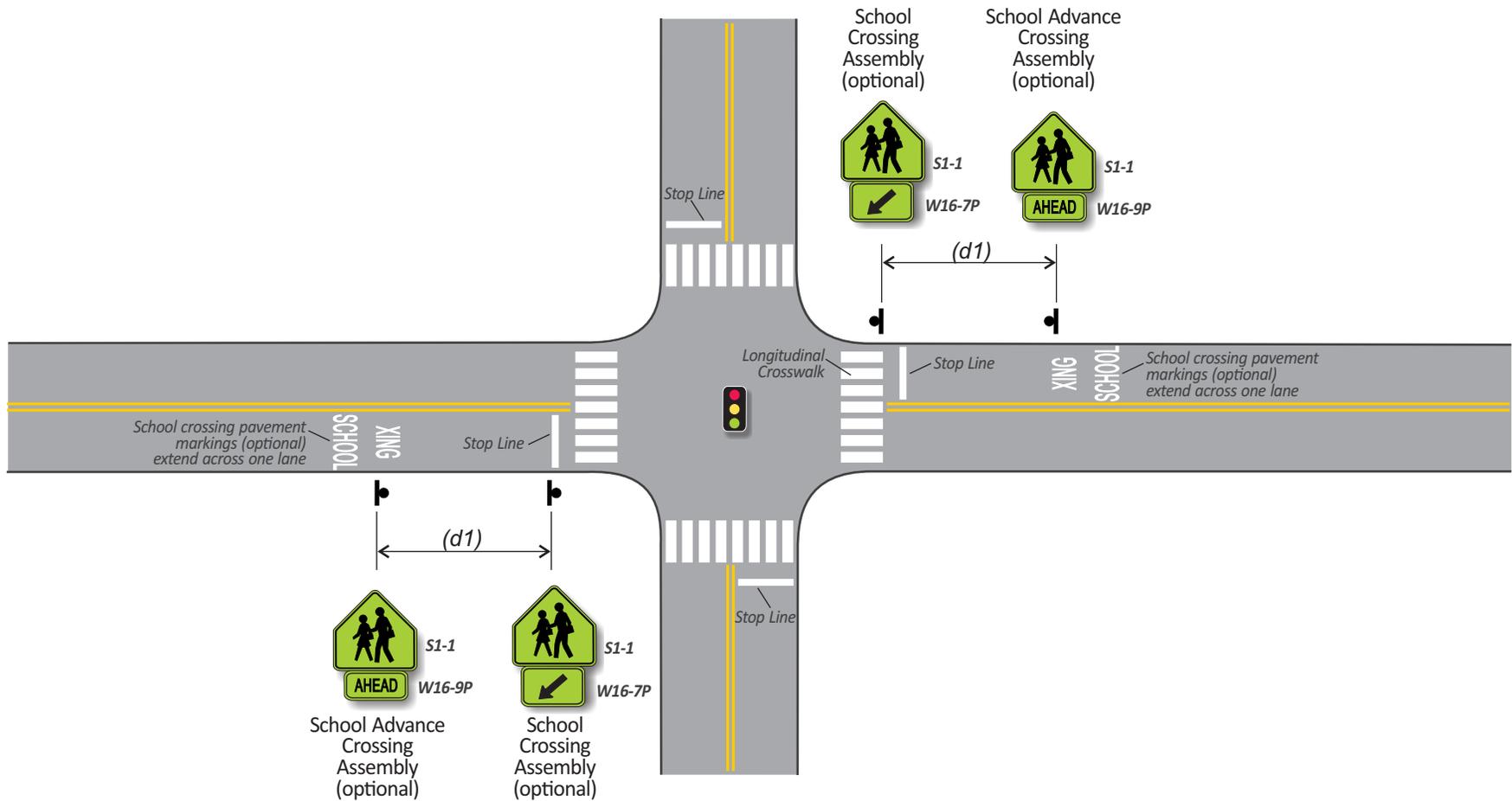
Posted or 85th Percentile Speed (mph)	25-40	45	50
Distance (d1) - Between Stop Sign and School Zone Assembly (ft)	150*	175	250

*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

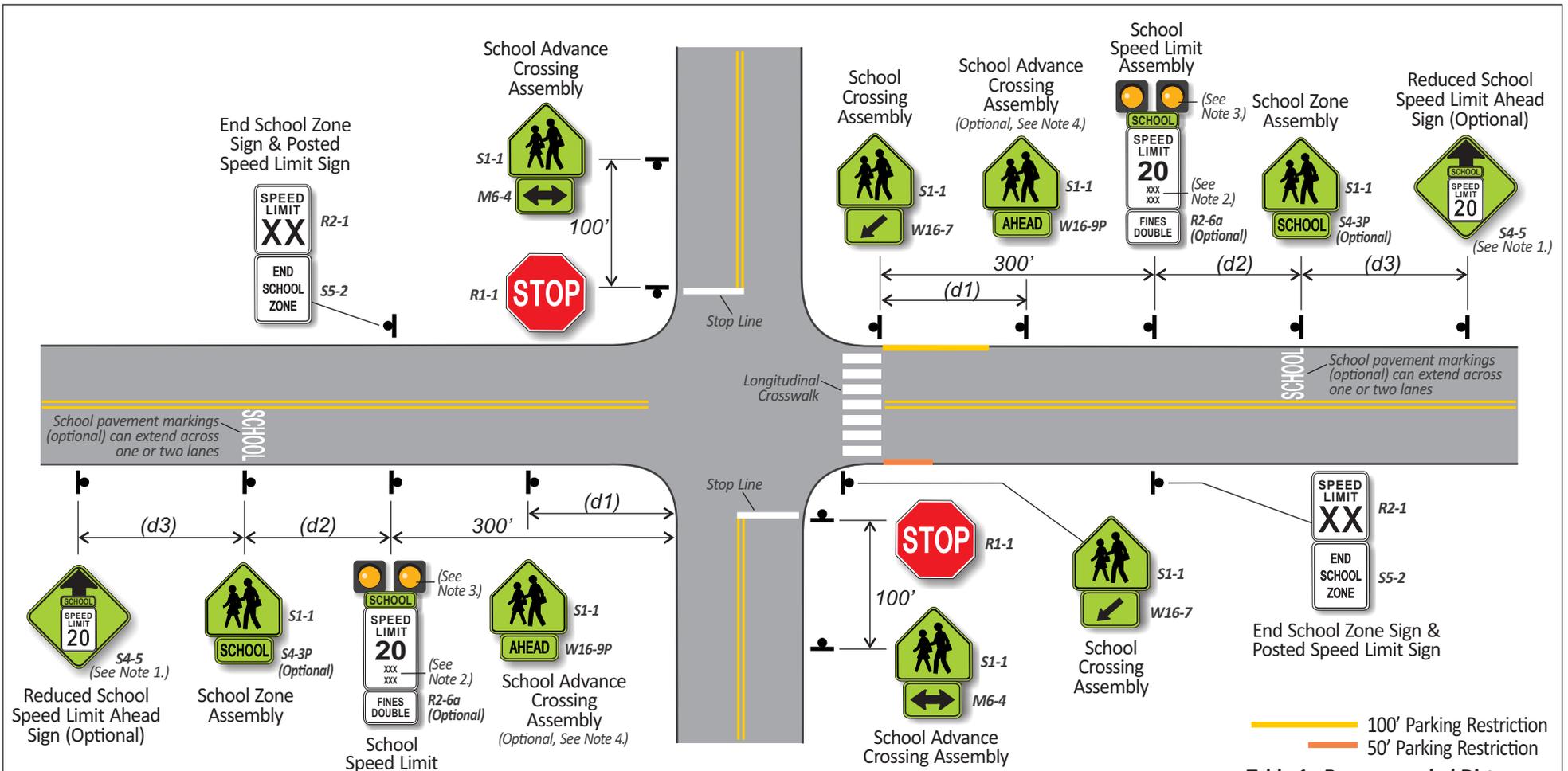


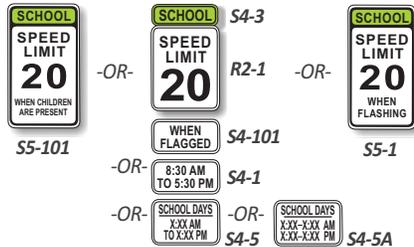
Table 1. Recommended Distances

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.

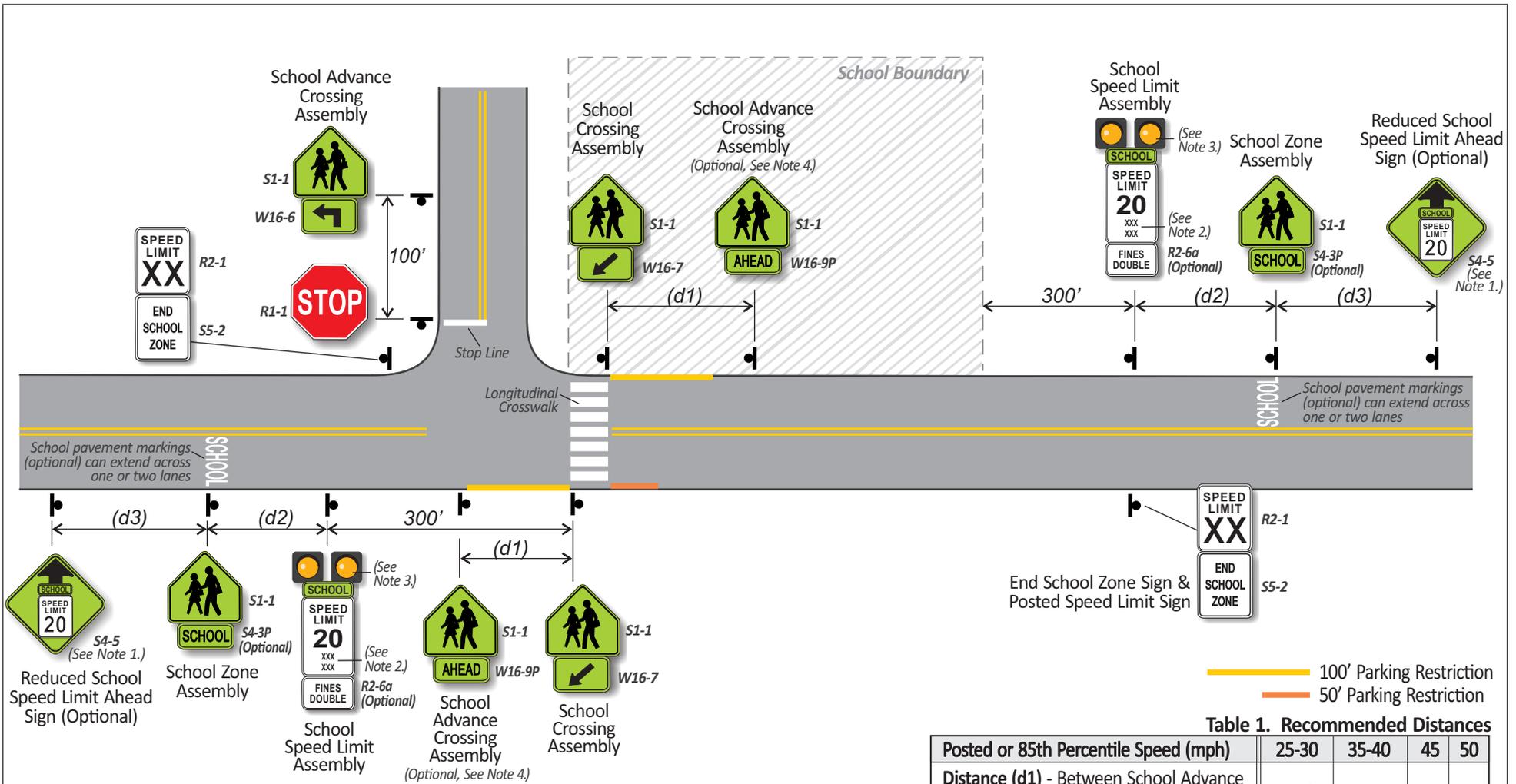


- 3.) Only use flashing beacons with WHEN FLASHING enforcement legend.
- 4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B1 -- School Crossing In Reduced School Speed Zone

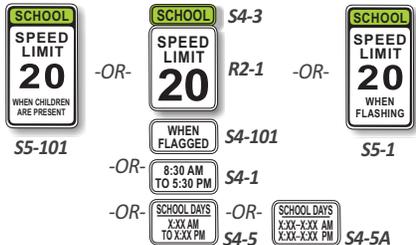
Clark County School Zone Signing & Pavement Marking Policy





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

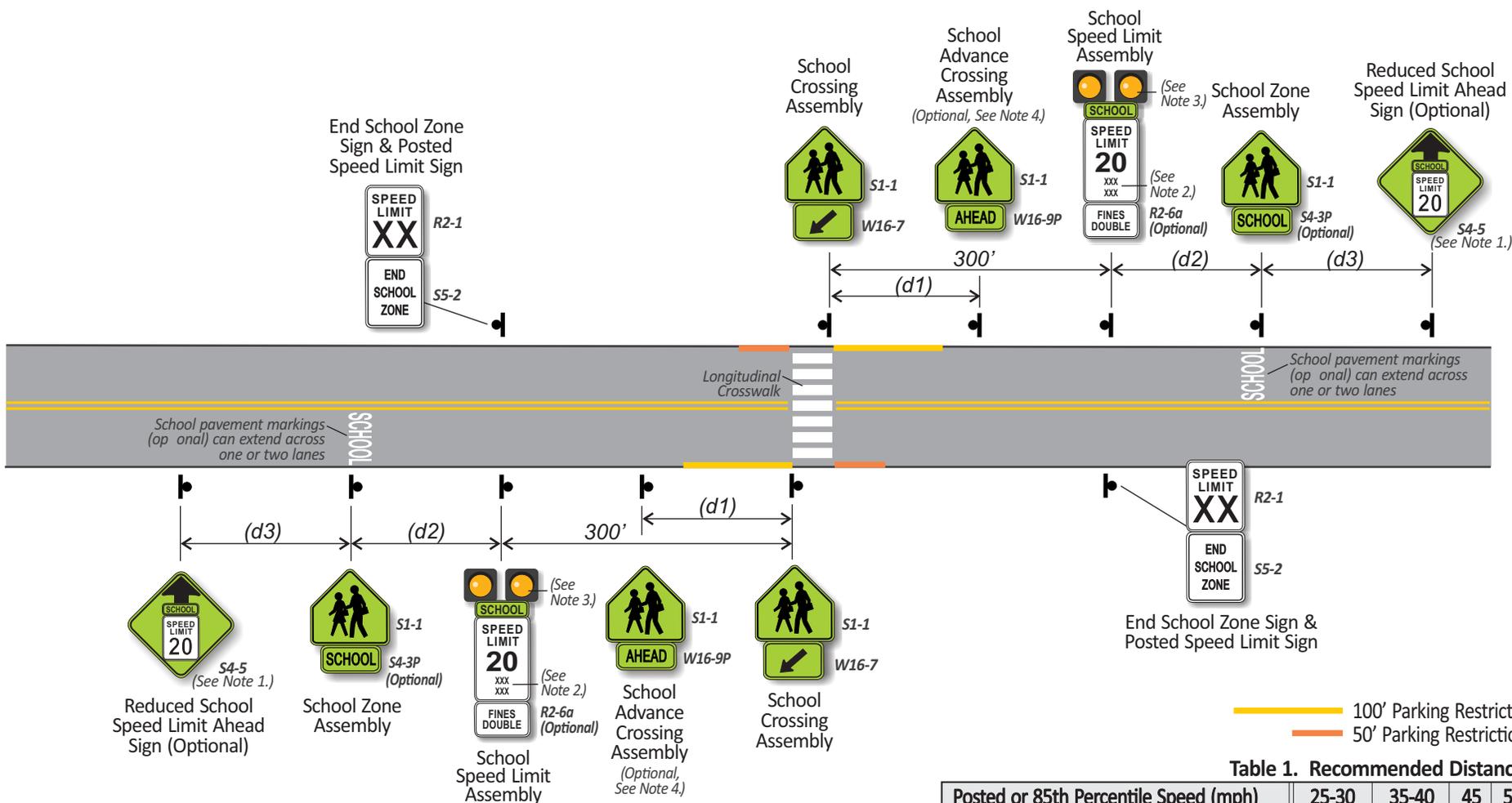
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between 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 B2 -- School Crossing Adjacent To School In Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy





100' Parking Restriction
50' Parking Restriction

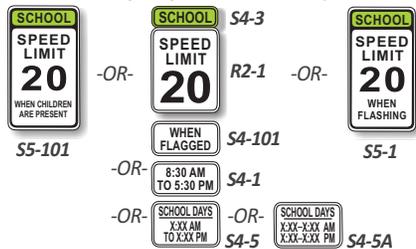
Table 1. Recommended Distances

Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School 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.

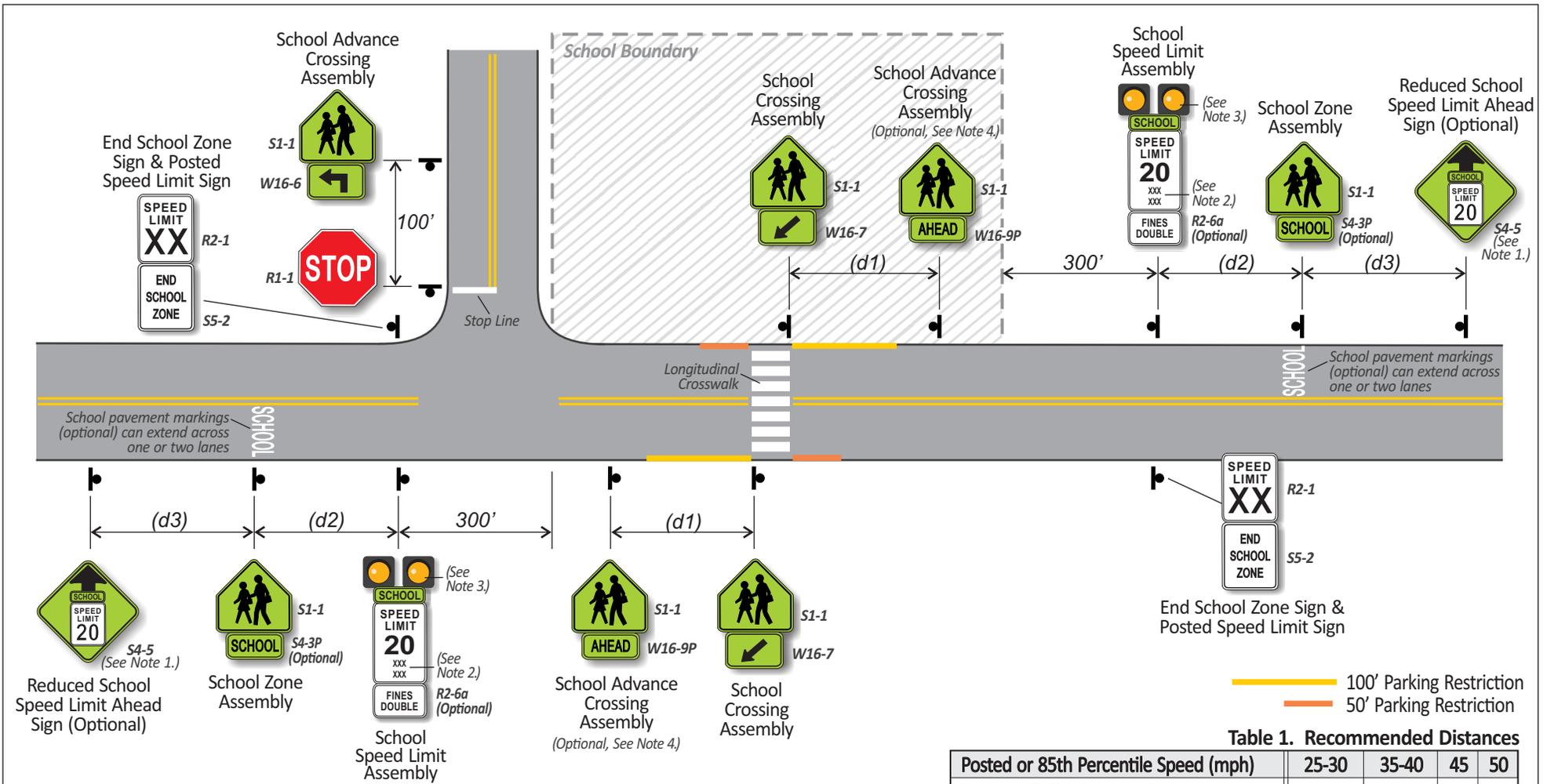


- 3.) Only use flashing beacons with WHEN FLASHING enforcement legend.
- 4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

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

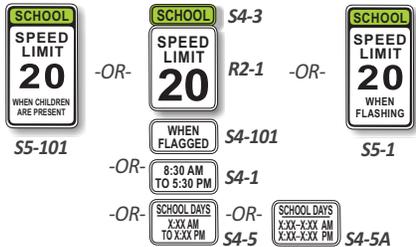
Clark County School Zone
Signing & Pavement Marking Policy





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

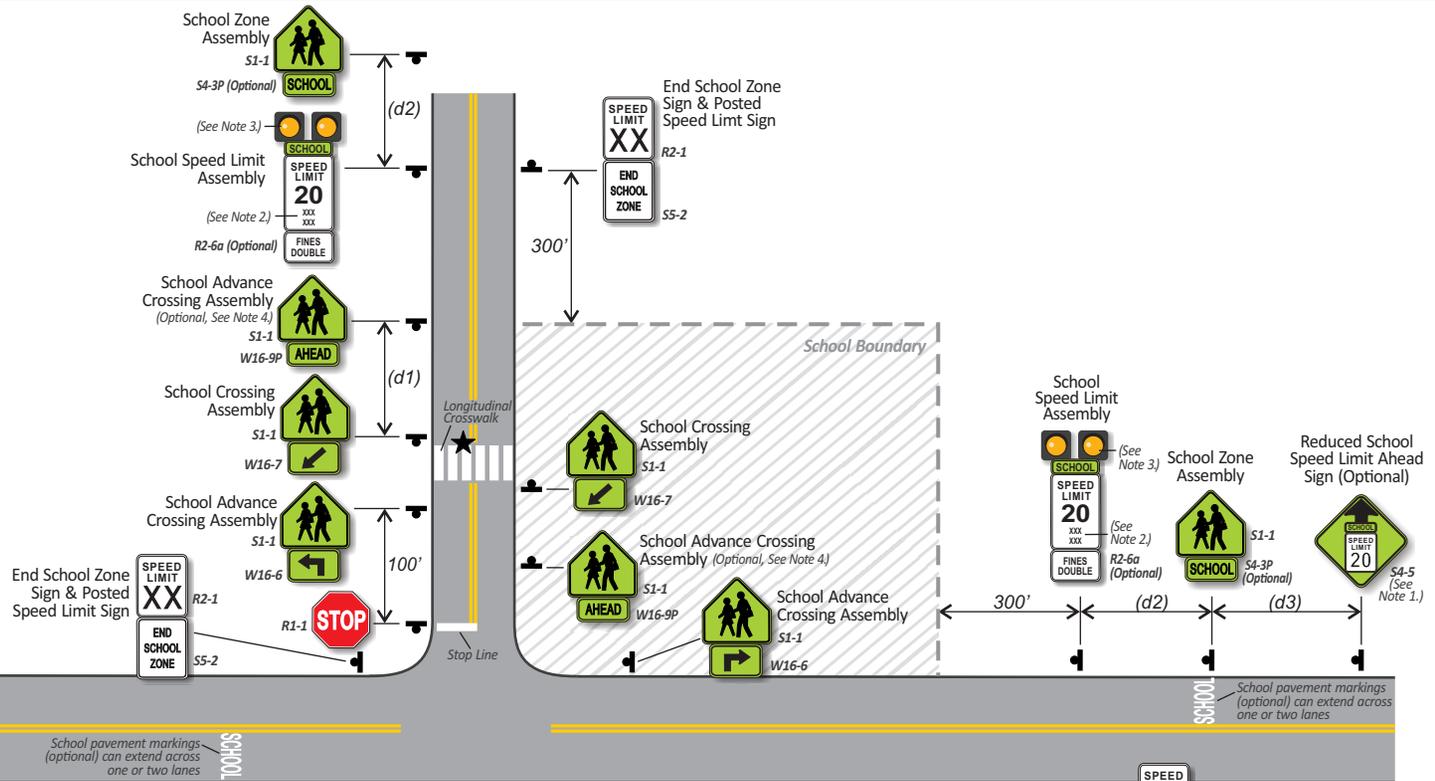
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between 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 B4 -- Midblock School Crossing Adjacent to School in Reduced School Speed Zone

Clark County School Zone Signing & Pavement Marking Policy

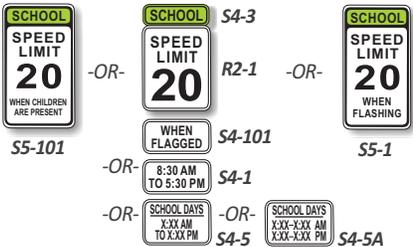




★ Crosswalk must be within school boundary or less than or equal to 600 feet from crosswalk to school boundary on side street.

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

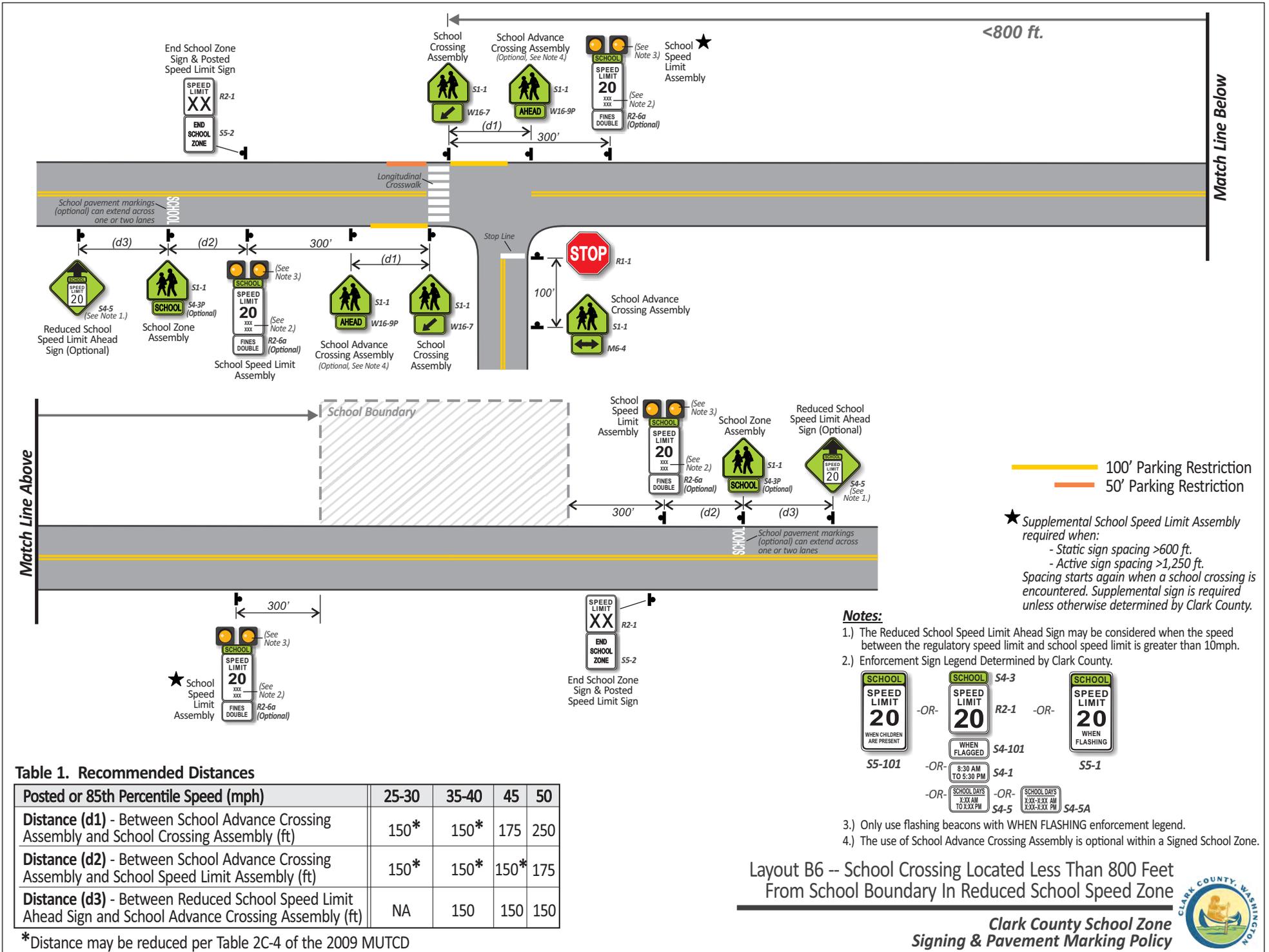
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between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





<800 ft.

Match Line Below

Match Line Above

— 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.

S5-101

R2-1

S4-5

S4-101

S4-1

S4-5

S4-1

S4-5
- 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

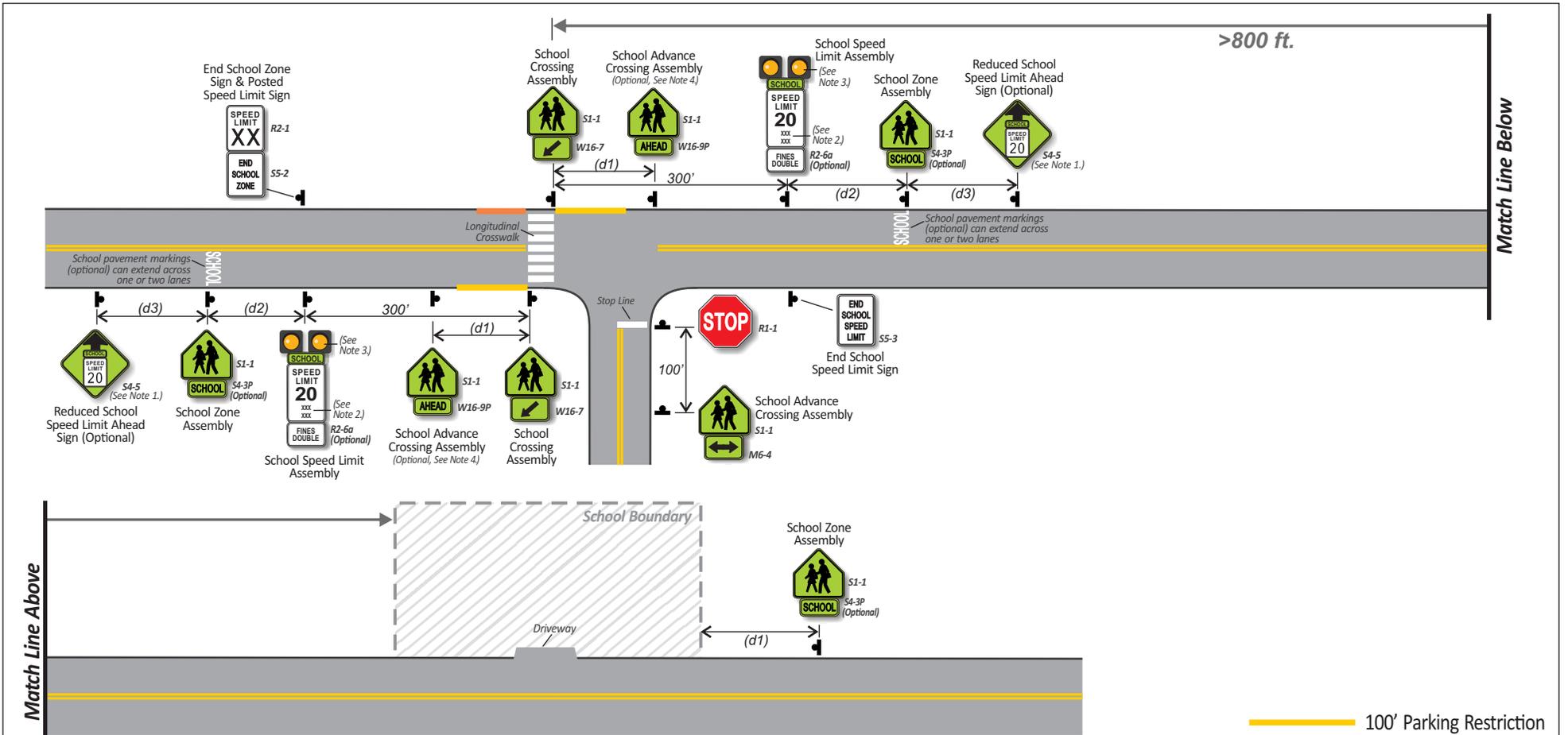
Posted or 85th Percentile Speed (mph)	25-30	35-40	45	50
Distance (d1) - Between School Advance Crossing Assembly and School Crossing Assembly (ft)	150*	150*	175	250
Distance (d2) - Between School Advance Crossing Assembly and School Speed Limit Assembly (ft)	150*	150*	150*	175
Distance (d3) - Between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





Match Line Above

Match Line Below

>800 ft.



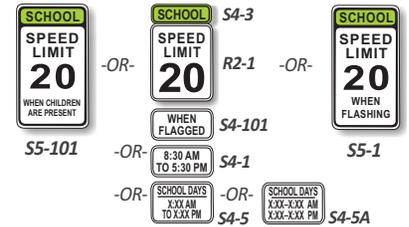
Table 1. Recommended Distances

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.

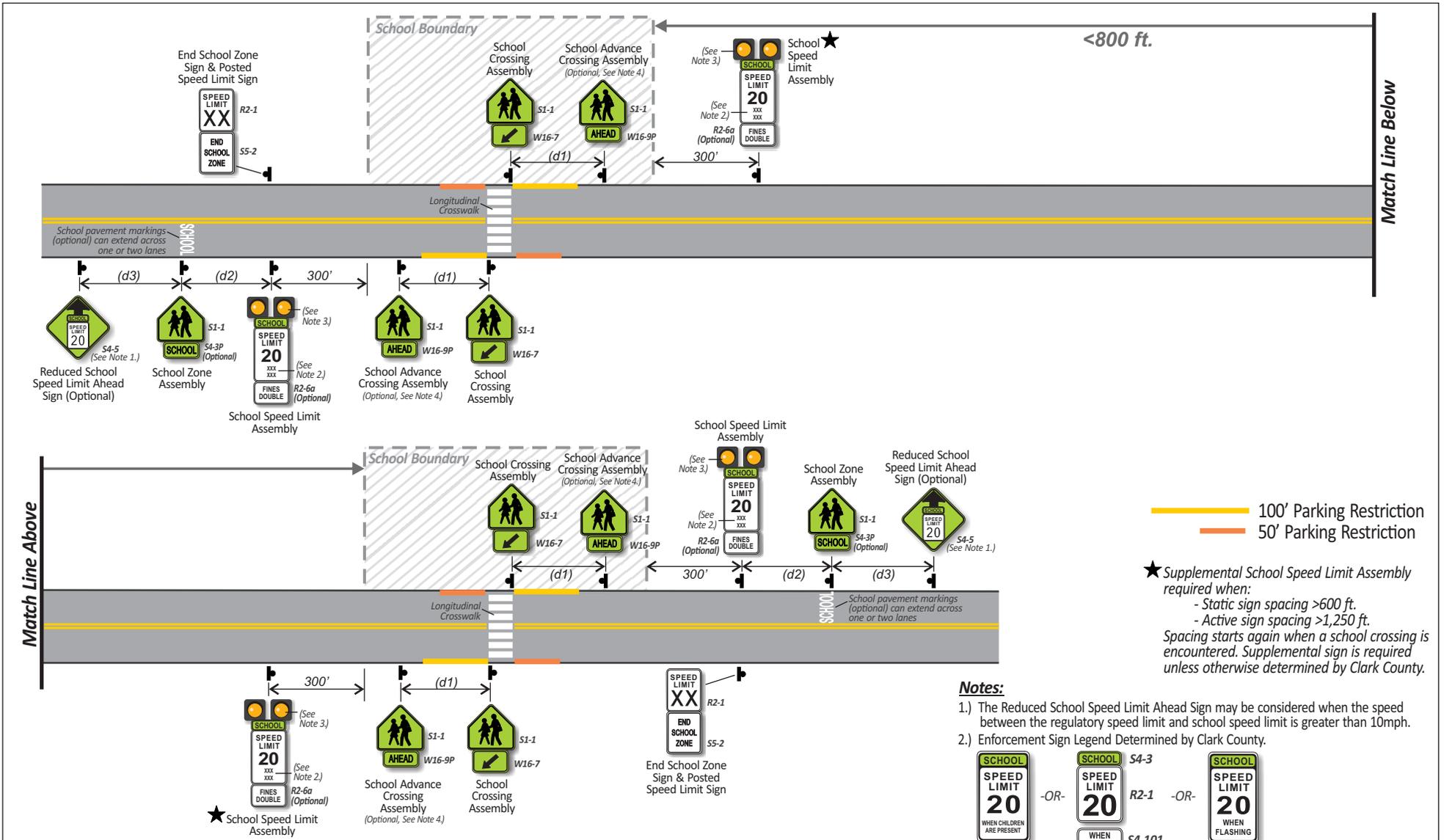


- 3.) Only use flashing beacons with WHEN FLASHING enforcement legend.
- 4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

Layout B7 -- School Crossing Located Greater 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

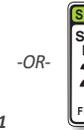
★ Supplemental School Speed Limit Assembly required when:
 - Static sign spacing >600 ft.
 - Active sign spacing >1,250 ft.
 Spacing starts again when a school crossing is encountered. Supplemental sign is required unless otherwise determined by Clark County.

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.


 S5-101


 S4-3


 S4-101


 S5-1


 S4-1


 S4-5


 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.

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

Clark County School Zone Signing & Pavement Marking Policy



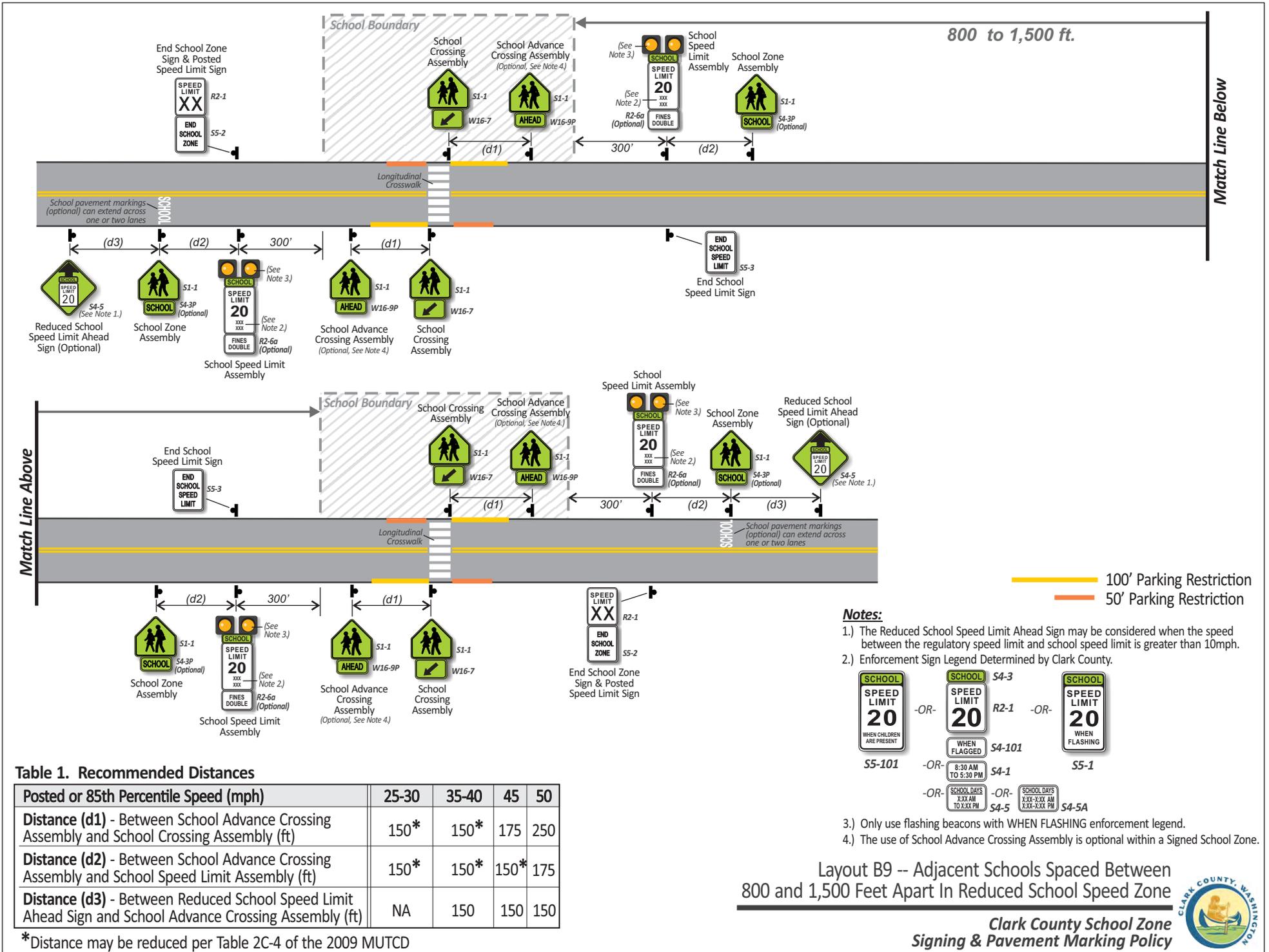


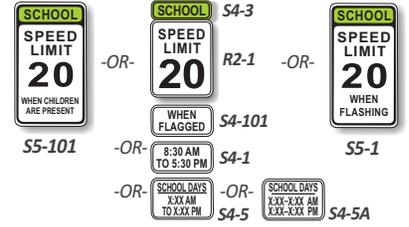
Table 1. Recommended Distances

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.

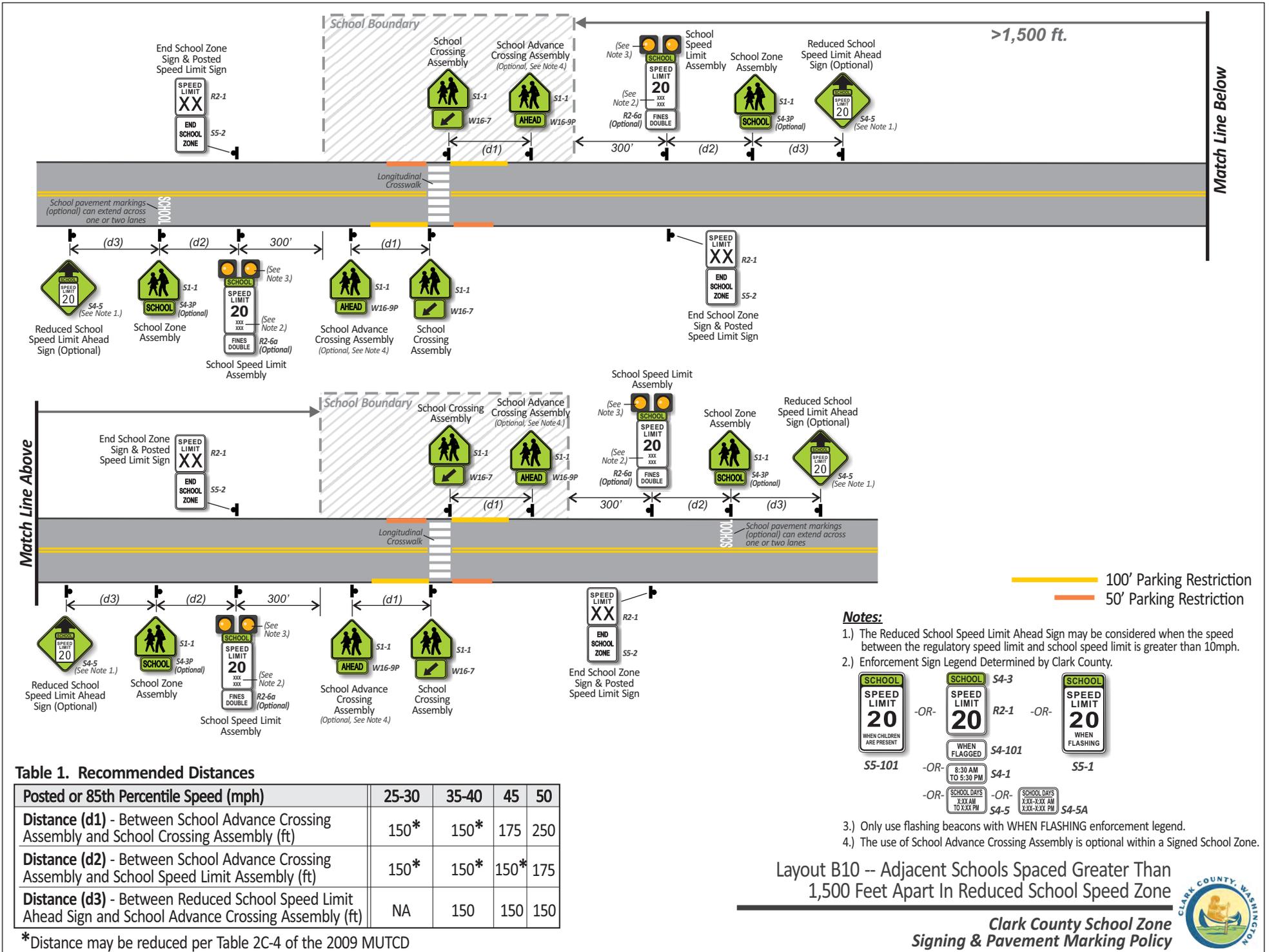


- 3.) Only use flashing beacons with WHEN FLASHING enforcement legend.
- 4.) The use of School Advance Crossing Assembly is optional within a Signed School Zone.

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

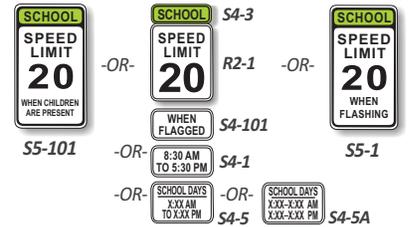
Clark County School Zone Signing & Pavement Marking Policy





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.

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



APPENDIX C:
SUPPORTING MEMORANDUMS



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

MEMORANDUM

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 ≤ 25 mph, type of school zone signage did not make a significant difference. For posted speeds ≥ 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

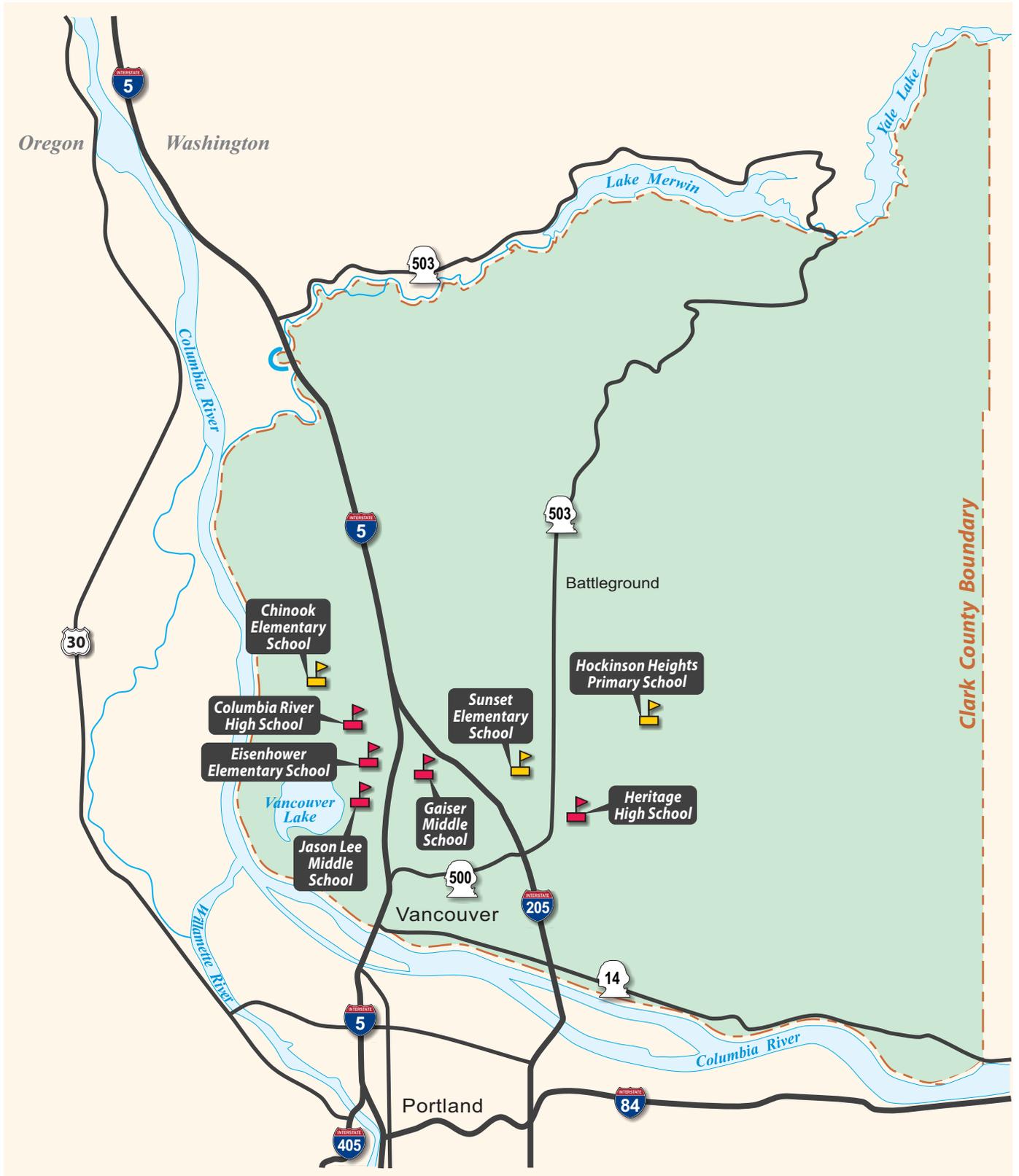
³ Speeds in School Zones, Texas Transportation Institute, 2009

- 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 session⁴. 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

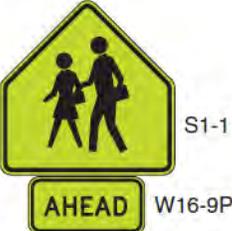
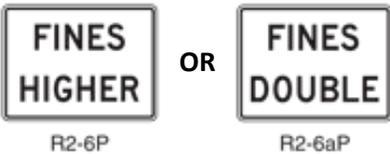
Typically, the flasher is set to turn on thirty to forty minutes before school begins in the morning and will remain on until five minutes after school has started. In the afternoon, the flasher typically starts five minutes before school ends and remains on for thirty to forty minutes after school has 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 Code⁵. 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	 <p>S1-1 W16-9P</p>	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	 <p>S4-3P R2-1 S4-4P OR S4-2P</p>	300 feet from school boundary or crosswalk on both approaches
Higher Fines/Fines Double	 <p>R2-6P OR R2-6aP</p>	Located below school speed limit assembly
School Crossing Assembly	 <p>S1-1 W16-7P</p>	At school crosswalk on both approaches
End School Zone	 <p>S5-2</p>	300 feet from school boundary or crosswalk on both approaches opposite school speed assembly
Posted Speed Limit	 <p>R2-1</p>	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

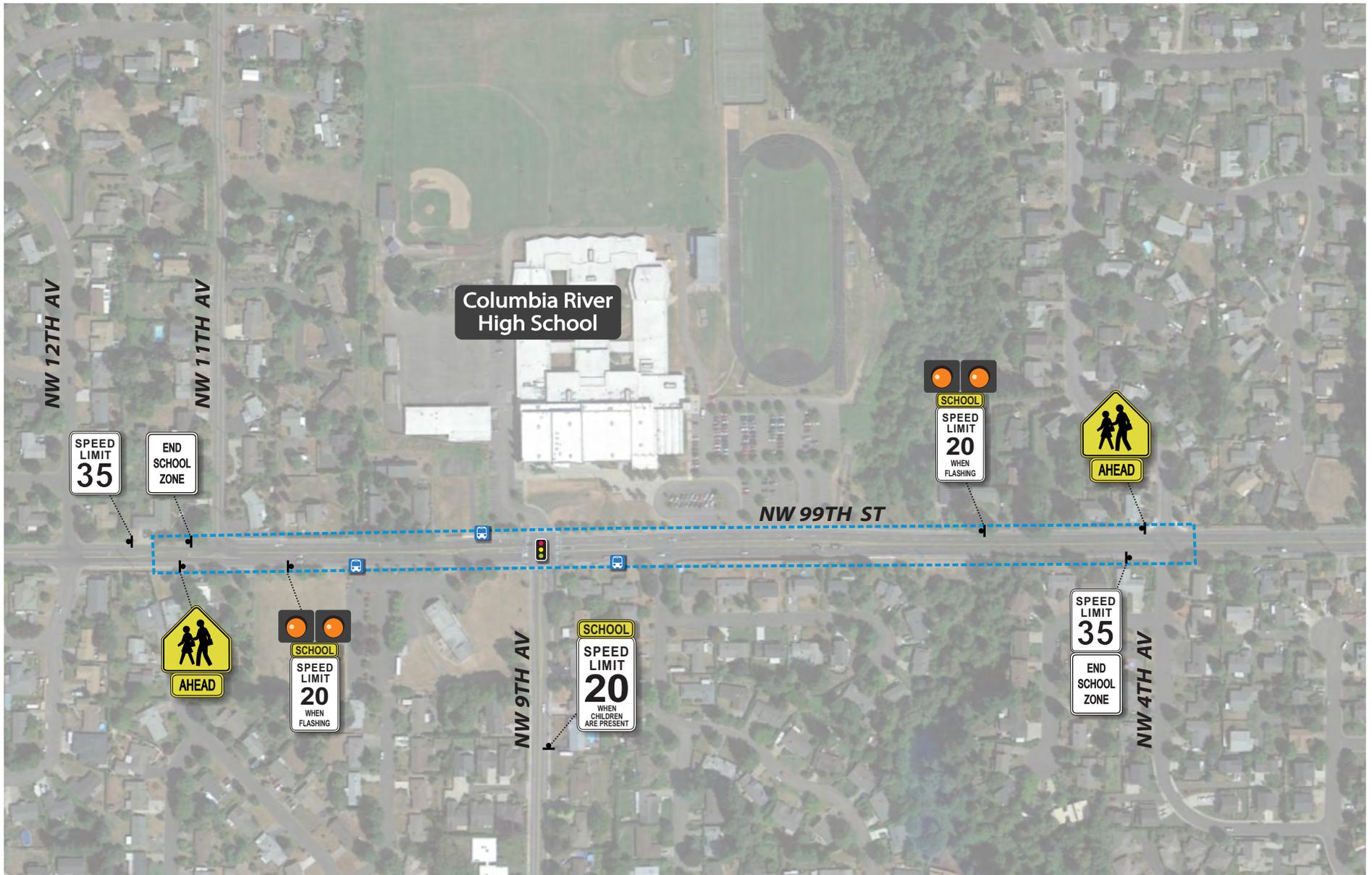
- School Zone Study Area
(Figure only depicts study elements within defined study area.)
- Sign Post Location
- Designated School Crosswalk
- Stop Sign

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

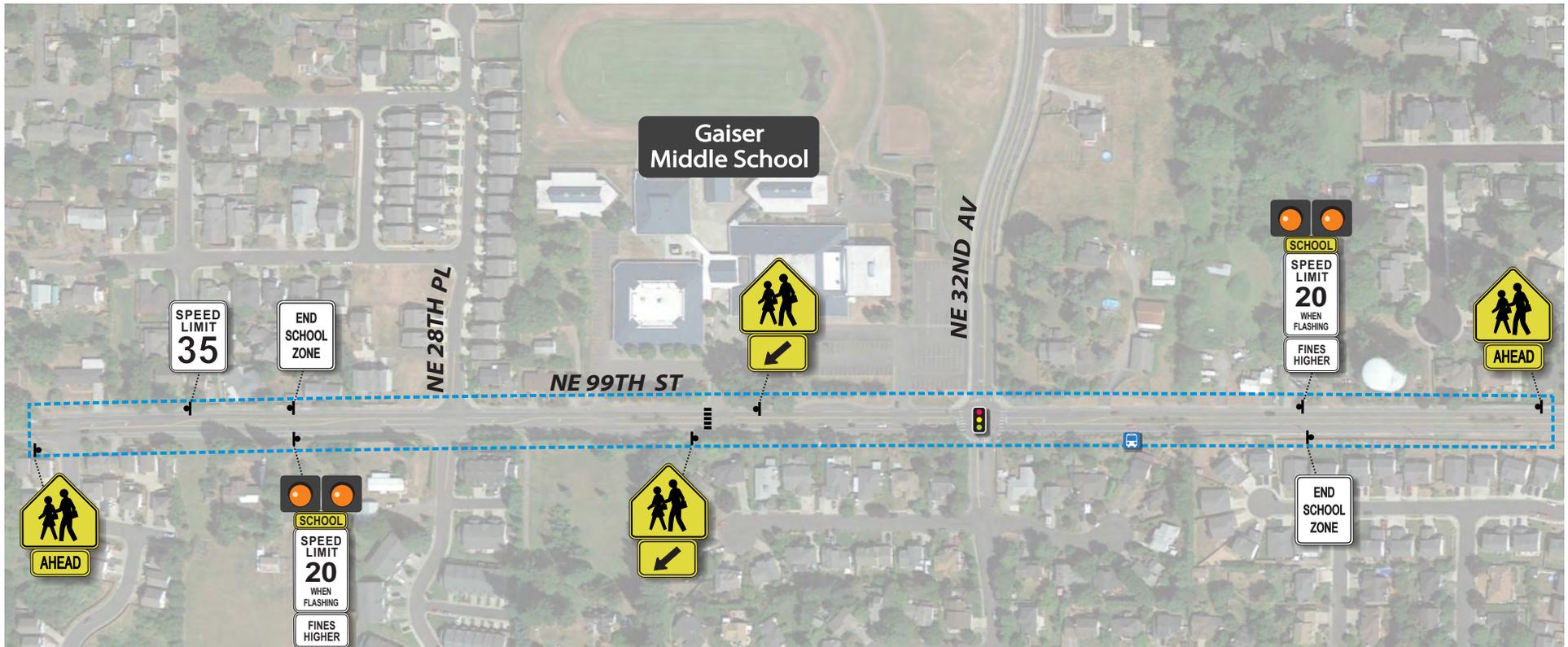
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No Scale

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

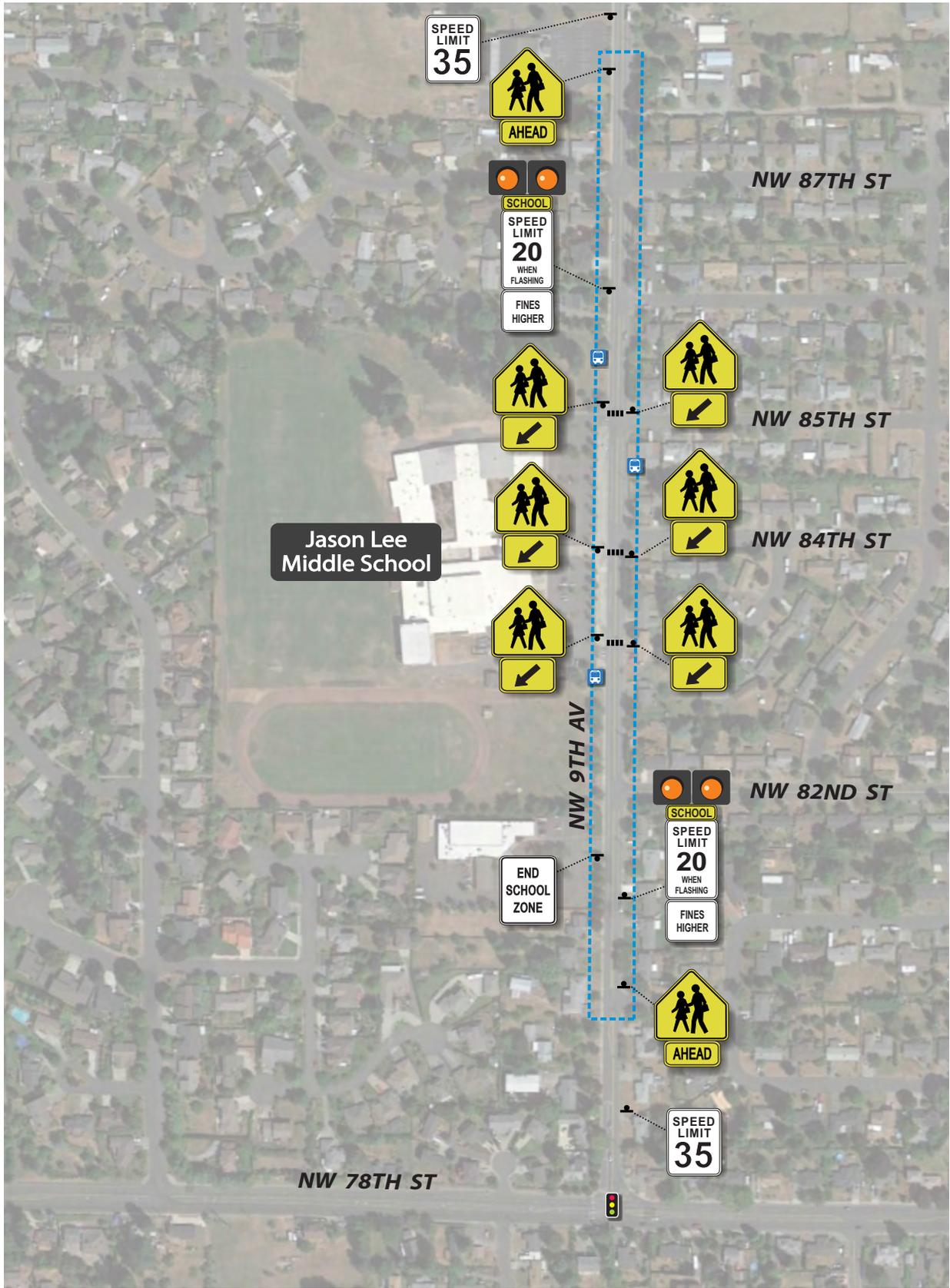
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No Scale

Figure 7

**Gaiser Middle School
SITE AREA
(Active Flashers)**



LEGEND

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



Figure 8

**Jason Lee Middle School
SITE AREA
(Active Flashers)**



LEGEND

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

DKS



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 inconsistencies 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 law⁶.

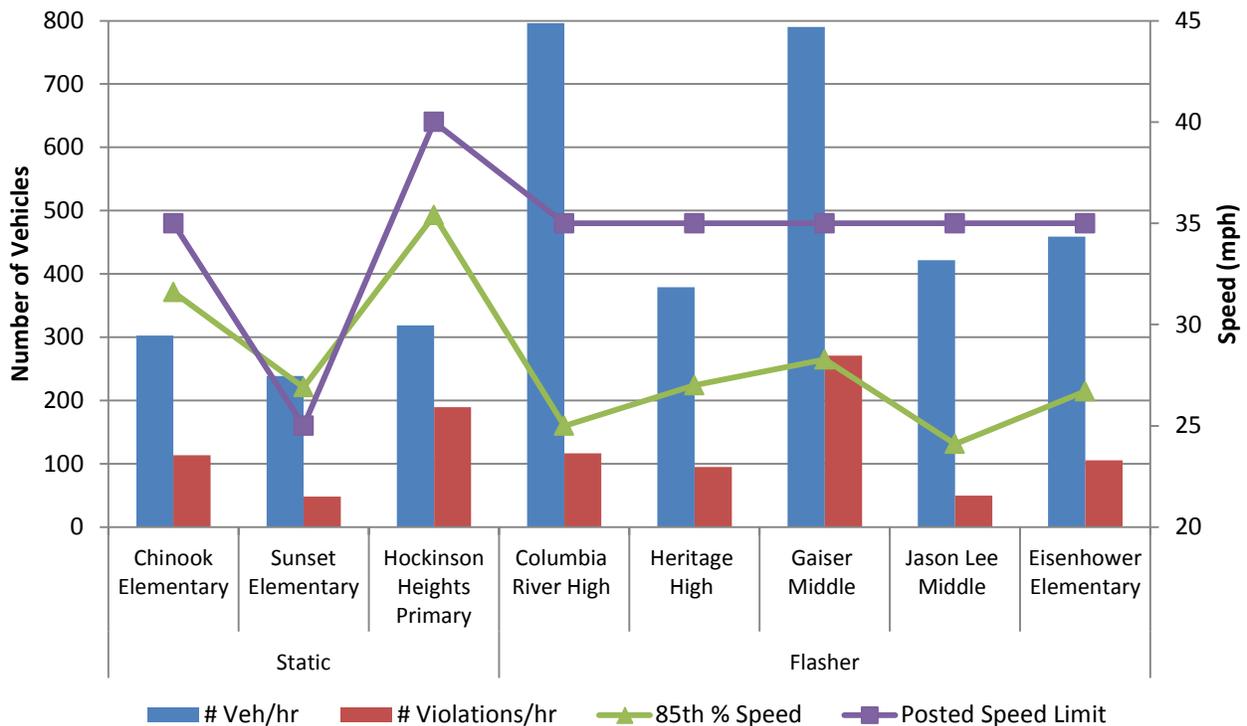


Figure 10. Morning School Zone Study Site Vehicles and Speeds

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

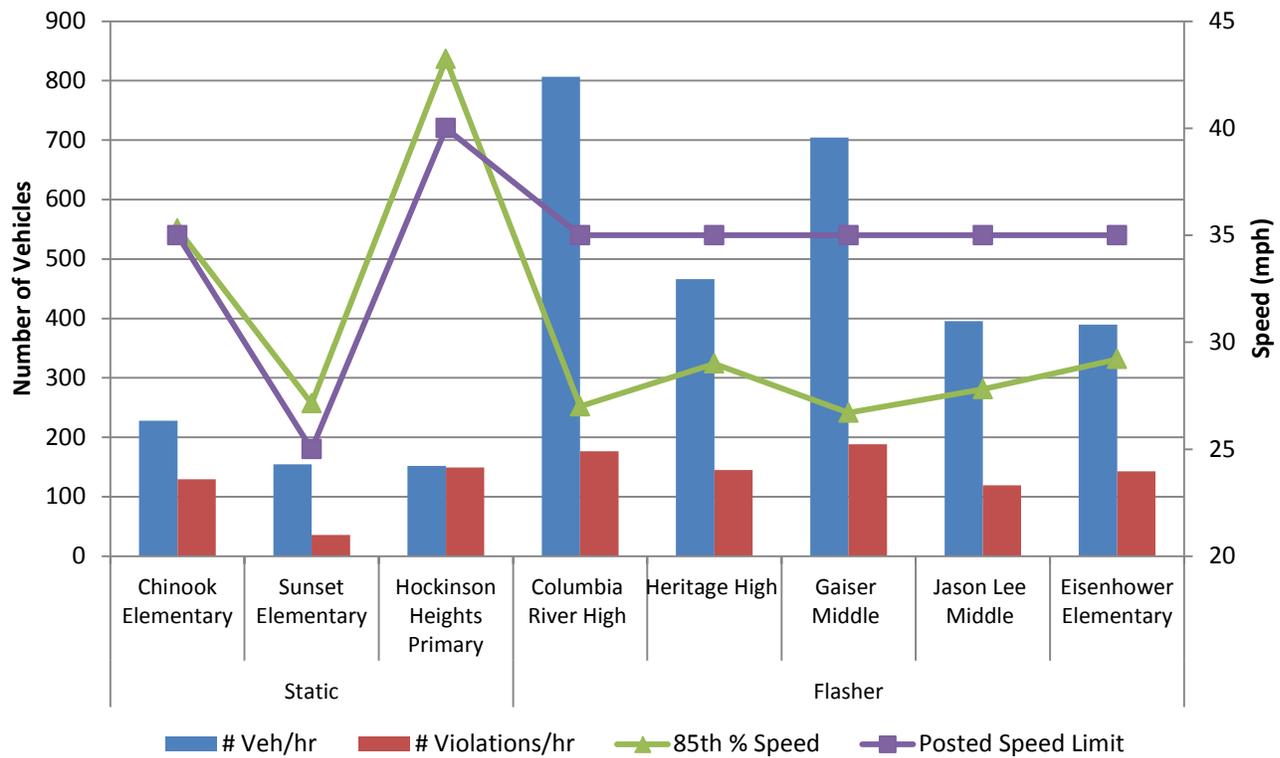


Figure 11. Afternoon School Zone Study Site Vehicles and Speeds

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)	85 th Percentile Speed (mph)	% Violations	Average Speed (mph)	85 th Percentile Speed (mph)
<i>All Study Sites</i>						
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
<i>Only Elementary School Sites</i>						
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 safely⁷. 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 zones⁸. 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 school⁹ 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 enforcement¹⁰.

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:

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

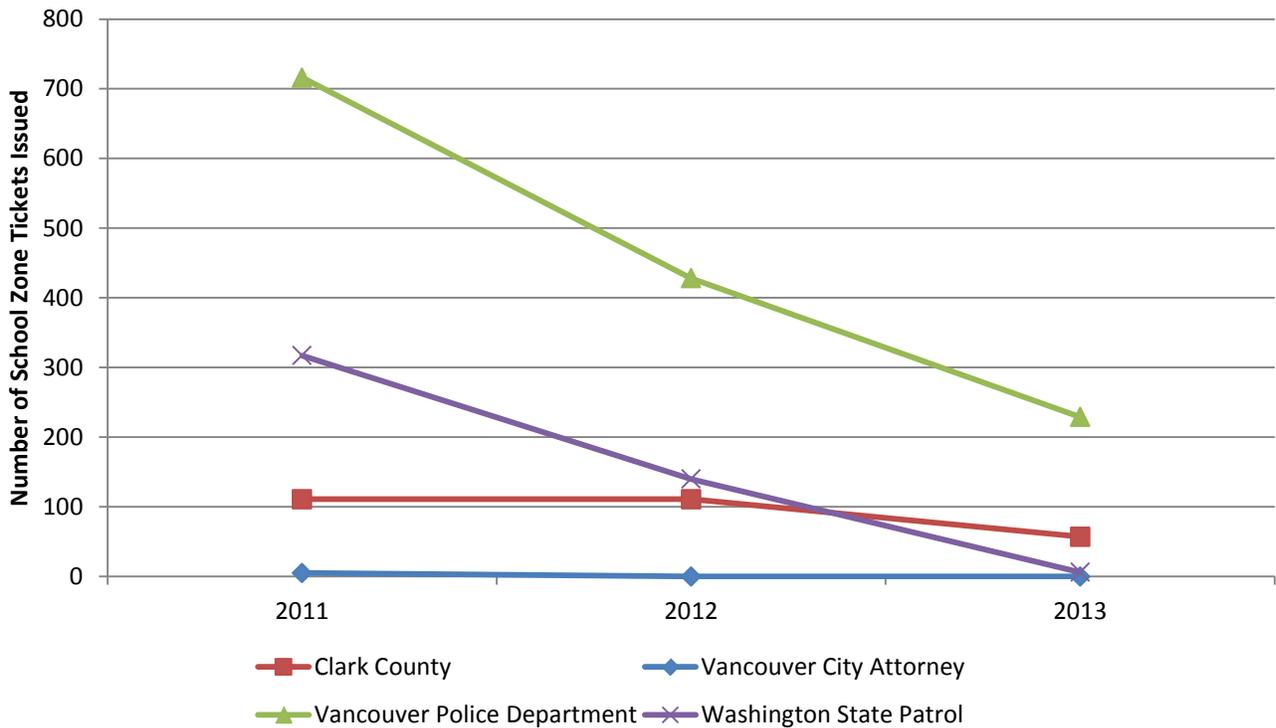


Figure 12. School Zone Ticket Trend Summary

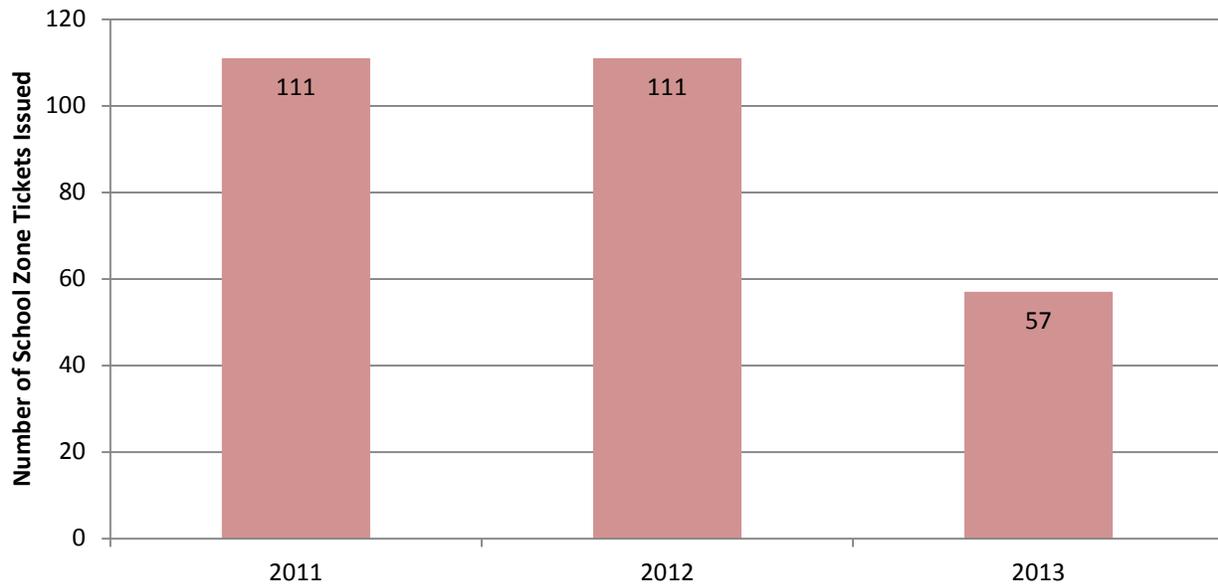


Figure 13. Clark County School Zone Ticket Trend

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 unaware 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.



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MEMORANDUM

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.

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.



MUTCD S1-1

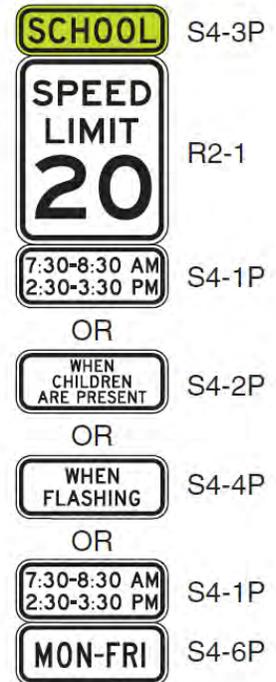


Figure 1. School Speed Limit Assembly



- 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.

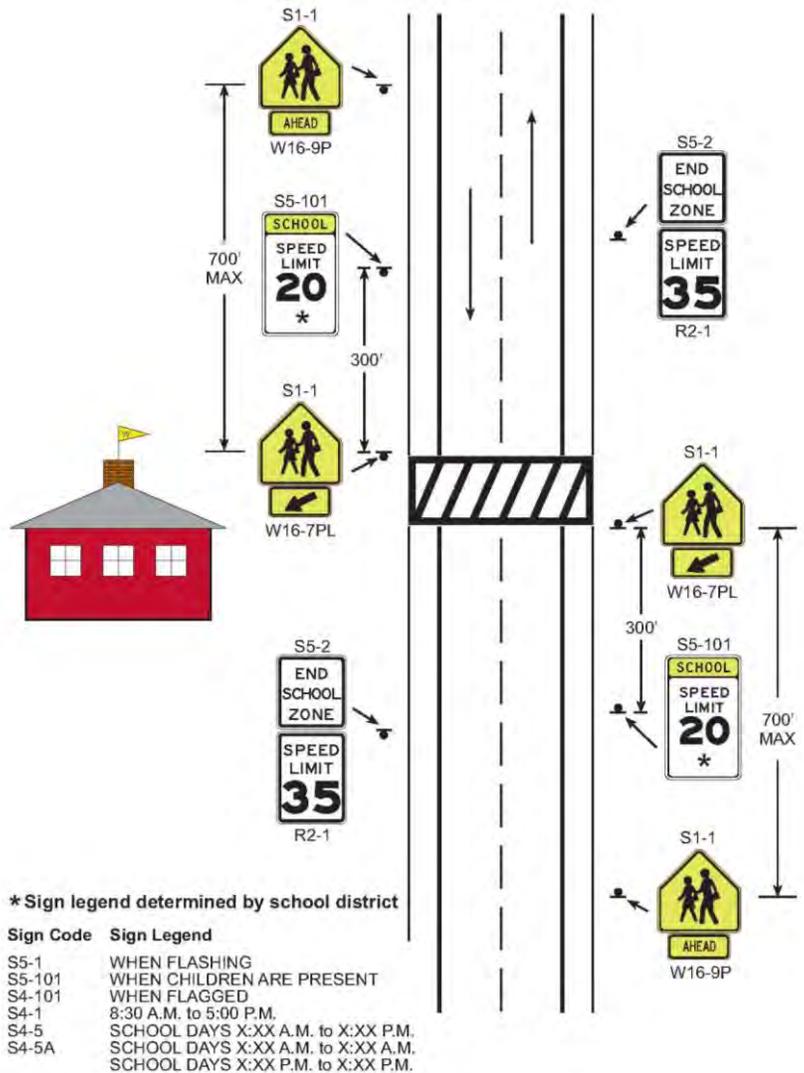


Figure 2. WSDOT Traffic Manual – Reduced School Speed Zone Signing (Appendix 2-12)

- 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 \geq 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 County⁵ 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 percent⁶.

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 136 th 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 104 th Street Phase II	Vancouver
	NE 159 th 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 18 th Ave Safety Improvements and NE 43 rd 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	<p>School zones are encouraged when:</p> <ul style="list-style-type: none"> 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 <p>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</p>	An engineering study would be necessary to justify requiring a school zone
Alaska ⁸	<p>School zones are encouraged when:</p> <ul style="list-style-type: none"> There are no STOP signs or traffic signals at crossing <p>School zone includes: a marked crosswalk, advance and crossing school signs, 20 mph speed limit when flashing</p>	School zone includes: a marked crosswalk, advance and crossing school signs
Arizona ⁹	<p>School zones are encouraged when:</p> <ul style="list-style-type: none"> There are no STOP signs or traffic signals within 600 feet on the same street <p>School zone includes: a marked crosswalk, advance and crossing school signs, stop when children in crosswalk, no passing, 15 mph school speed limit assemblies</p>	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 school¹².

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).

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)

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 future¹⁴. 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.



Figure 3. Clark County School Zone Speed Limit Flasher System

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.	<p>Driver of a vehicle shall not exceed 20 miles per hour in a school speed zone, which is defined as:</p> <p>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.</p> <p>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).</p>

APPENDIX E:
WASHINGTON ADMINISTRATIVE CODE (WAC)

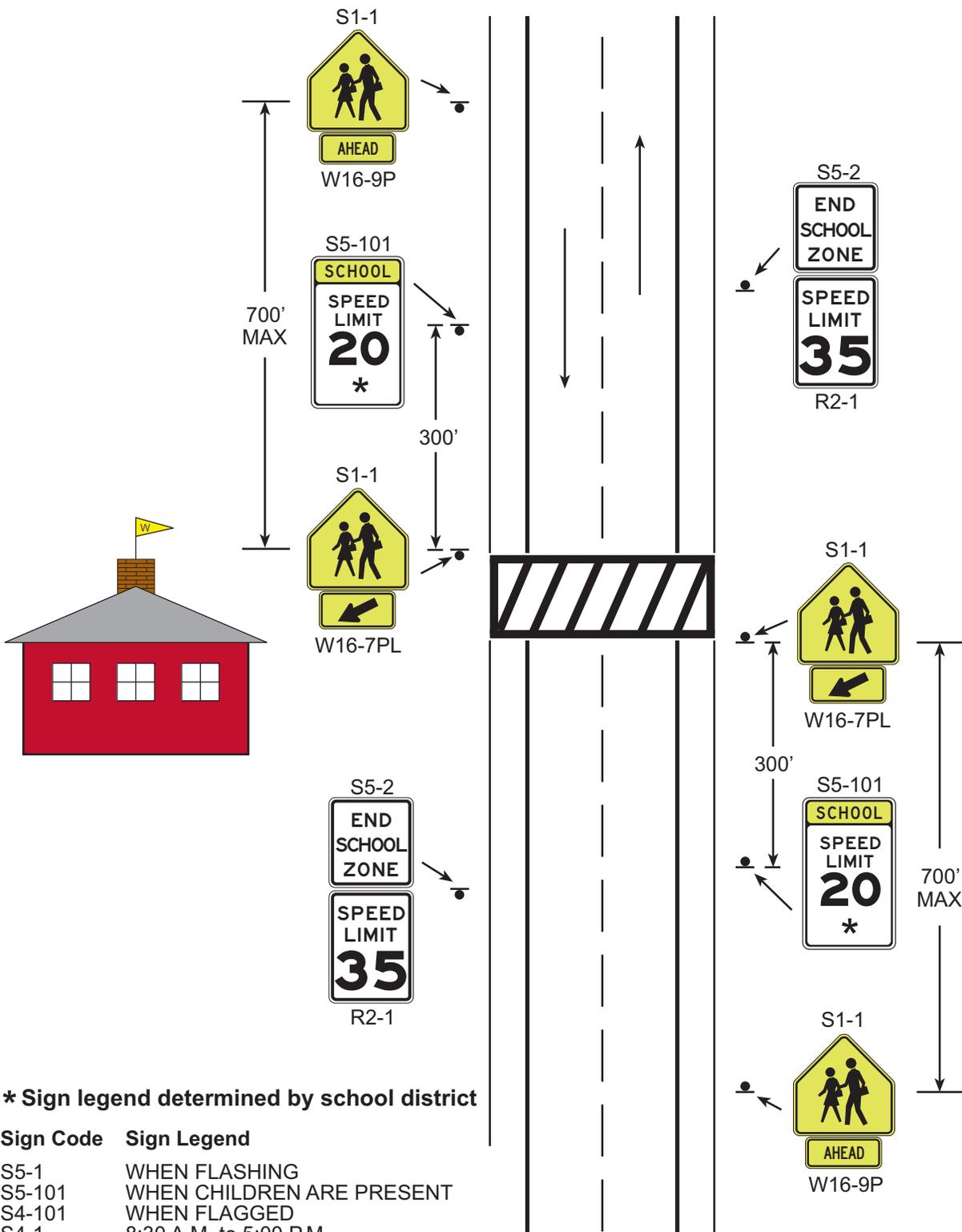
Washington Administrative Code (WAC) Summary

WAC Number	Name	Description
468-95-325	In-street signs in school areas	<p><u>MUTCD Figure 7B-6</u> Action: Delete signs R1-6 and R1-6b (yield to pedestrians within crosswalk signs)</p> <p><u>MUTCD Section 7B.08 (first option)</u> 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.</p>
468-95-327	Higher fines zone signs	<p><u>MUTCD section 7B.10 (first paragraph)</u> Action: Change the wording from shall be installed to may be installed for higher fines zone signs and plaques in school zones.</p>
468-95-328	School Crossing Assembly	<p><u>MUTCD section 7B.12 (fourth, sixth, and seventh paragraphs)</u> Action: Remove the in-street pedestrian crossing signs for yield (R1-6 and R1-6b) from text</p>
468-95-3285	In-street signs in school areas	<p><u>MUTCD Figure 7B-6</u> Action: Delete signs R1-6 and R1-6b (yield to pedestrians within crosswalk signs)</p>
468-95-330	School speed limit assembly	<p><u>MUTCD section 7B.15 (seventh paragraph)</u> 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.</p> <p><u>MUTCD Figure 7B-5</u> Action: Move speed limit signs to be located per RCW 46.61.440.</p>
468-95-335	When children are present	<p><u>MUTCD section 7B.15 (seventh paragraph)</u> Action: Add the following: <i>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:</i></p> <ul style="list-style-type: none"> • <i>School children are occupying or walking within the marked crosswalk.</i> • <i>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.</i> • <i>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.</i>

468-95-340	School speed limit assembly	<p><u>MUTCD Figure 7B-1</u> Action: Add the WHEN FLAGGED (S4-501) sign</p> <p><u>MUTCD section 7B.15 (eighth and ninth paragraphs)</u> 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).</p>
468-95-360	Crosswalk markings	<p><u>MUTCD section 7C.02 (fourth paragraph)</u> Action: Add the following: <i>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.</i></p>
392-151-025	Route plans	<p>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.</p>
392-151-030	Controlled crossings	<p>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.</p>

APPENDIX F:

**WSDOT SCHOOL ZONE LAYOUT & SIGN
FABRICATION DETAILS**

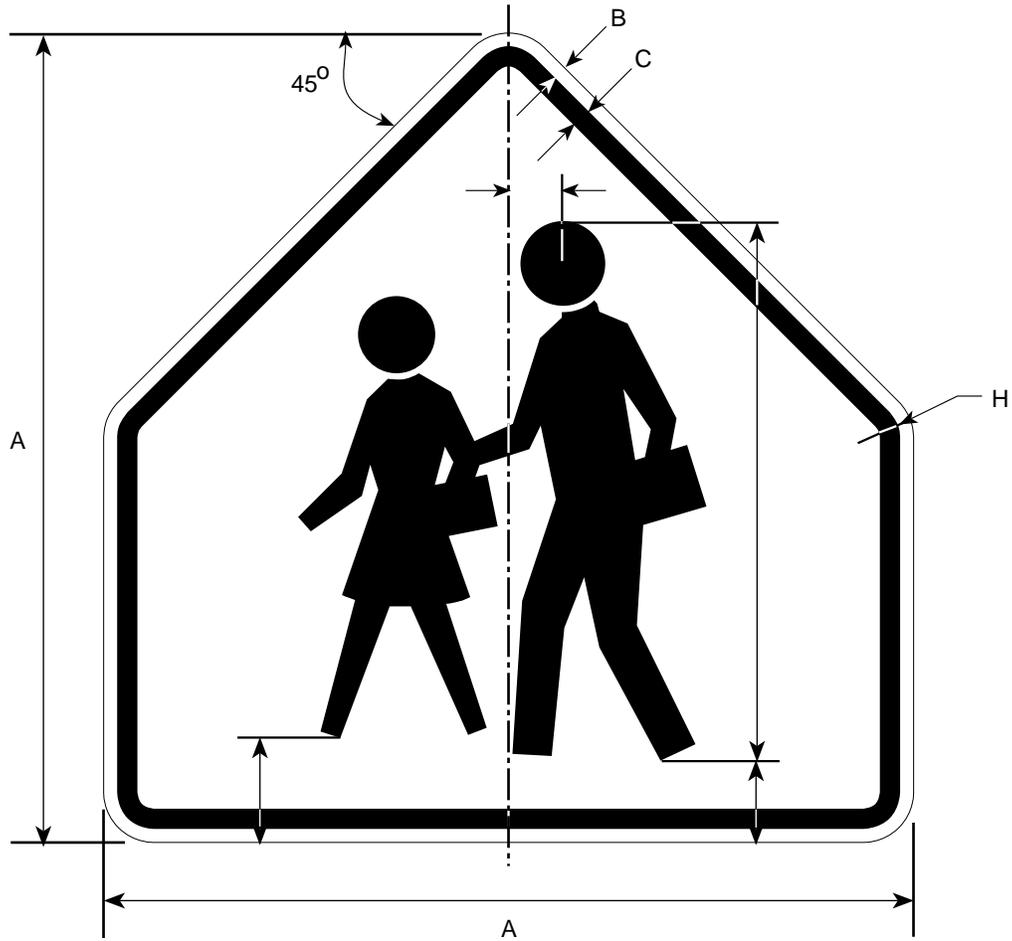


* Sign legend determined by school district

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

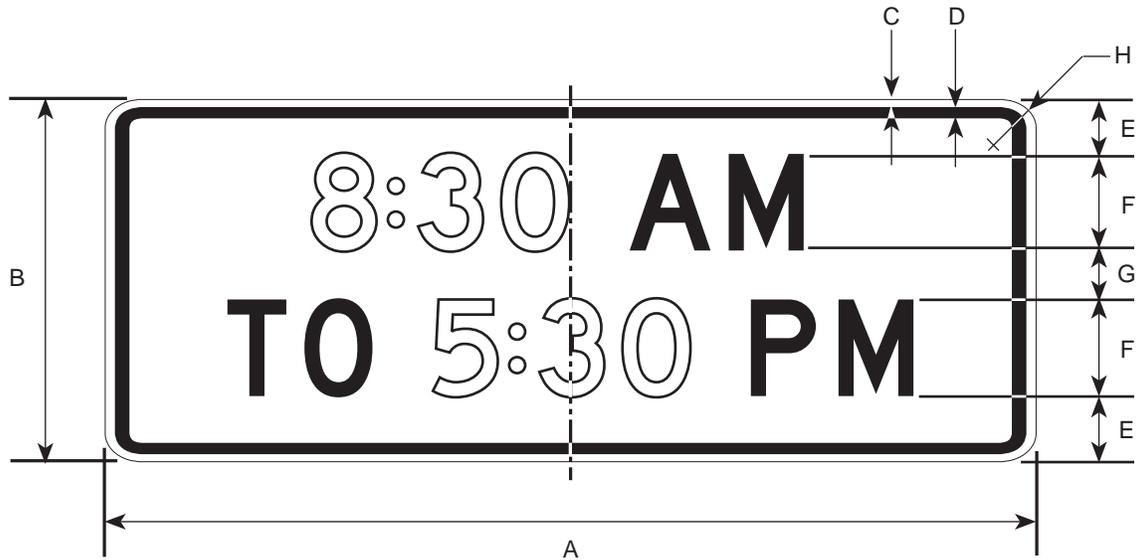
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
30	1/2	3/4	2	20	3	3 3/4	1 7/8
36	5/8	7/8	2 1/2	24	3 1/2	4 1/2	2 1/4
48	3/4	1 1/4	3 1/4	32	5	6	3

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

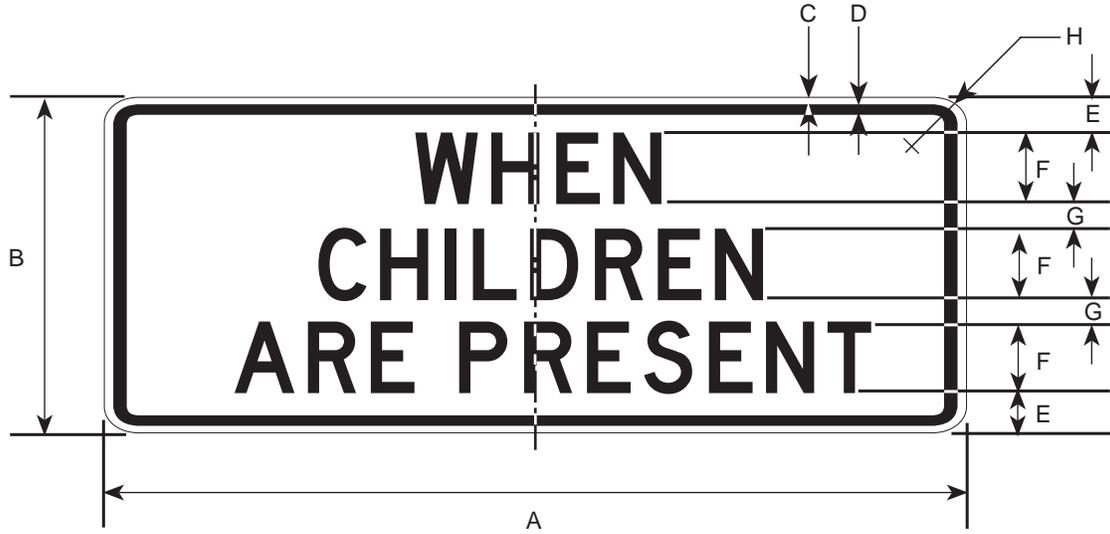
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
24	12	5/8	5/8	2	3 1/2D	1	1 1/2
36	18	3/4	7/8	3.25	5D	1 1/2	2 1/4
48	24	1 1/4	1 1/4	4.75	6D	2 1/2	3

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

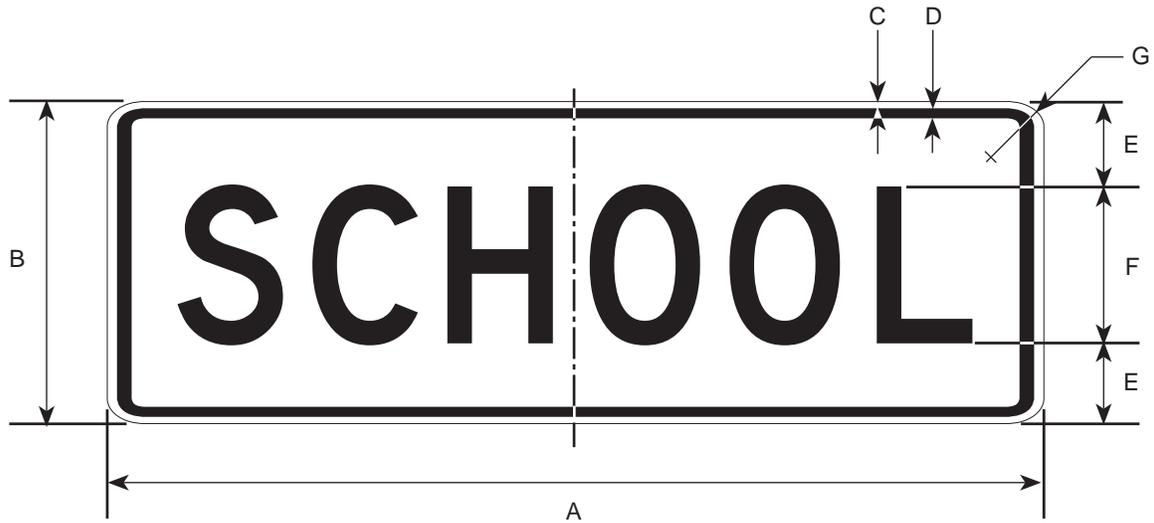
COLORS

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

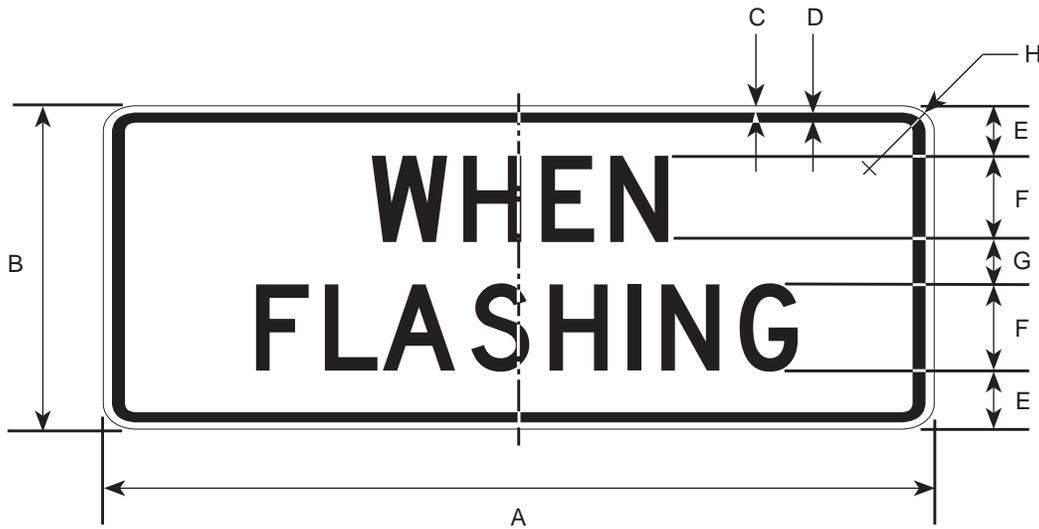
COLORS

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

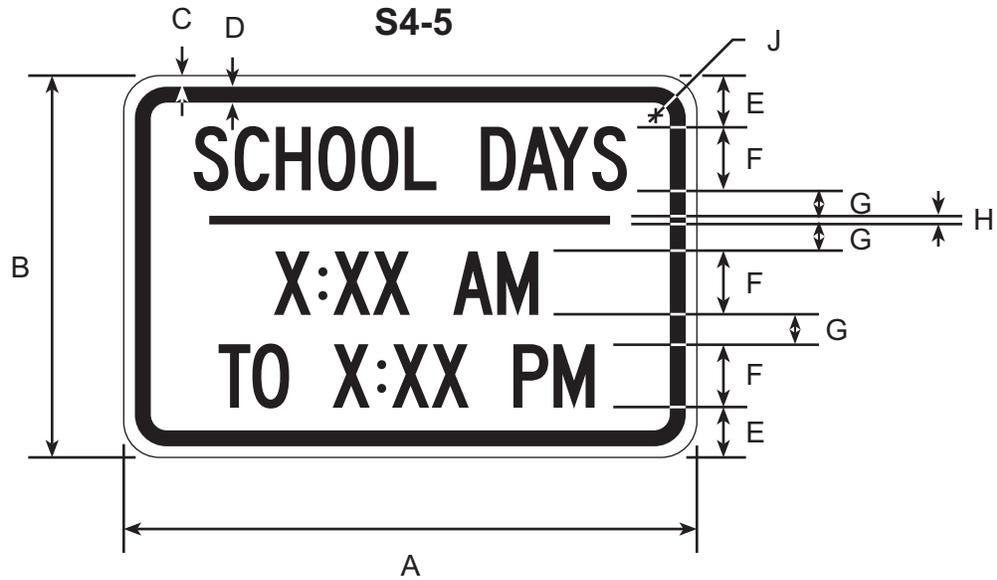
DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
24	10	3/8	5/8	2	2 1/2D	1	1 1/2
36	15	5/8	7/8	2 3/4	4D	1 1/2	2 1/4
48	20	3/4	1 1/4	4	5D	2	3

COLORS

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

S4-5 & S4-5A

5/06



S4-5A



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

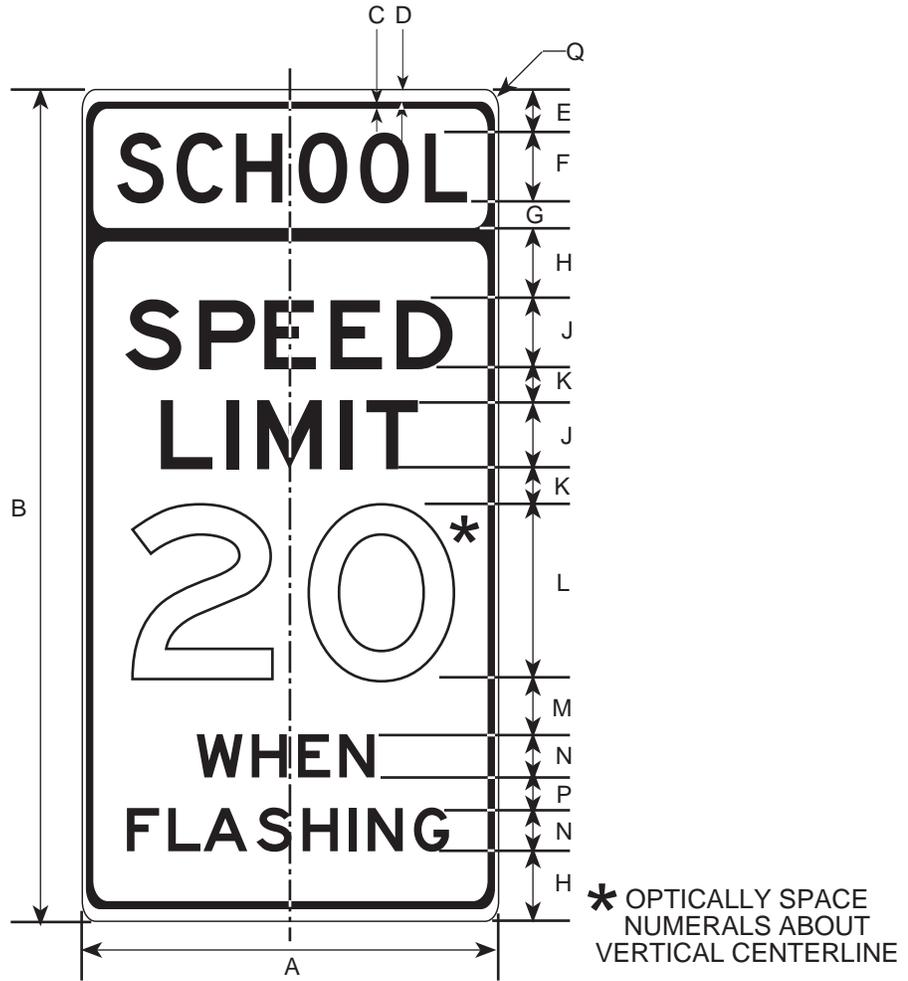
DIMENSIONS (INCHES)						
A	B	C	D	E	F	G
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36	15	5/8	7/8	4D	1 1/2	2 1/4
48	20	3/4	1 1/4	5D	2	3

COLORS

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

S5-1

6/00



* OPTICALLY SPACE NUMERALS ABOUT VERTICAL CENTERLINE

**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

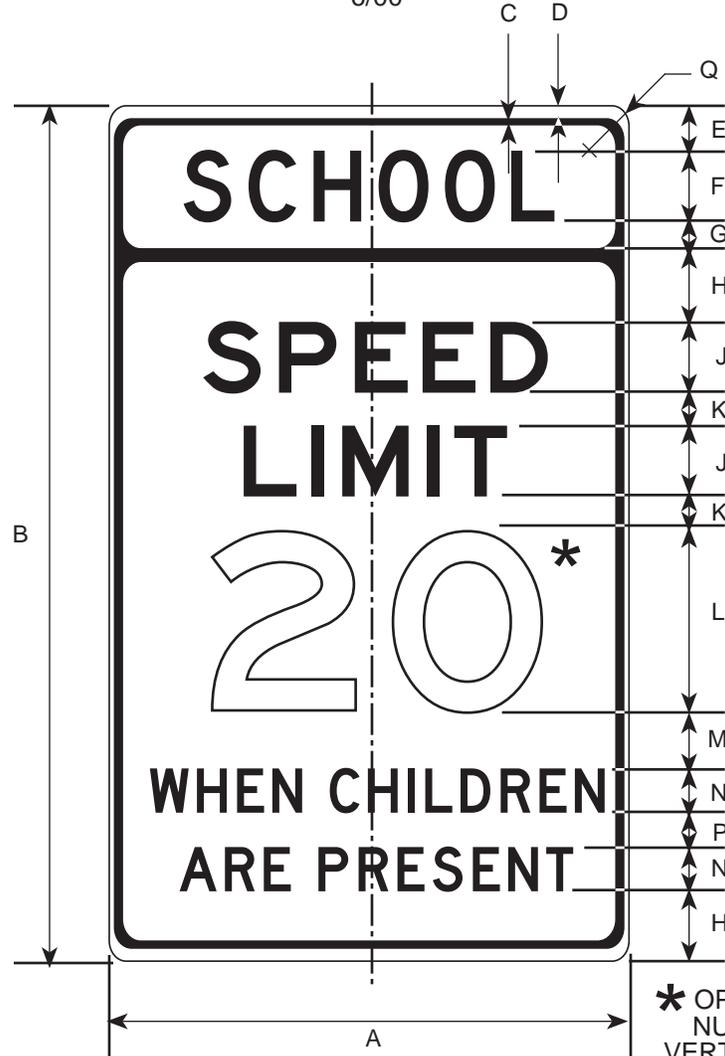
COLORS

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

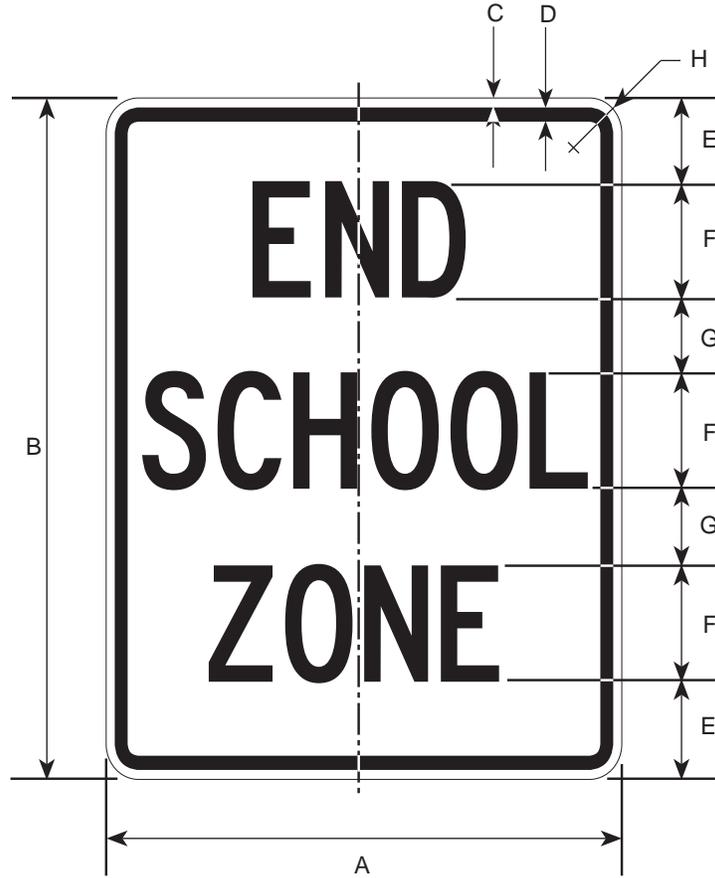
COLORS

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

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

S5-2

11/97



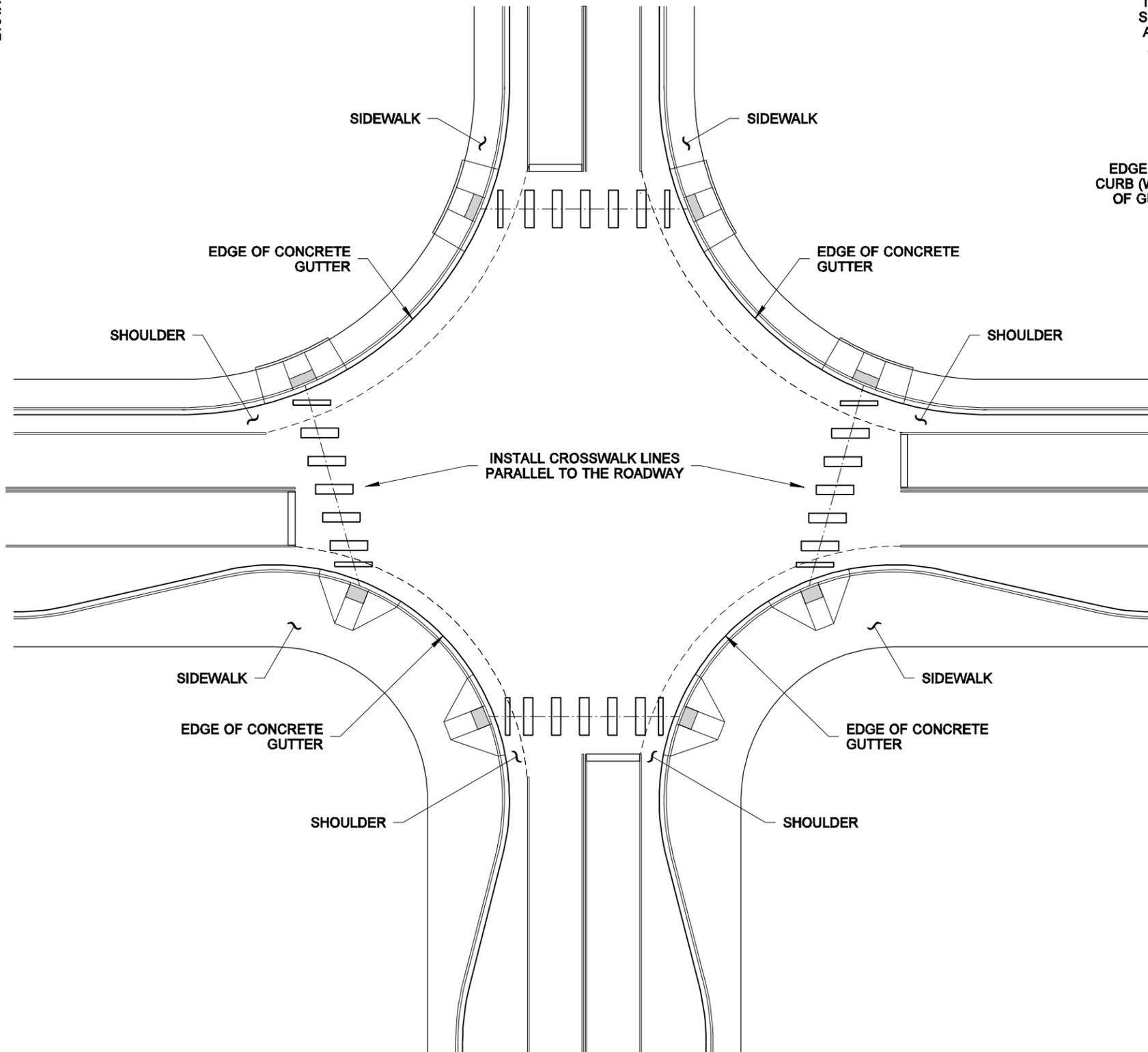
DIMENSIONS (MILLIMETERS)							
A	B	C	D	E	F	G	H
450	600	9	16	88	100C	63	38
600	750	9	16	100	125C	88	38
900	1200	16	22	163	200C	138	56

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

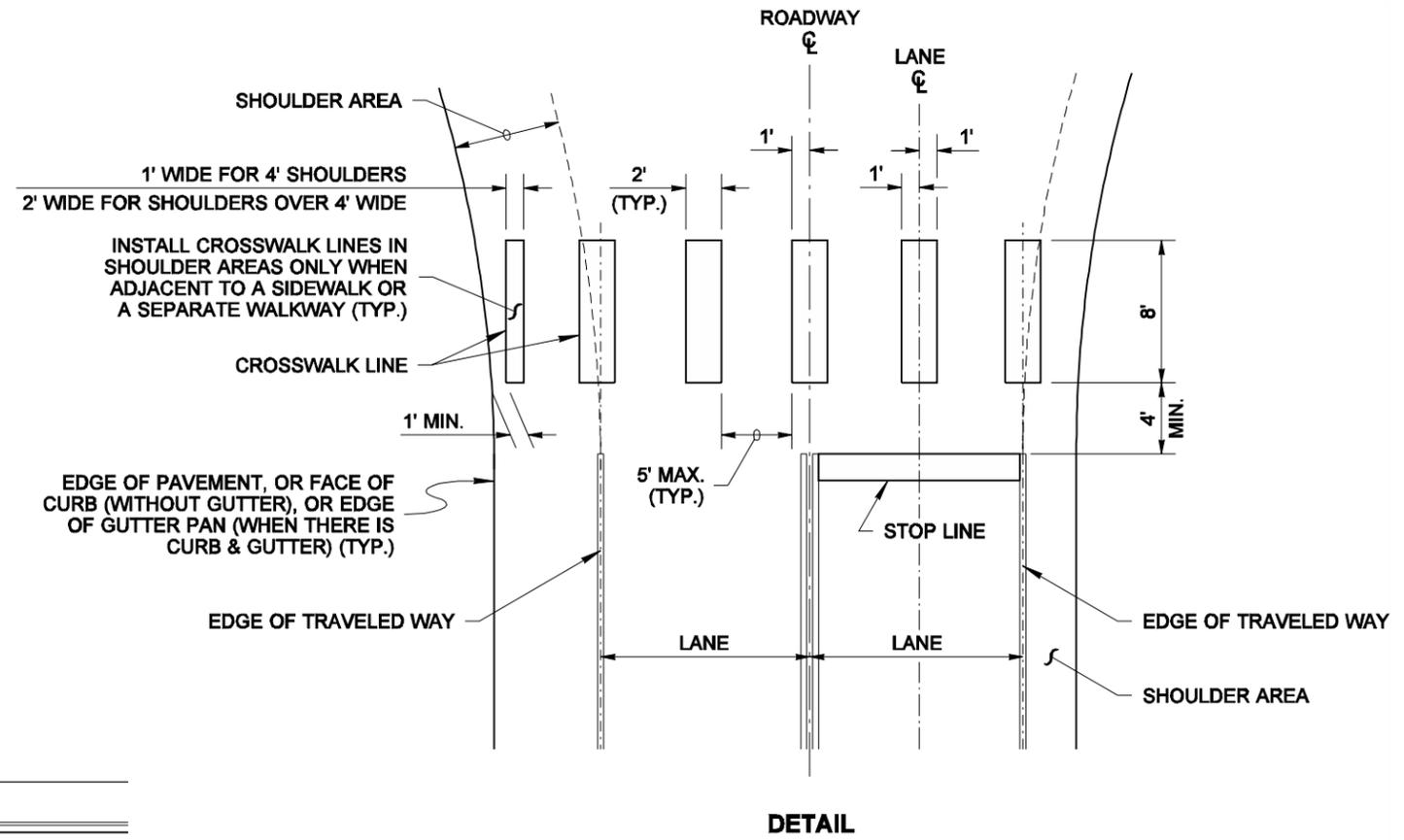
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APPENDIX G:
WSDOT STANDARD DETAILS

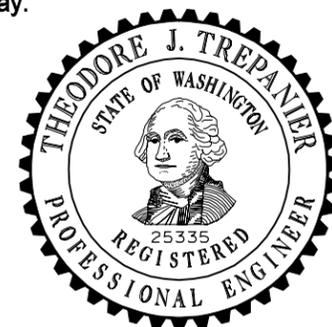


TYPICAL APPLICATIONS



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.



EXPIRES AUGUST 9, 2007

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CROSSWALK LAYOUT

STANDARD PLAN M-15.10-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Ken L. Smith

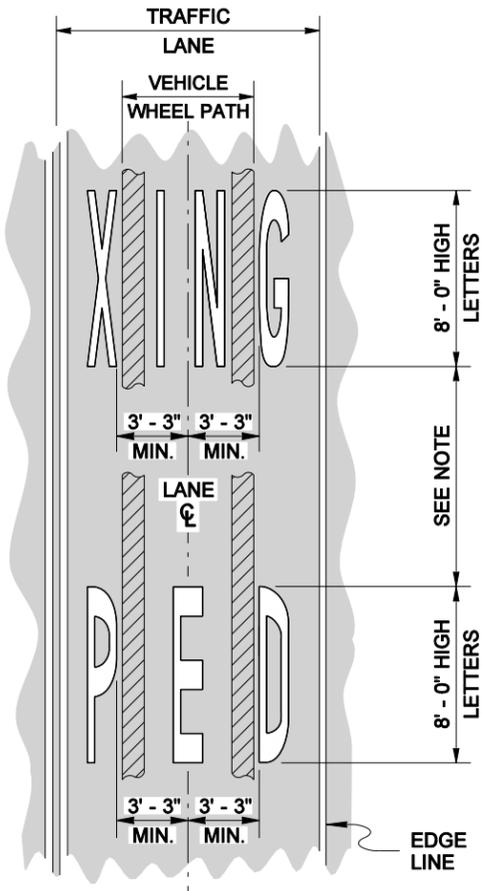
STATE DESIGN ENGINEER

02-06-07

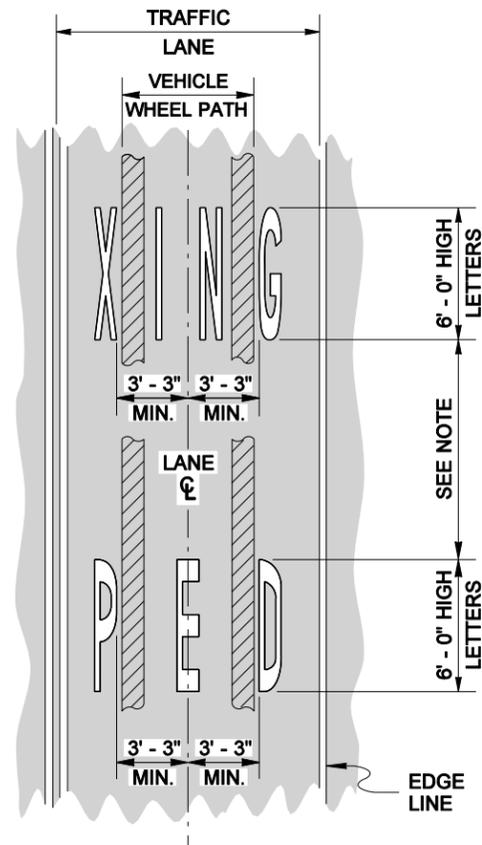
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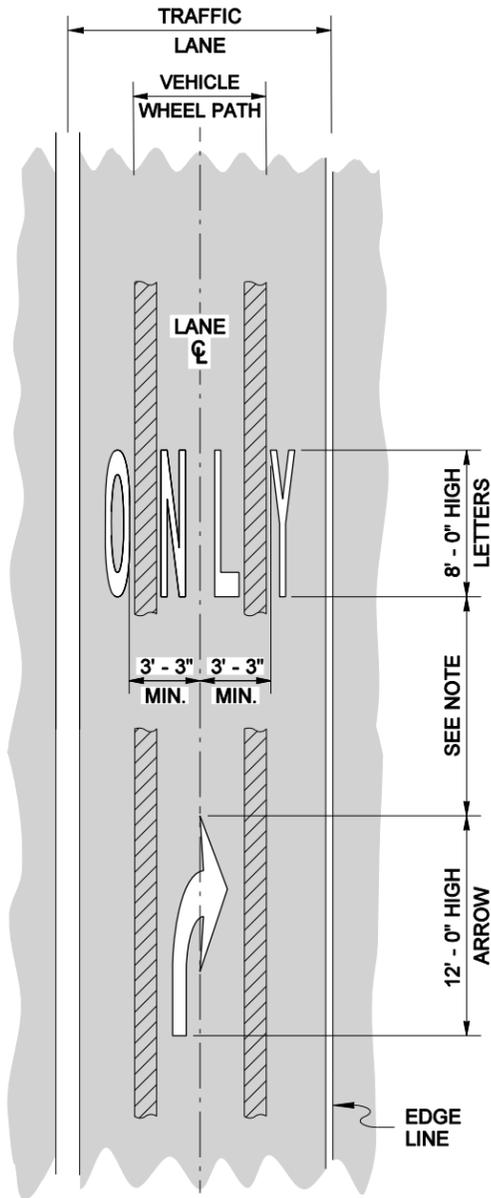
Washington State Department of Transportation



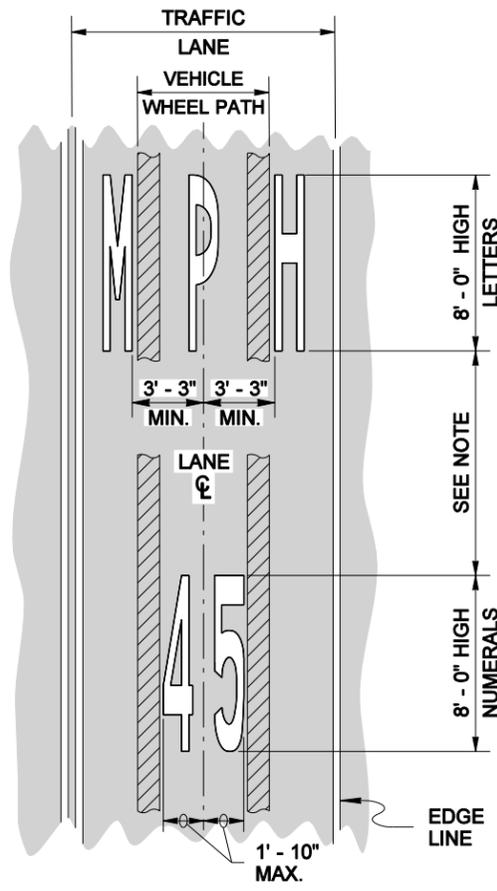
HIGH-SPEED APPLICATION



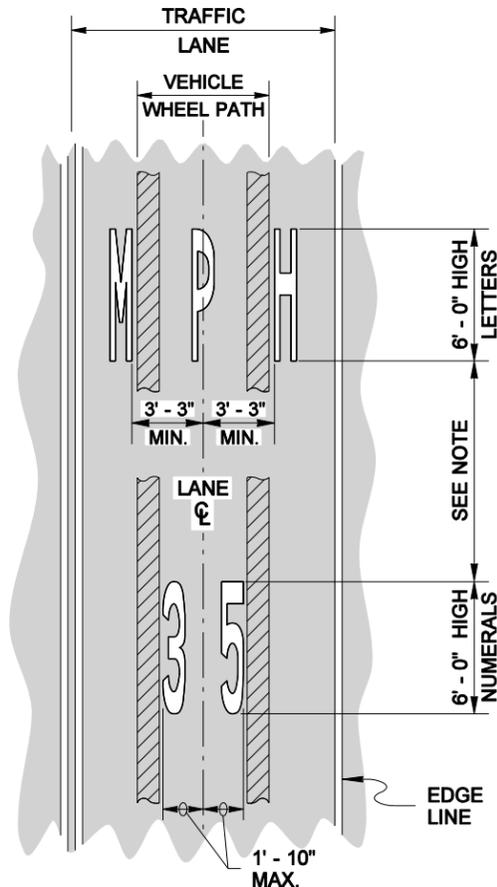
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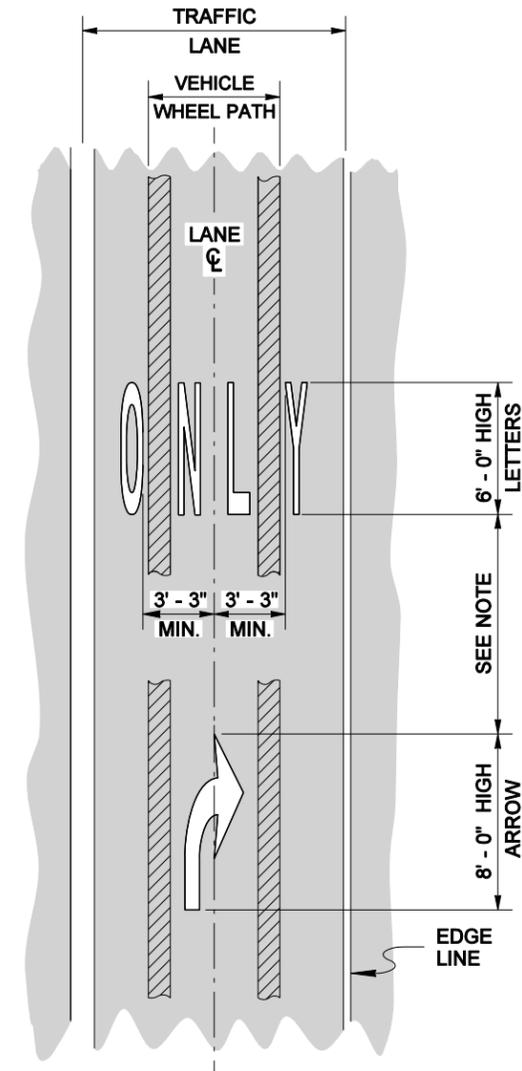
HIGH-SPEED APPLICATION



HIGH-SPEED APPLICATION



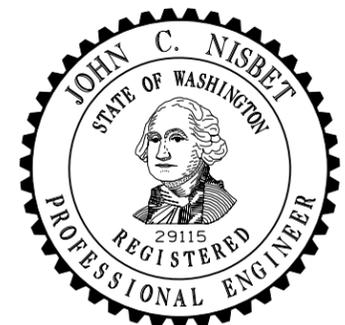
LOW-SPEED APPLICATION



LOW-SPEED APPLICATION

NOTE

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



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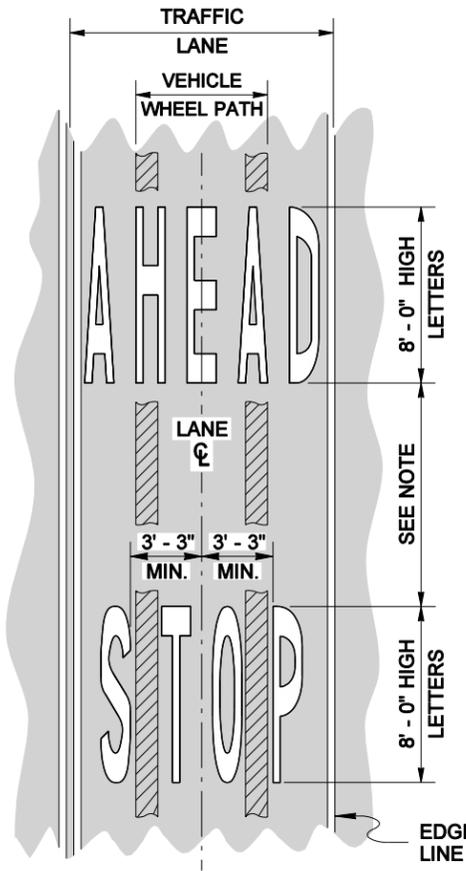
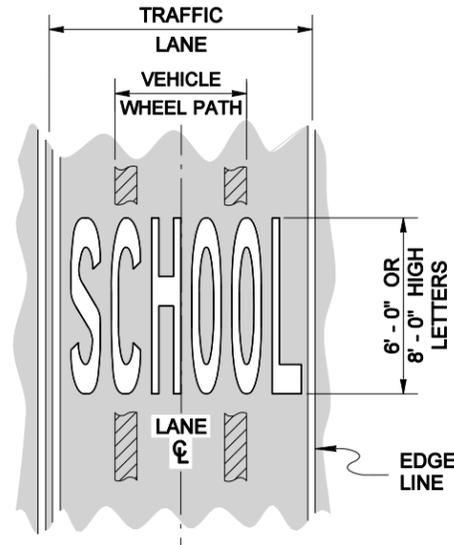
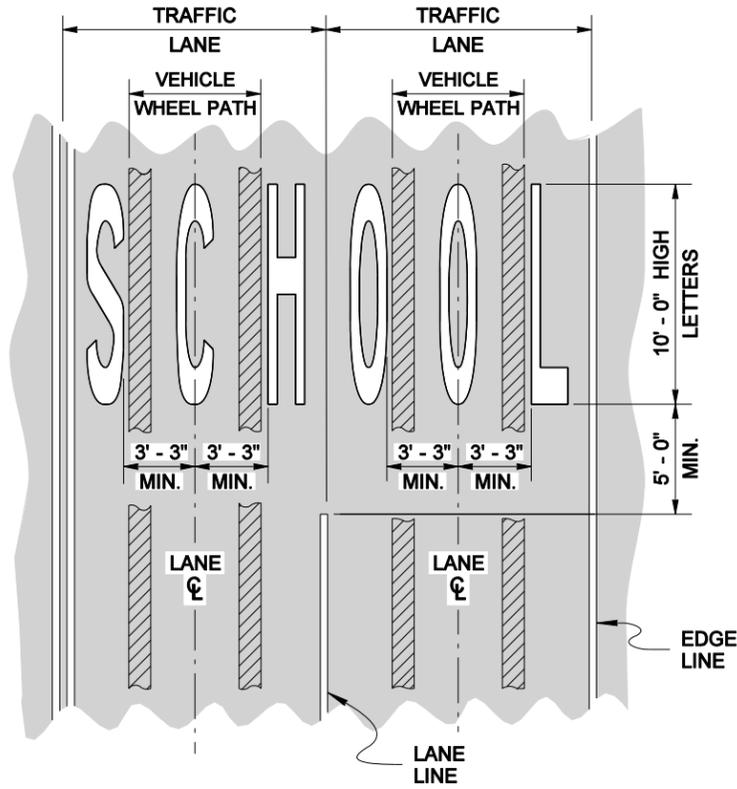
TRAFFIC LETTER AND NUMERAL APPLICATIONS
STANDARD PLAN M-80.10-01

SHEET 1 OF 2 SHEETS

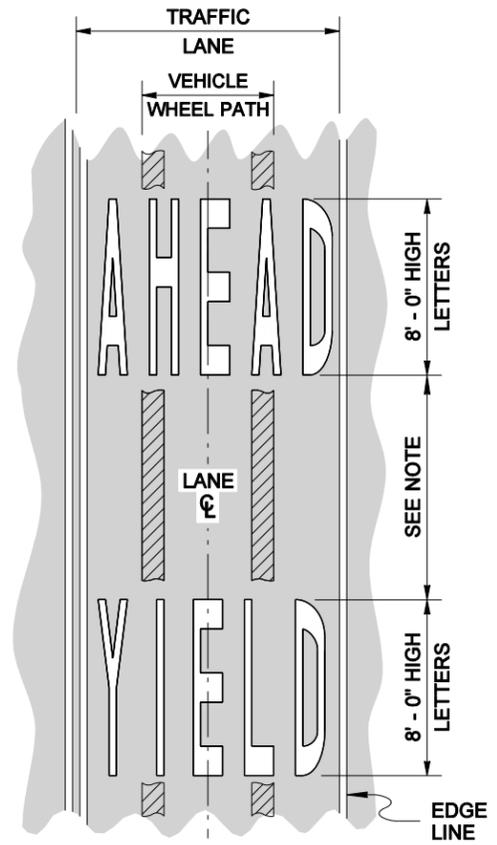
APPROVED FOR PUBLICATION

Pasco Bakotich III 06-03-11
 STATE DESIGN ENGINEER DATE

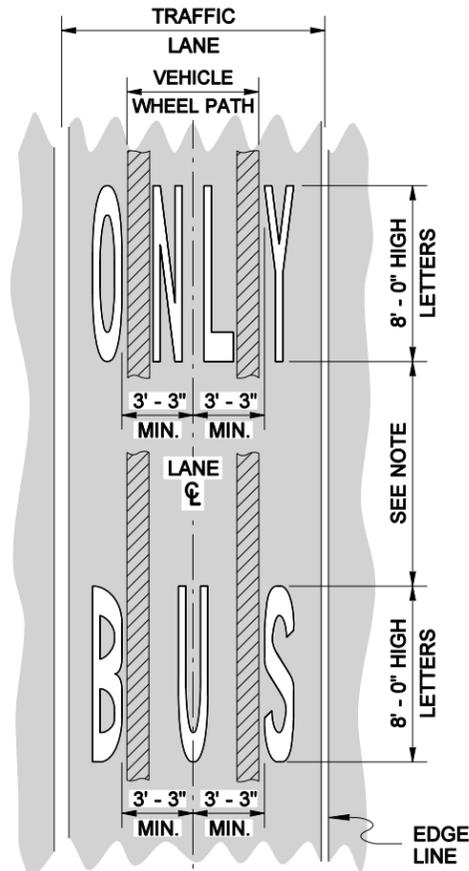




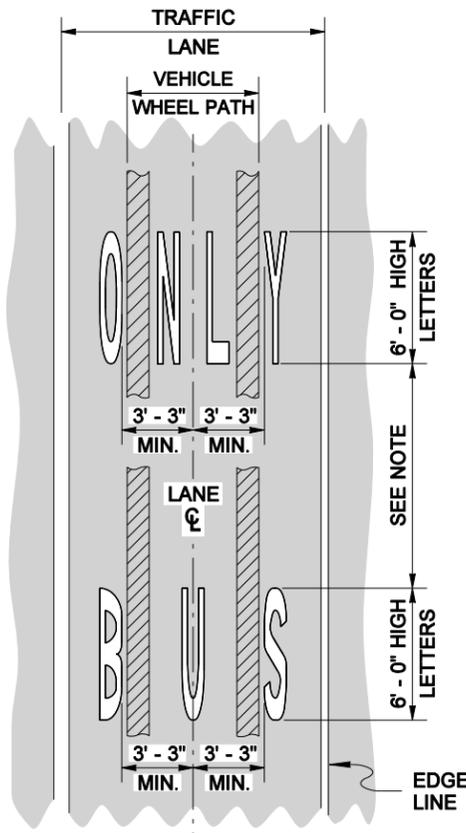
HIGH-SPEED APPLICATION



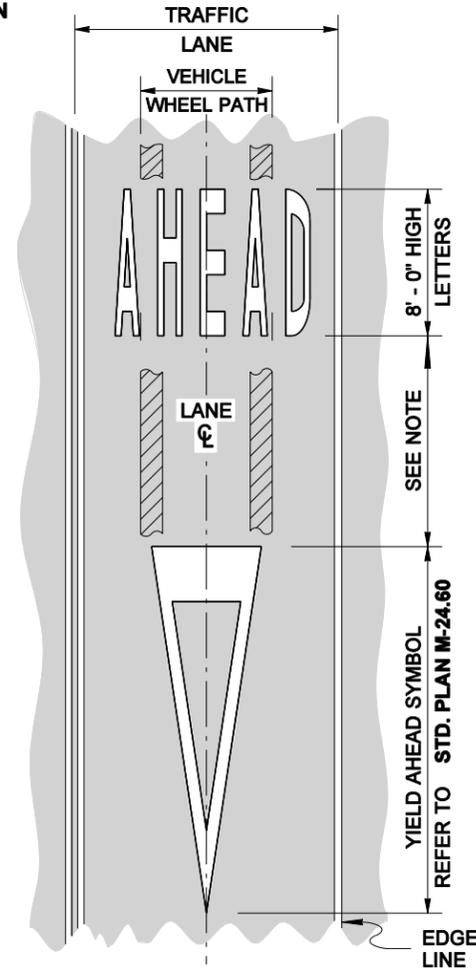
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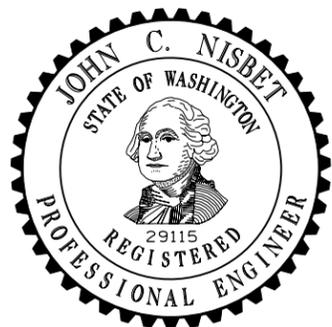
HIGH-SPEED APPLICATION



LOW-SPEED APPLICATION



HIGH-SPEED APPLICATION



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TRAFFIC LETTER AND NUMERAL APPLICATIONS
STANDARD PLAN M-80.10-01

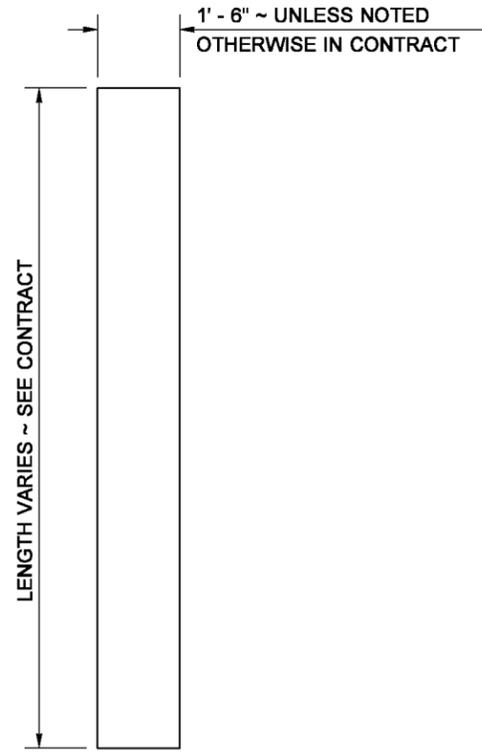
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

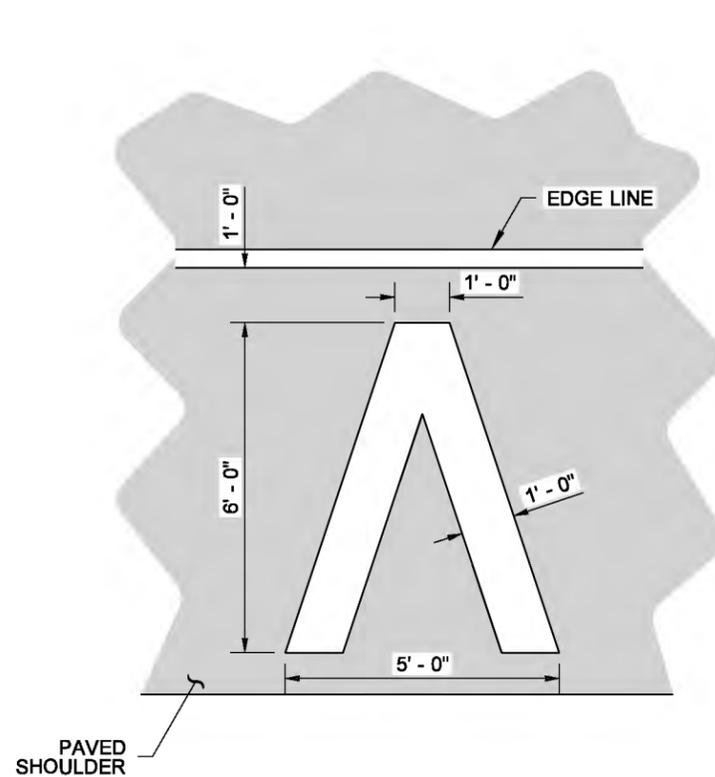
Pasco Bakotich III 06-03-11

STATE DESIGN ENGINEER DATE

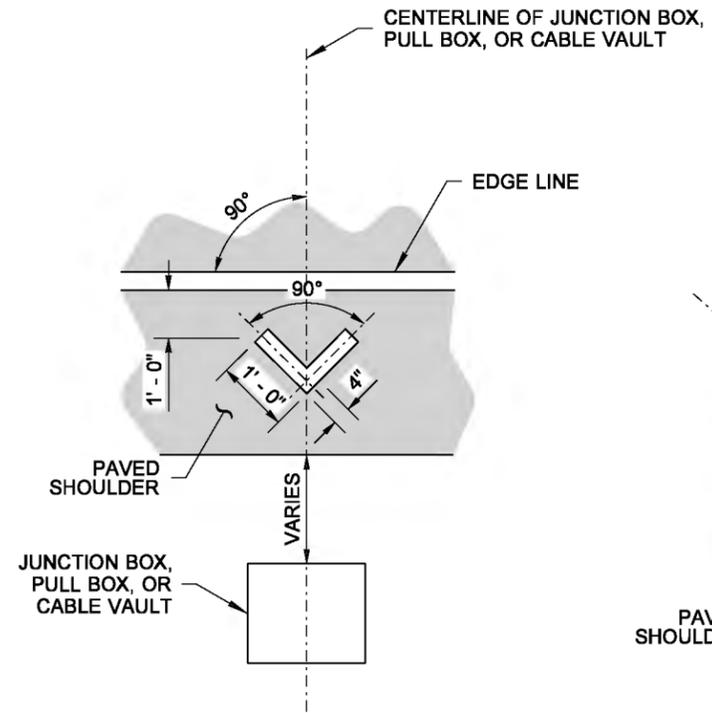




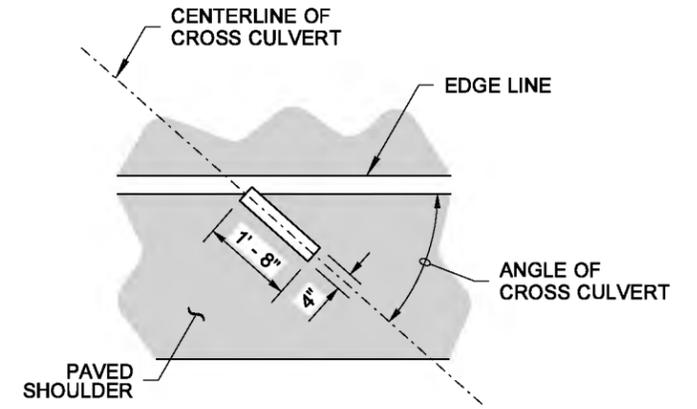
STOP LINE



MARKING AREA = 11.73 SQ.FT.
HALF-MILE MARKER

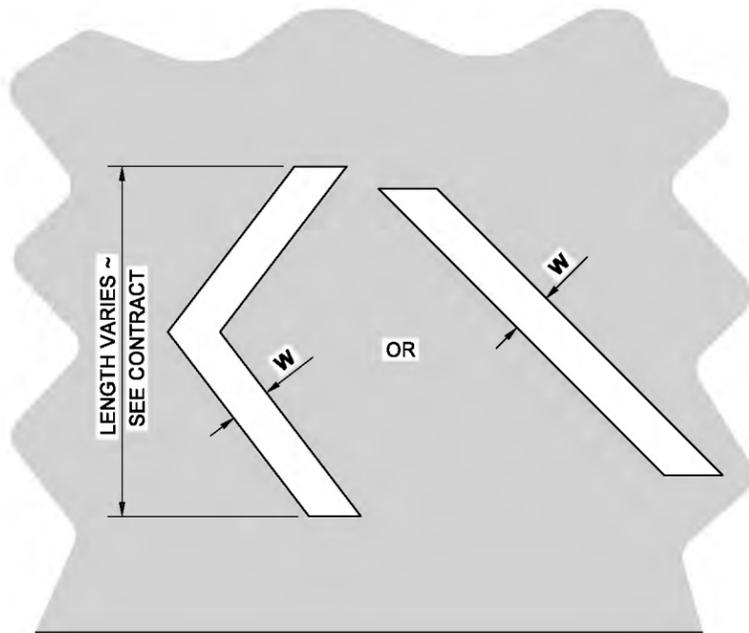


MARKING AREA = 0.56 SQ. FT.
JUNCTION BOX, PULL BOX, OR CABLE VAULT MARKINGS



MARKING AREA = 0.56 SQ.FT.
CROSS CULVERT

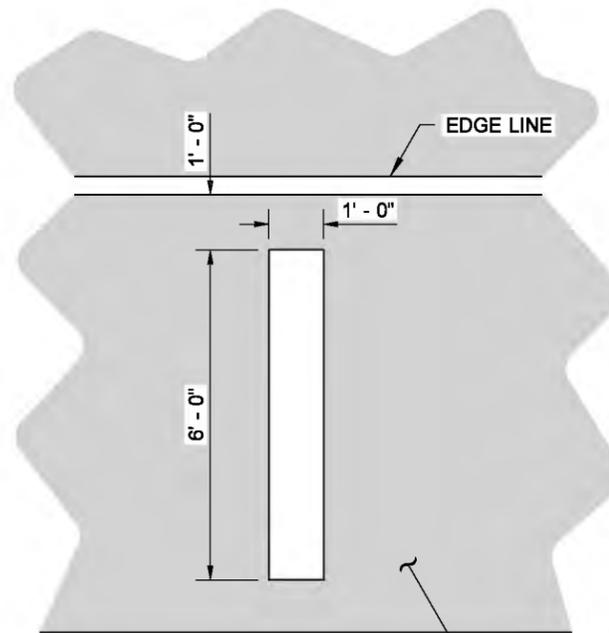
DRAINAGE MARKING



WHITE OR YELLOW ~ SEE CONTRACT
CHEVRON OR DIAGONAL

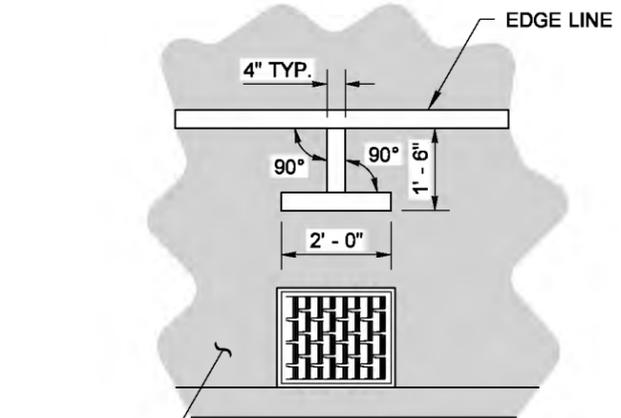
CROSSHATCH MARKING

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

NOTE

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

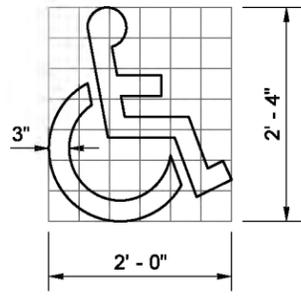


**SYMBOL MARKINGS
MISCELLANEOUS**

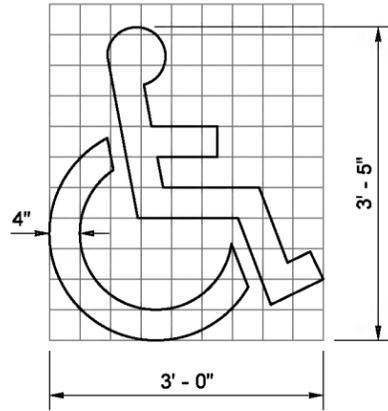
STANDARD PLAN M-24.60-04

SHEET 1 OF 2 SHEETS

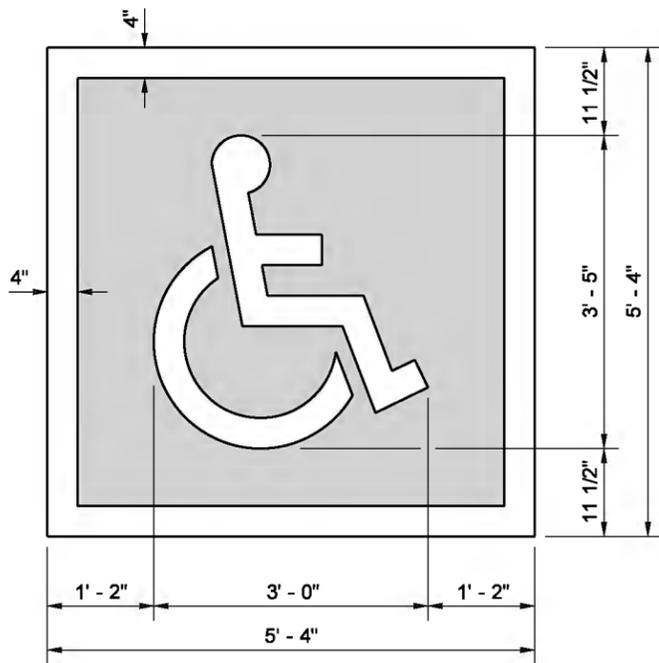
APPROVED FOR PUBLICATION



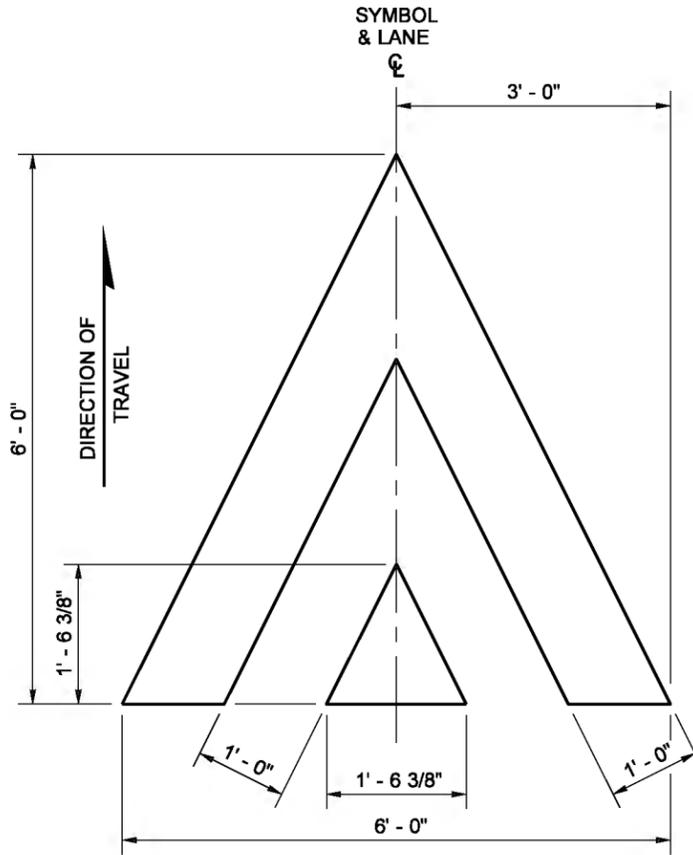
GRID IS 4" (IN) SQUARE MARKING AREA = 1.41 SQ.FT.
ACCESS PARKING SPACE SYMBOL (MINIMUM)



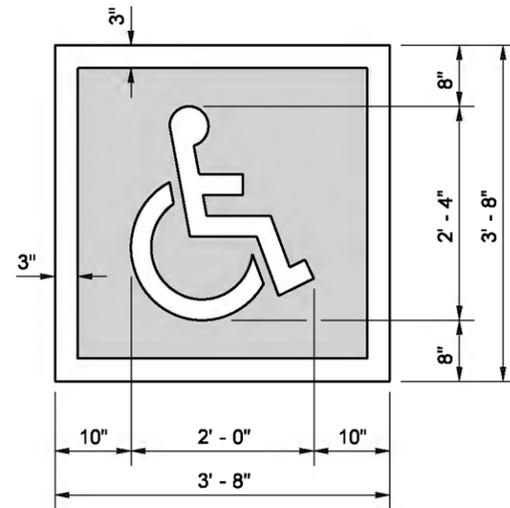
GRID IS 4" (IN) SQUARE MARKING AREA = 3.09 SQ.FT.
ACCESS PARKING SPACE SYMBOL (STANDARD)



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)



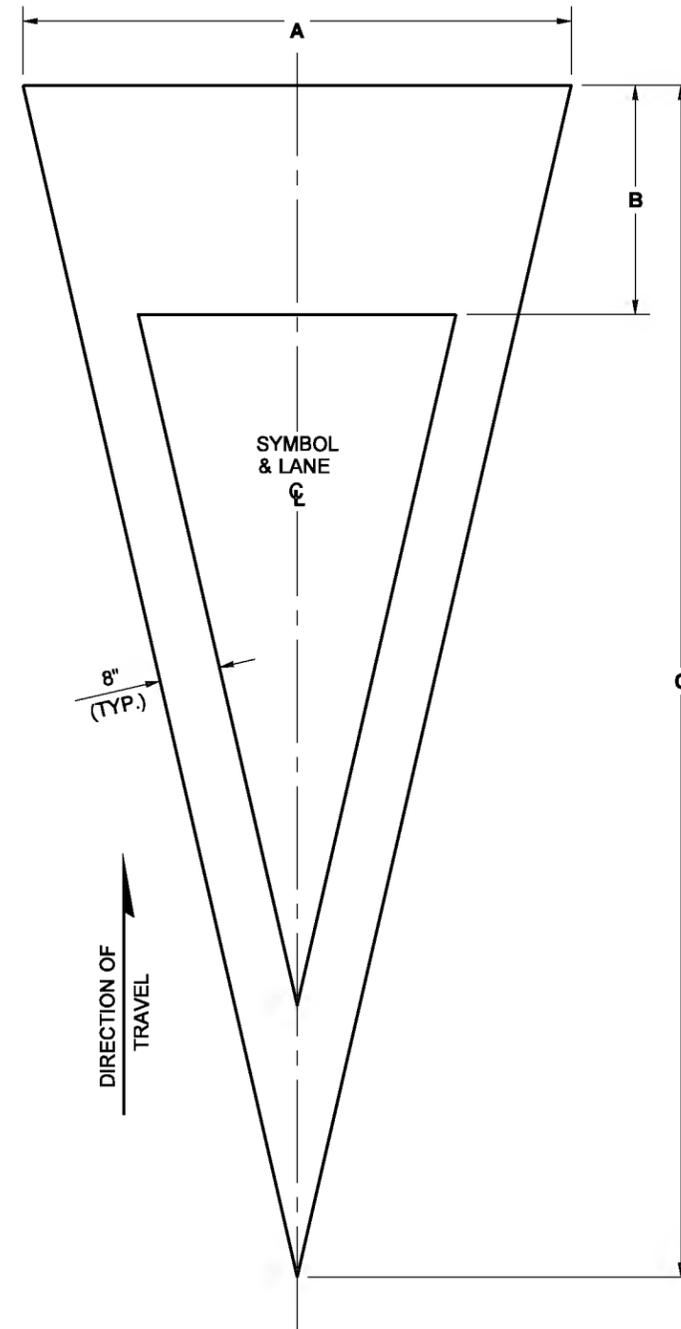
MARKING AREA = 12.08 SQ.FT.
SPEED BUMP SYMBOL



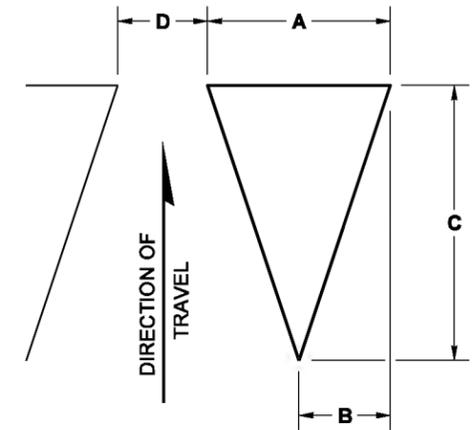
TOTAL MARKING AREA = 13.44 SQ.FT.
 WHITE = 4.82 SQ.FT. BLUE = 8.62 SQ.FT.
ACCESS PARKING SPACE SYMBOL (MINIMUM) WITH BLUE BACKGROUND AND WHITE BORDER (REQUIRED FOR CEMENT CONCRETE SURFACES)

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"	ROUNDBOUNT 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)



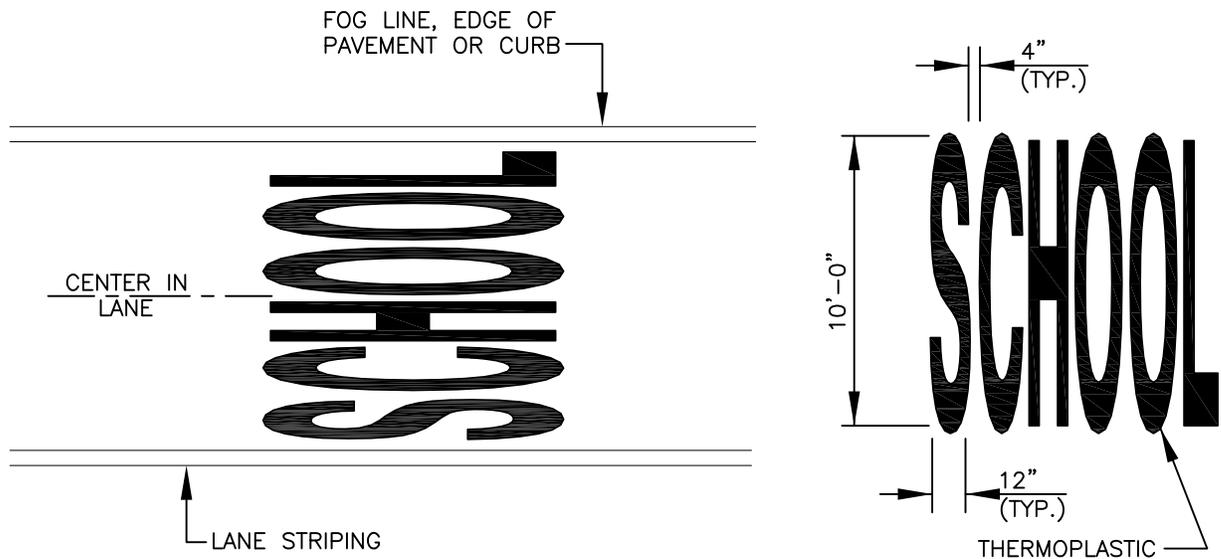
SYMBOL MARKINGS MISCELLANEOUS
STANDARD PLAN M-24.60-04

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

APPENDIX H:
LOCAL AGENCY STANDARD DETAILS

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

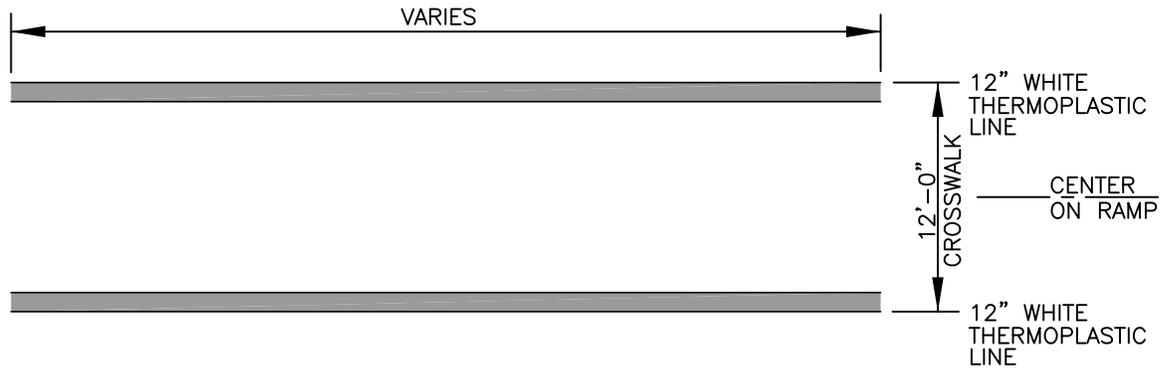


"SCHOOL" ZONE LEGEND

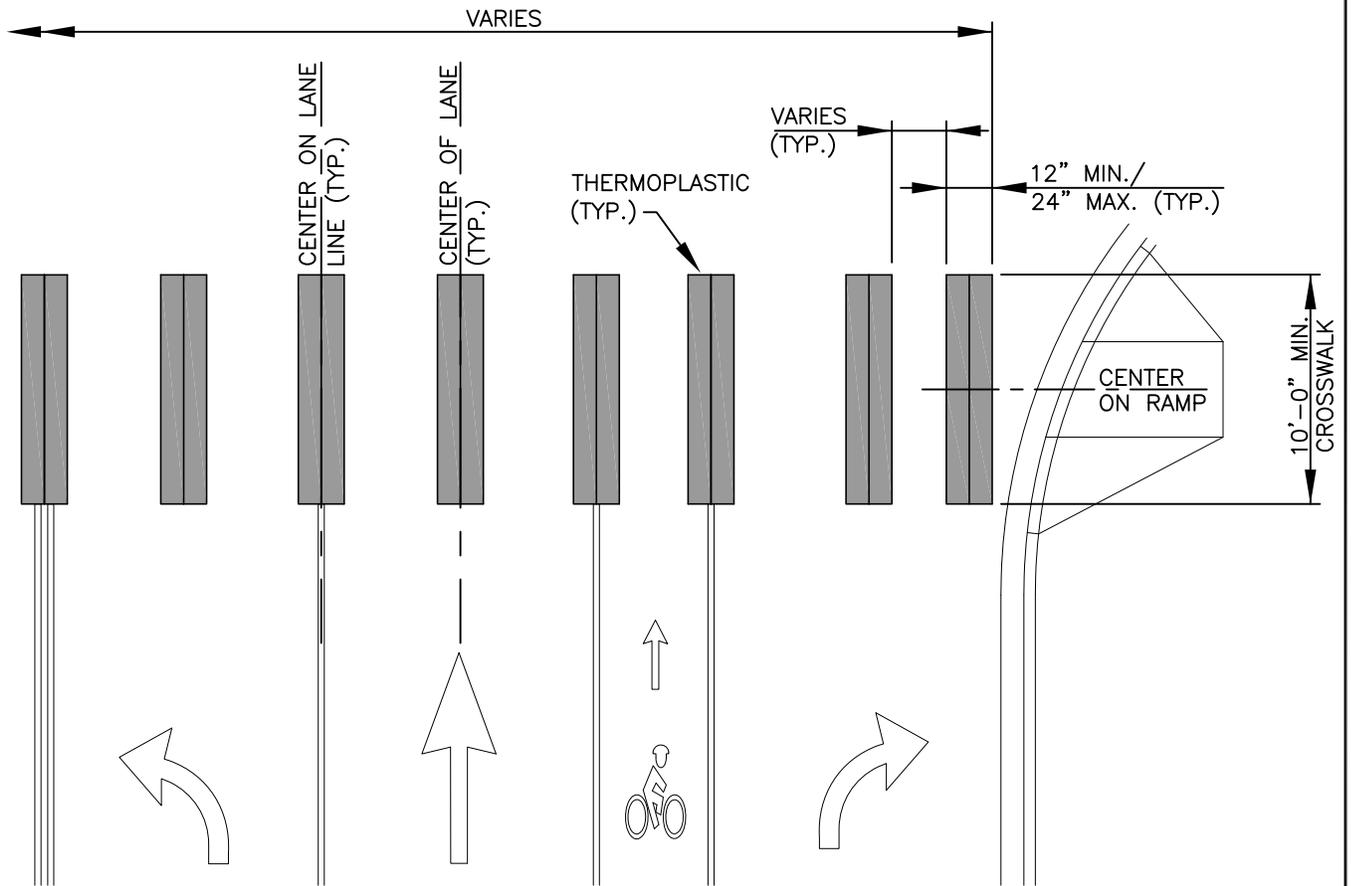
REV NO.	DATE	BY	APPR	
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2	3/06	RAW	AGE	
3	2/07	RAW	AGE	
4	8/08	RAW	AGE	



<i>CITY OF VANCOUVER</i>		<small>STANDARD PLAN NUMBER</small>
"SCHOOL" LEGEND MARKINGS		T29-58



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.

I:\CITYPPS\AUTOCAD\STD_DETAILS\DRAWING_FILES\T29-41.DWG

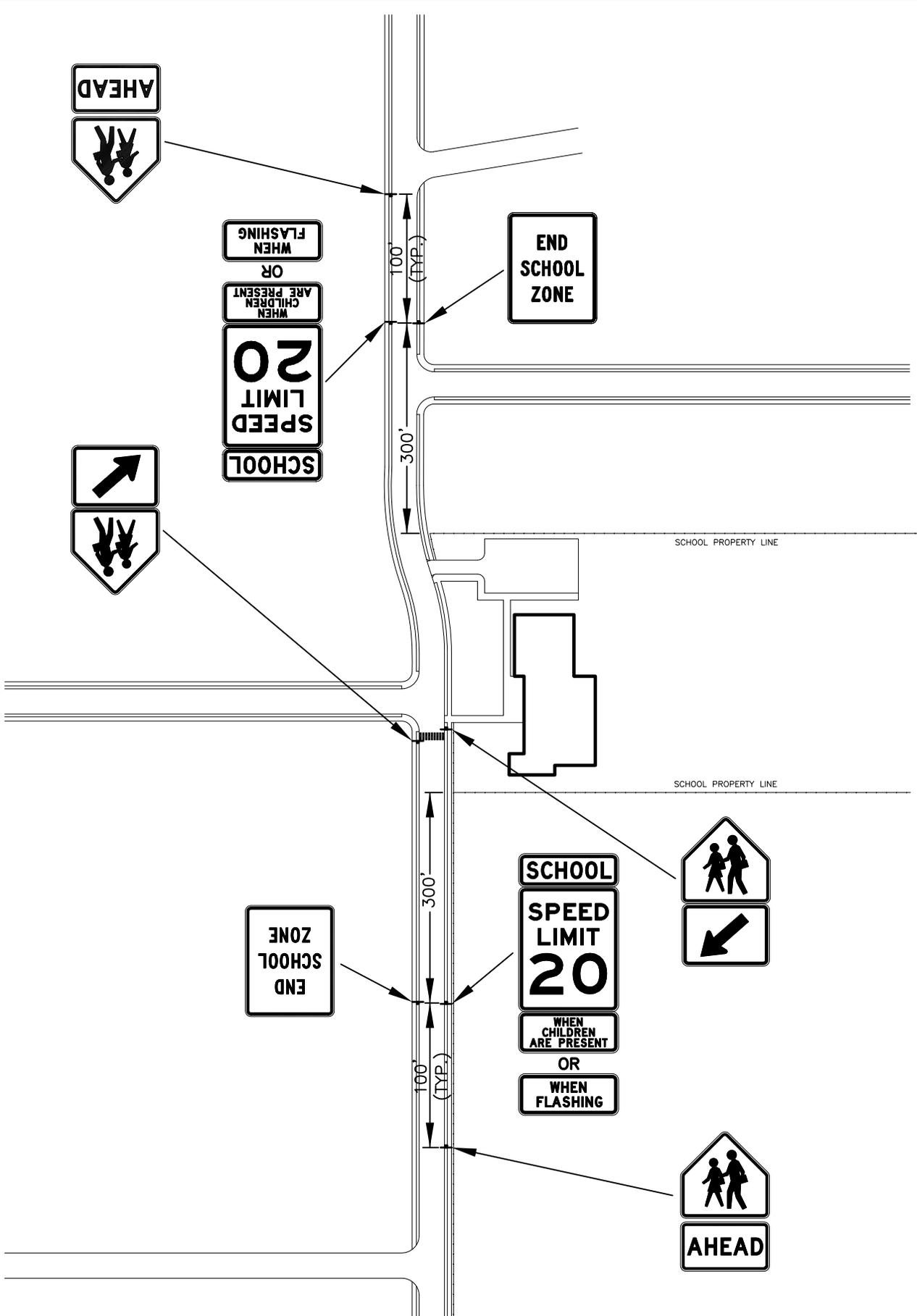
REV NO.	DATE	BY	APPR
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2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES
 APPROVED BY: *[Signature]*
 TRAFFIC ENGINEER MANAGER
 APPROVED DATE: 8/15/2008



CITY OF VANCOUVER
 CROSSWALKS LINE MARKINGS

STANDARD PLAN NUMBER
 T29-41



I:\CITYPPS\AUTOCAD\STD_DETAILS\DRAWING_FILES\T29-23.DWG

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

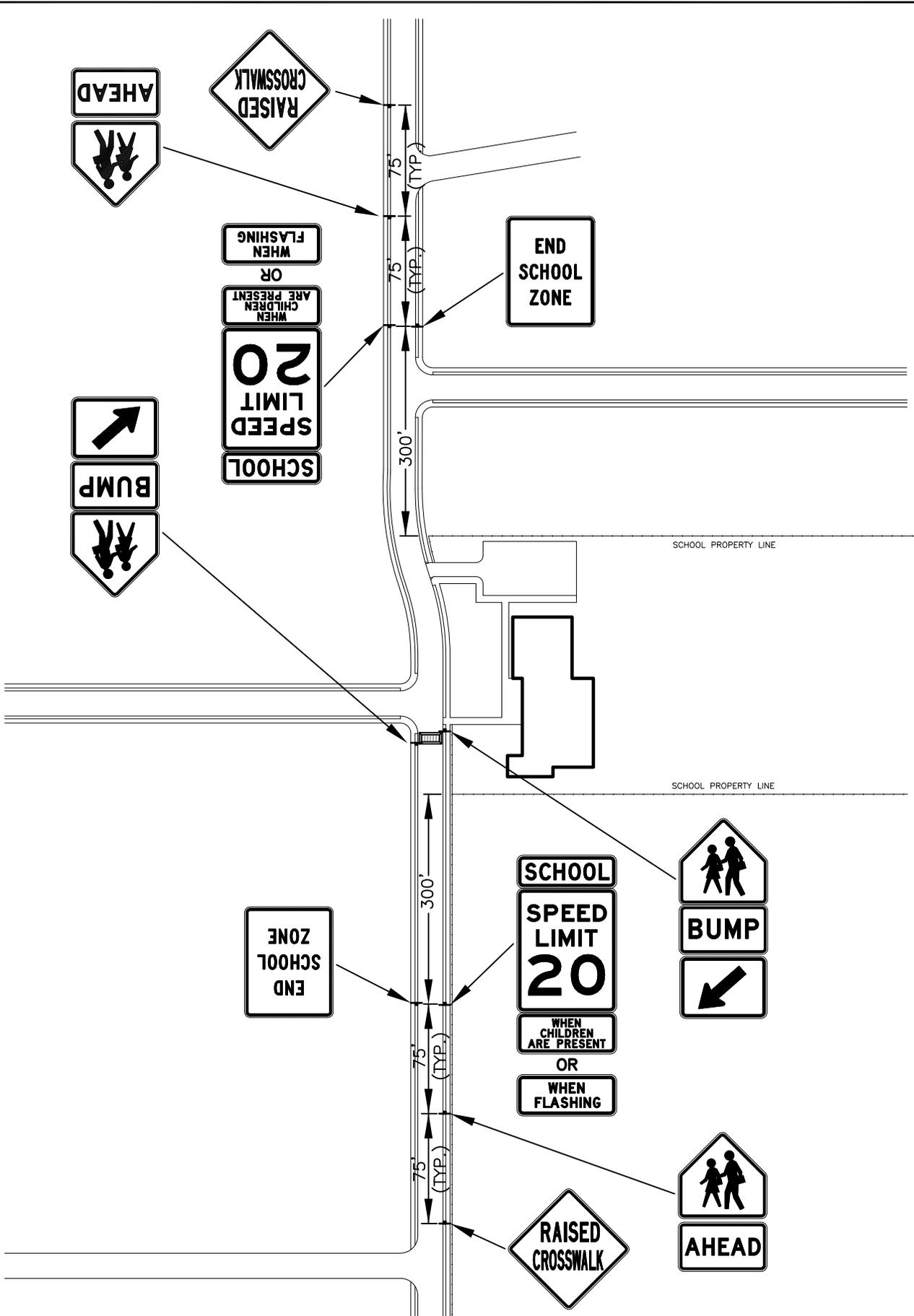
TRANSPORTATION SERVICES
 APPROVED BY: *[Signature]*
 TRAFFIC ENGINEER MANAGER
 APPROVED DATE: 8/15/2008



CITY OF VANCOUVER
 TYPICAL SIGNING FOR
 SCHOOL AREA TRAFFIC CONTROL

STANDARD PLAN NUMBER
 T29-23

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



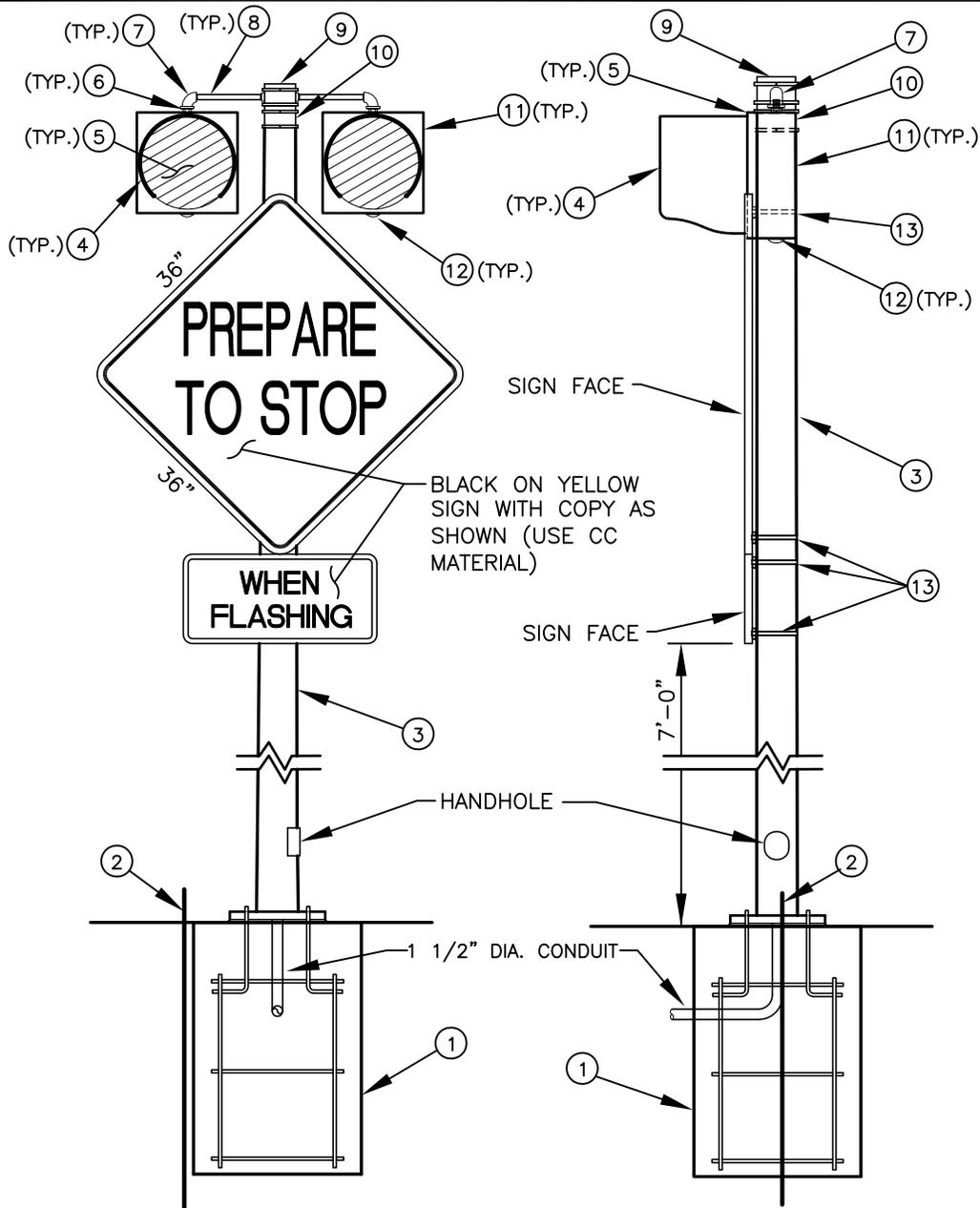
REV NO.	DATE	BY	APPR
1	8/04	RAW	AGE
2	3/06	RAW	AGE
3	2/07	RAW	AGE
4	8/08	RAW	AGE

TRANSPORTATION SERVICES
 APPROVED BY: *[Signature]*
 TRAFFIC ENGINEER MANAGER
 APPROVED DATE: 8/15/2008



CITY OF VANCOUVER
 TYPICAL SIGNING FOR
 SCHOOL AREA TRAFFIC CONTROL
 WITH RAISED CROSSWALK

STANDARD PLAN NUMBER
 T29-22



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.

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

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

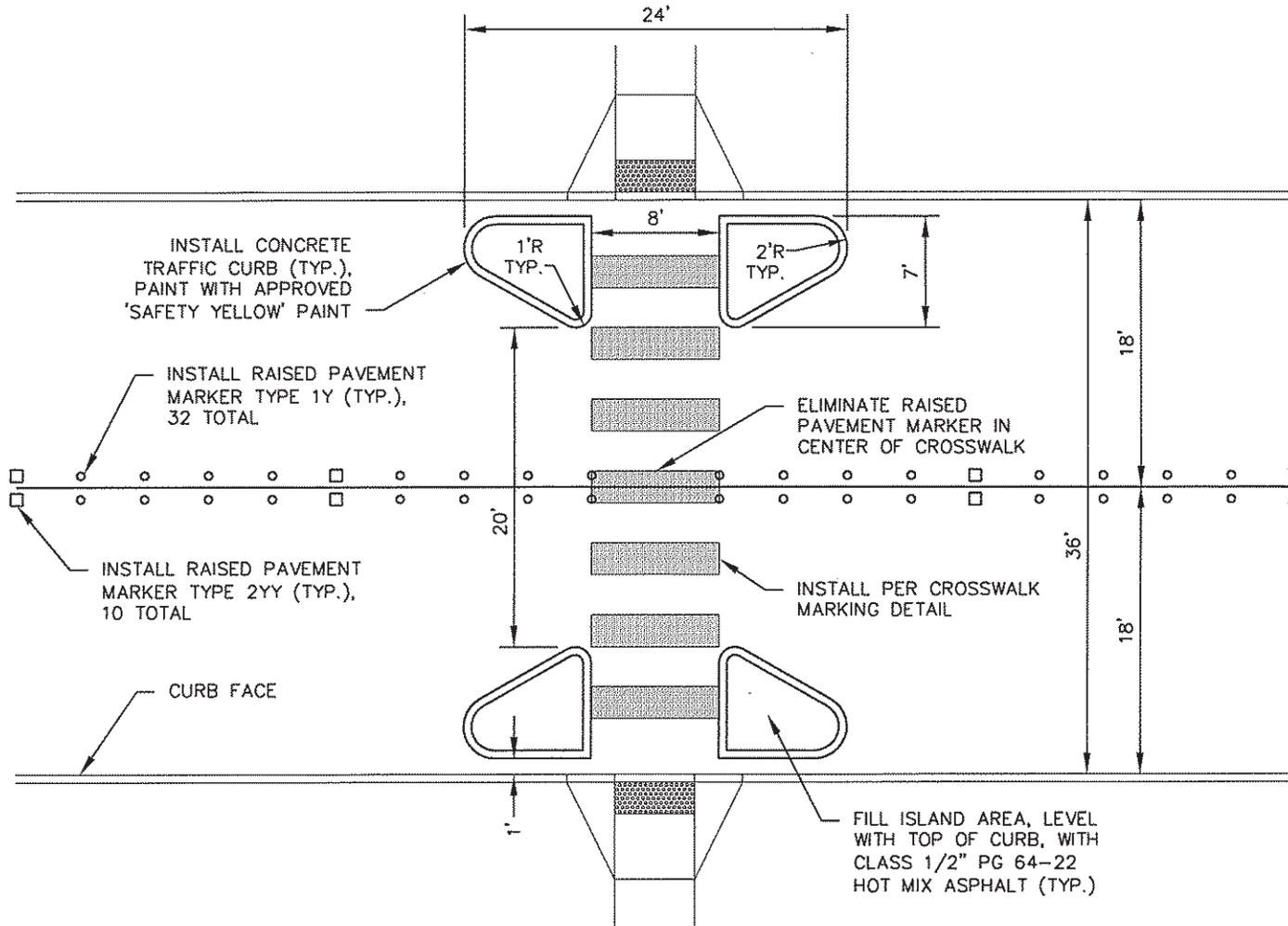
PUBLIC WORKS TRANSPORTATION

APPROVED BY: *[Signature]*
 TRAFFIC ENGINEER MANAGER
 APPROVED DATE: 7/1/2014



CITY OF VANCOUVER
SIGN AND FLASHER ASSEMBLY

STANDARD PLAN NUMBER
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



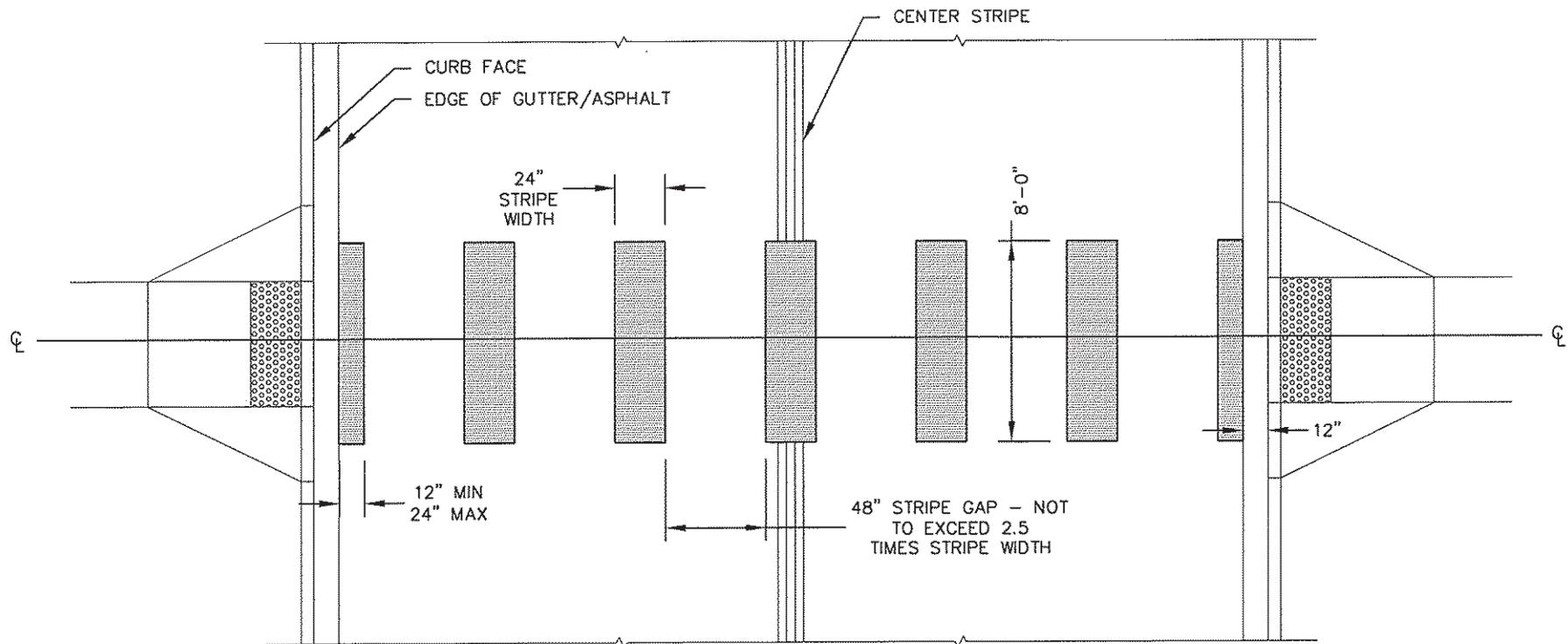
CITY OF CAMAS ~ STREET DETAIL
TRAFFIC CALMING BULB-OUT

Joan P. Coe 1-4-11
 DETAIL APPROVED BY DATE

DETAIL NO.

ST32

NOT TO SCALE



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.
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2	1/1/11	SCD	JC



CITY OF CAMAS ~ STREET DETAIL
MIDBLOCK CROSSWALK MARKINGS

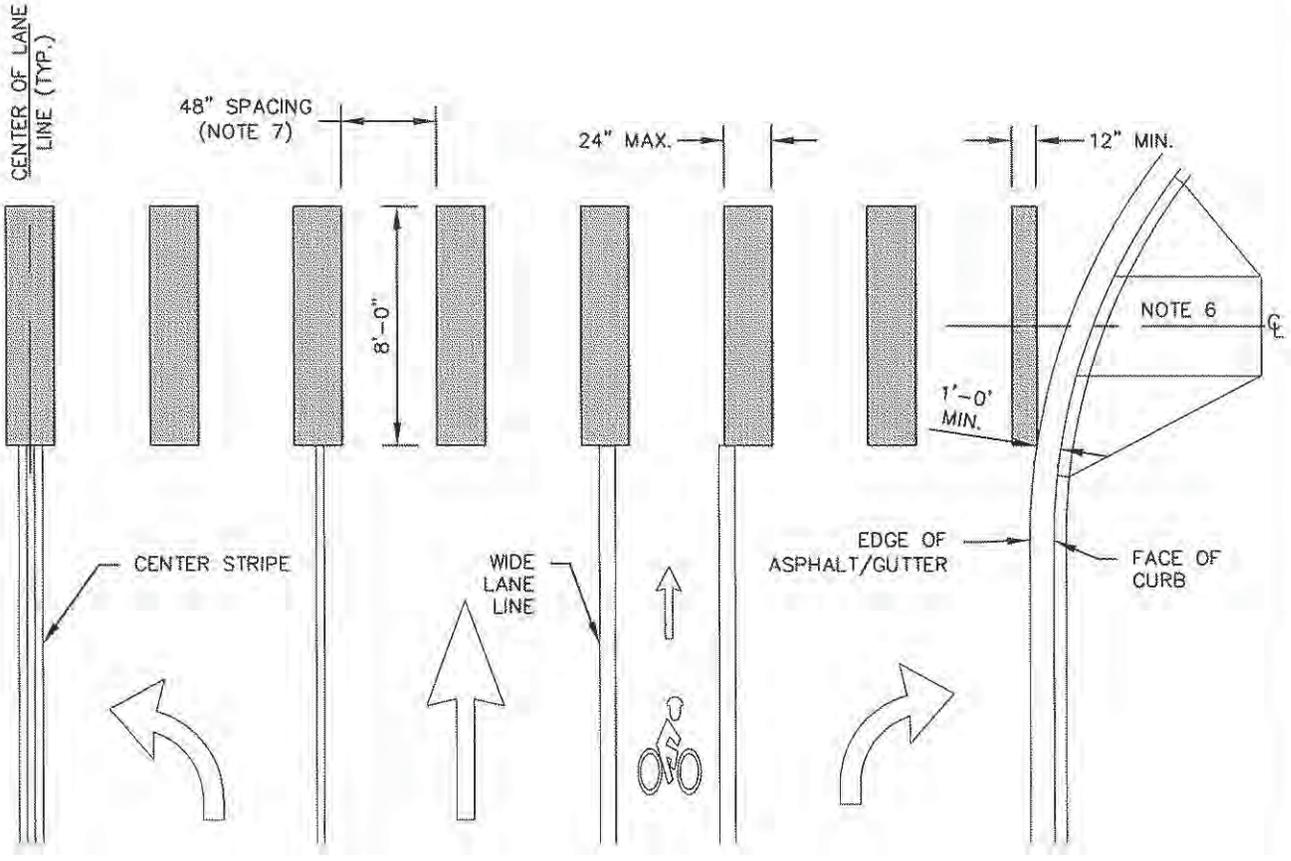
James P. Coakley 1-4-11
DETAIL APPROVED BY DATE

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



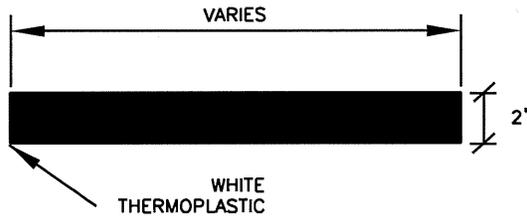
CITY OF CAMAS ~ STREET DETAIL
CROSSWALK MARKINGS

James E. Caruthers 1-4-11
DETAIL APPROVED BY DATE

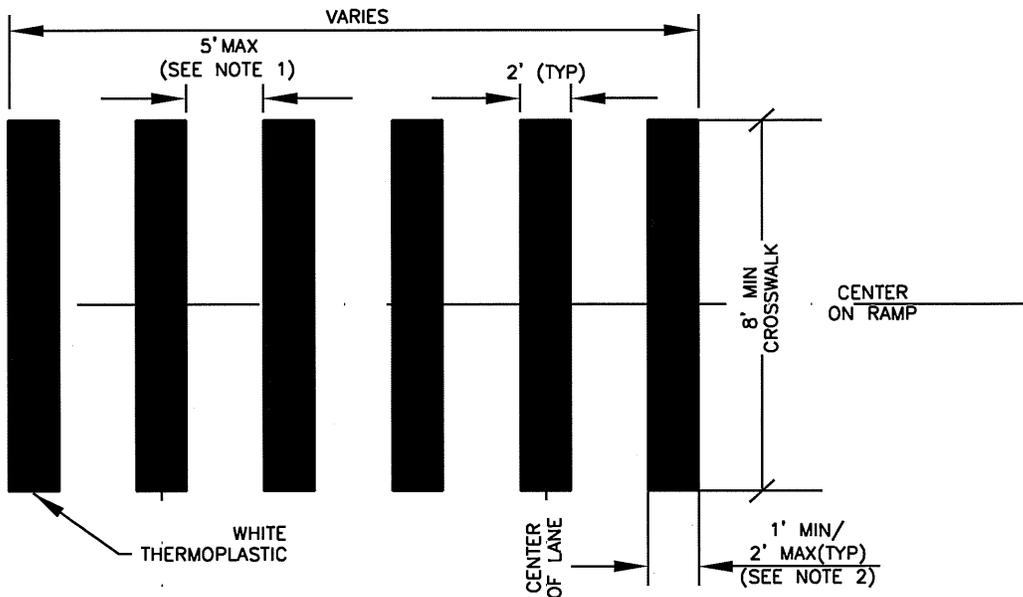
NOT TO SCALE

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

Rb
CITY ENGINEER
6/11/08
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

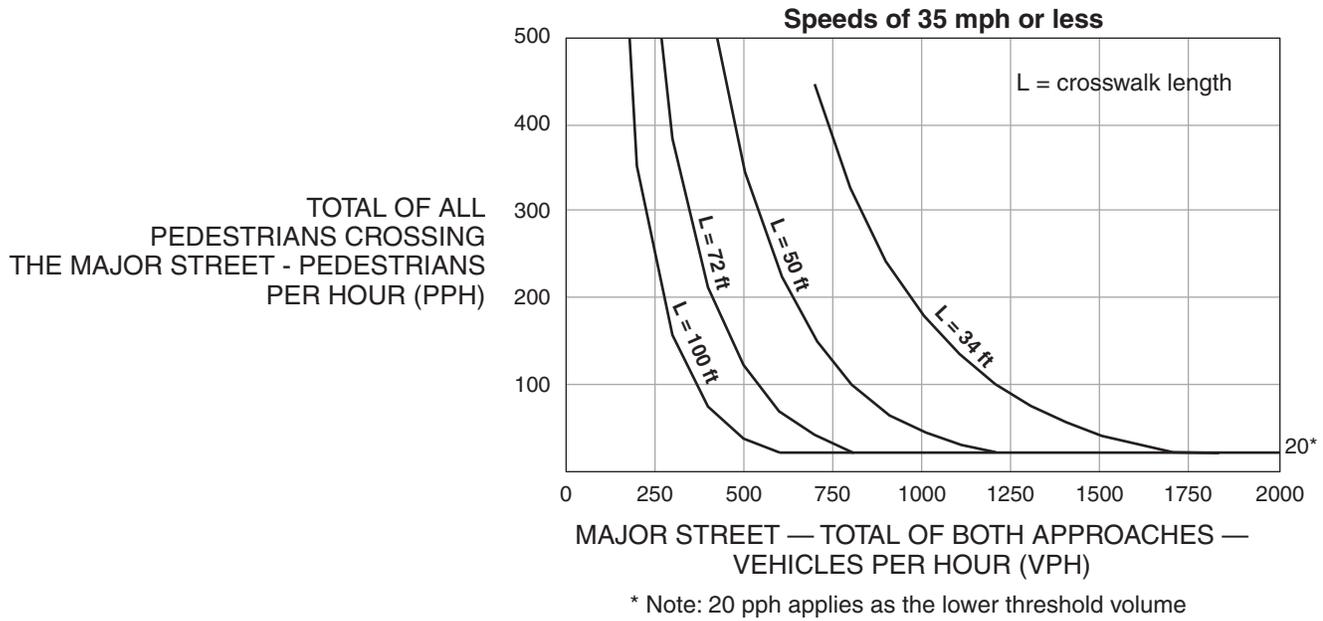
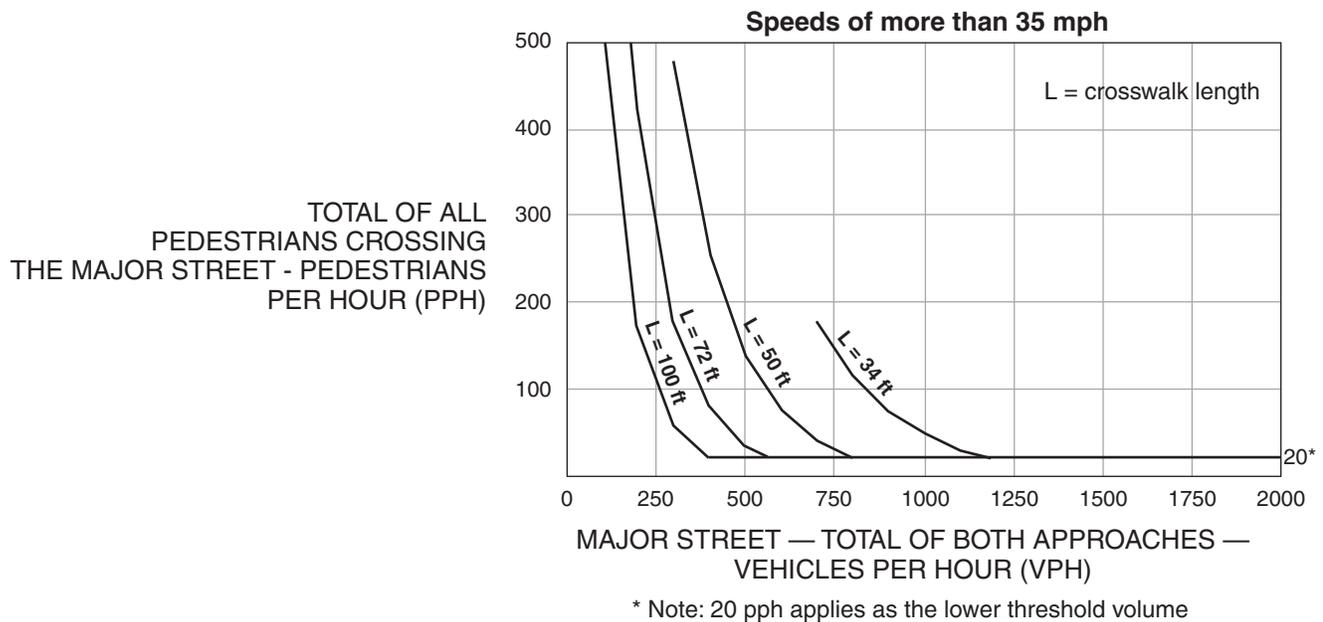


Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



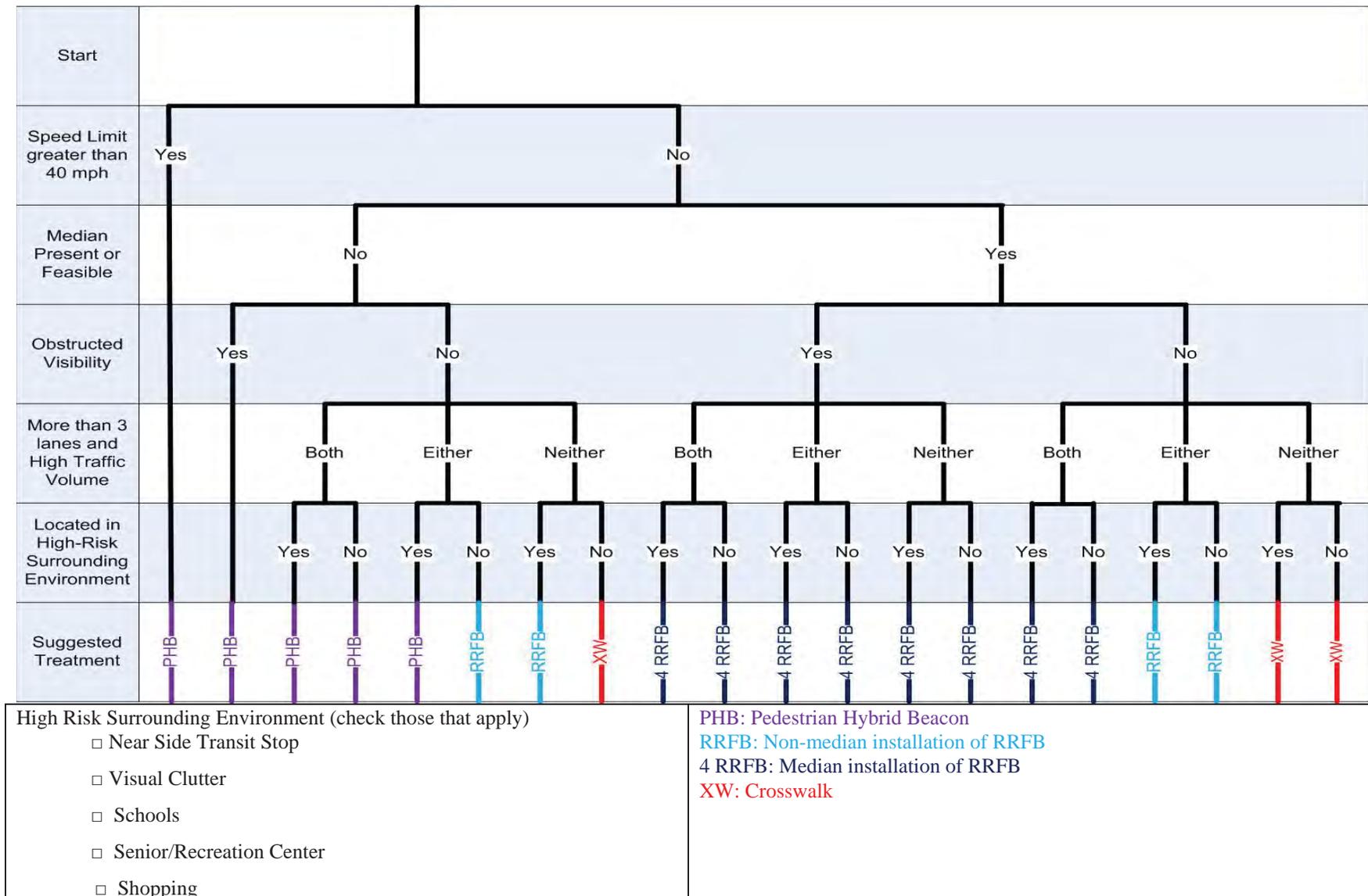


Figure 7.2: Crosswalk treatment decision matrix

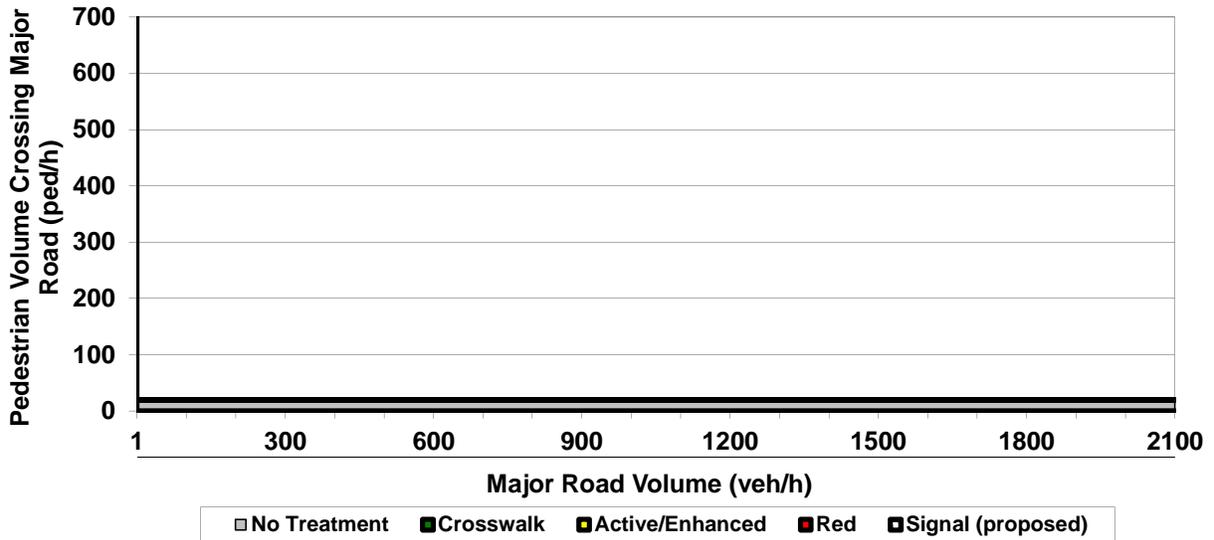
GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

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.

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.

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

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-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%
	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-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/>.