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### Stakeholder Group Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Role and Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert “Chip” Gallup</td>
<td>Field Services Manager, Charlotte-Mecklenburg Schools</td>
</tr>
<tr>
<td>Dick Winters</td>
<td>Built Environment/Safe Routes to School/Office of Policy &amp; Prevention, Mecklenburg County Public Health</td>
</tr>
<tr>
<td>George Berger</td>
<td>Region 4 Coordinator, NC Active Routes to School Program</td>
</tr>
<tr>
<td>Laura Thomason</td>
<td>Safe Routes to School Coordinator, Mecklenburg County Public Health</td>
</tr>
<tr>
<td>Tony Tagliaferri</td>
<td>Division 10 Traffic Engineer, North Carolina Department of Transportation</td>
</tr>
</tbody>
</table>

### Staff Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Role and Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debbie Smith</td>
<td>PE, Deputy Director, Charlotte Department of Transportation</td>
</tr>
<tr>
<td>Charles Abel</td>
<td>PE, PTOE, Engineering &amp; Operations Division Manager, Charlotte Department of Transportation</td>
</tr>
<tr>
<td>Angela Berry</td>
<td>PE, Traffic Safety, ITS &amp; Special Projects Section Manager</td>
</tr>
<tr>
<td>CDOT Engineering &amp; Operations</td>
<td></td>
</tr>
<tr>
<td>David Bost</td>
<td>PE, Engineering Project Coordinator, Charlotte Department of Transportation</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents

Chapter 1. Introduction & Background ................................................................................................................................. 1

Chapter 2. Decision Process for Traffic Treatments .................................................................................................................. 5

Chapter 3. Design Application Toolkit ................................................................................................................................... 13

**Appendices**

Appendix 1  Review of Relevant Local and State Plans

Appendix 2  NCDOT Typical Plans for School Zones

Appendix 3  Peer Municipality Review and Literature Review Memo
List of Figures

Figure 1. Illustration of School Zones and School Areas .................................................................2
Figure 2. MUTCD School Sign and Pavement Marking Legend .....................................................2
Figure 3. School Crossing Treatment Decision Process .............................................................9
Figure 4. Signing and Markings for School Zones ...................................................................18
Figure 5. Signing and Markings for School Speed Zones ........................................................19
DEFINITIONS and REQUIREMENTS

The following section defines school areas and minimum transportation treatments related to school zones. Figure 1 illustrates the relationship between school areas and school zones.

School Area
The school area is typically located within a half mile of a school’s property boundary where school-related activities are expected to occur.

School Zone
The portion of the roadway located within three hundred (300) feet of a school’s property line. This includes streets that directly front or are adjacent to the school’s main access. School zones are identified with a school sign (MUTCD S1-1) and “SCHOOL” pavement marking legend as shown in Figure 2.

School Speed Zone
The portion of a roadway located within three hundred feet of a school’s property line that includes an established school speed limit. This includes streets that directly front or are adjacent to the school’s main access.

School speed zones should be established at 25 miles per hour citywide.

By authority of the Director of Transportation or designee as stated in NCGS 20-141, school speed zones on city-maintained streets will be set at 25 miles per hour. The City will seek concurrence with the North Carolina Department of Transportation (NCDOT) to establish school speed zones on state-maintained streets in accordance with this policy.

School Crossing
The location of a pedestrian crossing along a roadway where school children cross. School crossings are typically within three hundred feet of a school’s property line on frontage or adjacent roadways. School crossings may include a marked crosswalk, traffic signal, or pedestrian hybrid beacon. Engineering evaluations shall be conducted to determine the appropriate treatments for school crossings.
VISION

The Charlotte Department of Transportation’s (CDOT) vision for the School Zone Implementation Guide (“Implementation Guide”) is to provide guidance on best design practices that enhance pedestrian and bicyclist accommodations and safety to, from, and around schools. This guidance accommodates both existing and future transportation needs around schools. The Implementation Guide supports the City’s commitment to Vision Zero and the design of safer streets.

PURPOSE

The City’s School Zone Policy, adopted in February 2019, outlines the eligibility, evaluation factors and requirements for school zone treatments to be considered. All public, private and charter schools with a minimum of 200 students are eligible for school transportation treatments and may be requested through school officials or through citizen request using CharMeck’s 311. Each request for school zone, school speed zone or school crossing is evaluated on several factors, including: school boundary and attendance area, number of students walking or bicycling, vehicular traffic volumes, vehicle speeds, CDOT’s High Injury Network map, geometric conditions of the roadway and street lighting. The Policy also addresses special considerations and evaluation for removal of school zone treatments.

The Implementation Guide has been prepared to provide guidance for engineering measures and treatments within and around school areas that employ best practices consistent with the most recent version of the Manual for Uniform Traffic Control Devices (MUTCD). Additionally, best practices from peer cities, the MUTCD, and other design resources from the National Association of City Transportation Officials (NACTO) and the American Association of State Highway Transportation Officials (AASHTO) were considered while creating this guide.

BACKGROUND

Charlotte’s roadways accommodate numerous motorized and non-motorized users, including automobiles, buses, heavy trucks, bicyclists, and pedestrians. In Charlotte, pedestrians and bicyclists are disproportionately impacted among traffic deaths compared to total crashes and mode share. Pedestrians and bicyclists are involved in less than 3 percent of all crashes; however they account for nearly 44 percent of all traffic deaths. While non-motorized users are a vulnerable population, children on roadways adjacent to schools are especially susceptible to unsafe road conditions. Vehicle speeds are an important factor contributing to real and perceived safety. Not only do higher vehicle speeds impact the visibility and reaction time of motorists, but they also greatly reduce the chance of survival of pedestrians involved in a collision. As vehicle speed increases, the chances of a pedestrian surviving a collision with a vehicle decrease. While vehicle speeds represent a real safety concern, wide roadways and/or the absence of transportation infrastructure (e.g., sidewalks, marked crosswalks) also influences the safety experience of pedestrians and school children.

Through various plans and policies, local, regional, and state agencies have committed to improving the safety and mobility of children accessing schools. In 2017,

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Charlotte WALKS, the City’s pedestrian plan, established action items focused on completing at least four school zone upgrades a year. The plan prioritizes new sidewalk and pedestrian crossing projects near schools, as well as coordination with partner agencies to collaborate on projects that improve pedestrian and bicycle access to school. The county’s Safe Routes to School initiative encourages communities to create opportunities to walk and bike by promoting the five “E’s”—education, encouragement, enforcement, engineering, and evaluation. The engineering component of this initiative strives to improve safety by addressing built environment deficiencies. Additionally, the City is adopting a Vision Zero strategy that emphasizes safety over speed in eliminating traffic-related fatalities and serious injuries.

REVIEW OF EXISTING POLICIES AND PLANS

There are a variety of existing policies, plans, and initiatives relevant to the development of CDOT’s Implementation Guide. These documents were reviewed to understand key goals and objectives for pedestrian and bicycle safety within the City of Charlotte. One plan of particular note is the Charlotte WALKS plan, which provides a five-year framework for improving walking in the City. The Charlotte WALKS plan recognizes that encouraging walking to school is a key part of creating a walkable city. The plan recommends updating the 2004 School Zone policy, which was completed in February 2019. Similarly, the Charlotte BIKES plan emphasizes goals to improve active transportation as an option for travelling to school. Refer to Appendix 1 for a complete summary of the documents reviewed.

NCDOT GUIDELINES AND PLANS

North Carolina law sets guidelines for School Speed Zones, only mandating that reduced speed limits are no lower than 20 mph and that “Reduced Speed Ahead” signs are placed 600 feet ahead of School Speed Zones. However, NCDOT’s standard practices establish minimum speeds of 25 mph and reductions no greater than 10 mph. NCDOT provides typical signage and marking plans for School Speed Zones. These plans are attached as Appendix 2.

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4 https://www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter_136/GS_136-33.2A.html
Chapter 2
Decision Process for Traffic Treatments
INTRODUCTION

This chapter outlines the process for determining whether a location is eligible for a School Crossing or a School Speed Zone. All actions recommended by this guidance are subject to modification based on engineering judgement.

APPLICATION PROCESS

Requests for the implementation of infrastructure in school zones or school areas are to be submitted to CDOT by the School’s Administrator. Citizens can also request school zone infrastructure through the CharMeck 311 system by calling 311. Charlotte’s School Zone Implementation Guide (“Implementation Guide”) is used to evaluate the request and determine the treatments for which the location is eligible. Once eligibility is determined, the design toolkit within the Implementation Guide provides context-sensitive design and implementation guidance. In cases where the location is neither eligible for a school speed zone nor a school crossing treatment, the appropriate review or further evaluation step is identified in the Implementation Guide.

All public, private and charter schools with a minimum of 200 students in kindergarten through 12th grade are eligible for transportation treatments under this policy. Schools that do not meet minimum requirements may be considered on a case-by-case basis.

The final determination of school traffic control treatments is subject to engineering judgement and is approved by the CDOT’s Traffic Safety Section. In the case of locations that are within North Carolina’s Department of Transportation’s (NCDOT) right-of-way, traffic control treatment recommendations shall be approved by the NCDOT division traffic engineer or designee.
Evaluations

CDOT will evaluate requests from school officials or citizens for a school zone, school speed zone, or school crossing. The evaluations will include a site visit during school arrival and departure times, and consider the following factors:

- School boundary and attendance area
- Number of students walking or bicycling
- Vehicular traffic volumes
- Vehicle speeds
- CDOT’s High Injury Network map
- Geometric conditions of the roadway
- Street lighting

School Speed Zone Treatment Decision Process

There are several criteria to consider for evaluating an eligible location for a school speed zone. Streets that directly front or are adjacent to the school’s main access are eligible locations. For requests at these locations with a speed limit of 25 mph, the following criteria are considered.

Vision Zero Criteria
School speed zones may be installed on adjacent streets with speed limit greater than 25 mph and within 300 feet of the school boundary in any direction if Vision Zero safety criteria is met. The Vision Zero criteria is met if either of the following applies within 300 feet of a school:

- There has been a pedestrian crash on the street segment in the past 5 years
- The street segment is on Charlotte’s High-Injury Network

School Activity Criteria
In the event the Vision Zero Criteria is not met, a school speed zone could be warranted if one of the following school activities occurs within 300 feet of a school. These must be observed at the field before, during and after the arrival and dismissal times.

- Students walking and/or biking to and from school
- Traffic activity where cars are queuing in the street at or around the school

Establishing a School Speed Limit
School speed zones should be established at 25 mph citywide per the policy. In cases where the proposed location falls on a state-owned street, CDOT will work with NCDOT to determine if a school speed zone is to be implemented and, if so, designate the school zone speed limit.

Crossing Treatment Decision Process

School Crossing Treatments may be installed within 300 feet of the school boundary in any direction if Vision Zero safety criteria is met and there are no existing crossings within 200 feet. The Vision Zero criteria is met if either of the following applies within 300 feet of a school:

- There has been a pedestrian crash on the street segment in the past 5 years
- The street segment is on Charlotte’s High-Injury network

Proposed crossing locations at stop-controlled legs of intersections must receive a score of at least 25 points to warrant a marked crosswalk (see Justification of Criteria and Point System for Crossing Treatments on page 8). Proposed crossing locations at non-stop-controlled locations with adequate stopping sight distance must receive a score of at
least 35 points to warrant a School Crossing Treatment. An Excel-based tool has been developed to facilitate evaluation of candidate locations. If conditions warrant a School Crossing Treatment, refer to Chapter 3 for guidance. Requests that do not ultimately warrant a School Crossing by these criteria should be referred to the City’s Pedestrian Crossing Committee. Figure 3 illustrates the School Speed Zone Treatment decision tree.
Figure 3. School Crossing Treatment Decision Process

*This step in the decision tree considers whether the proposed crossing is positioned on a stop-controlled leg of an intersection.
Criteria and Point System for Crossing Treatments

Vision Zero Safety Criteria
In line with Charlotte’s Vision Zero goals, locations with demonstrated safety concerns should be prioritized for treatment. Any location within 300 feet of a school with at least one pedestrian crash in the past 5 years or that is on the high-injury network automatically warrants a crossing treatment. All crashes within 200 feet of the proposed treatment location should be included in the crash history.

Presence of Stop-Control
During a review of national policies on school speed zones and crossing treatments, the cities of Orlando, FL and Seattle, WA provided best practice examples to inform the development of Charlotte’s policy and Implementation Guide. Refer to the Peer Municipality Review memorandum for additional information on other cities considered (Appendix 3). Both Orlando and Seattle consider the presence of traffic control as a first step in the crossing treatment decision process. However, Orlando distinguishes between controlled and uncontrolled locations while Seattle distinguishes based on the presence of stop control. Because signalized and four-way stop-controlled intersections should always have marked crosswalks, it is more appropriate to distinguish between stop-controlled locations (i.e., stop-controlled legs of 1- and 2-way stop-controlled intersections) and uncontrolled locations (i.e., mid-block crosswalks and free movements of 1- and 2-way stop-controlled intersections).

At stop-controlled legs, marked crosswalks alone do not substantially add to vehicle delay and serve to increase pedestrian visibility and mobility. Therefore, a lower point threshold (25 points) is required to install a marked crossing at a stop-controlled location while a higher point threshold (35 points) is required at non-stop-controlled locations.

Volume of School-Aged Children
No Maximum Points
This volume includes the total number of school-aged children crossing at the proposed location during the school arrival and dismissal peak hours. Pedestrian observations must differentiate school children crossing from other pedestrians (e.g., parents). While high volumes of school aged children may increase the need for a crossing treatment, it is important to recognize that there are locations where a crossing treatment would allow for school aged children to cross in locations where they are currently unable to cross. The allocation of points are based on the number of school aged children, and the number of points increases at a constant rate with increases in the number of pedestrians. The evaluation allocates 0.2 points per a school aged crossing child observed during the arrival and dismissal times. There is not a limit on the number of points that can be obtained for this criteria.

Vehicle Speeds
44 Points Maximum
The 85th percentile speed is the speed at or below which 85 percent of all vehicles are observed travelling. There is a well-documented relationship between vehicle impact speed and risk of pedestrian injury in crashes. At 20 mph, there is a 5 percent risk of pedestrian fatality. At 30 mph, the risk rises to 40 percent. At 40 mph, there is an 80 percent risk.\(^5\) For this reason, the number of points increases at an increasing

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rate for constant increases in 85th percentile vehicle speed. Vehicle speed and traffic volume are two important determinants of hazard to pedestrians, so they are highly weighted in the decision process. The 85th percentile speed should be measured through an engineering study.

**Peak Hour Traffic Volume**

*44 Points Maximum*

Higher traffic volumes substantially reduce perception of comfort and present higher risks to pedestrians. The number of points increases at an increasing rate for constant increases in peak hour traffic. Vehicle speed and traffic volume are two important determinants of hazard to pedestrians, and thus they are highly weighted in the decision process.

Ideally, traffic counts should be collected to accurately determine a roadway’s two-way vehicle volume during the peak hour of pedestrian crossing activity. However, it is acceptable to estimate the peak hour based on available daily traffic volumes (e.g., AADT, ADT, 48-hour tube counts). To derive the peak hour volume, multiply the daily traffic volume by a 9 percent K factor. A K factor is the ratio between a peak hour and the daily volume.

\[
\text{Estimated Peak Hour Traffic Volume} = 0.09 \times \text{Average Daily Traffic Volume}
\]

**Roadway Width**

*12 Points Maximum*

The roadway width determines the length of time pedestrians are exposed to vehicle traffic. As the width of the roadway increases (i.e., the number of travel lanes increases), pedestrians feel more exposed and less safe entering the intersection. For roadways with medians or pedestrian refuge islands, pedestrian exposure in the intersection is limited. At medians with at least 6 feet of protected space, it is more appropriate to treat the crossing as two distinct crossings of shorter length, as it is possible to use the median as a safe and comfortable pedestrian refuge. Therefore, the number of points awarded is based on the Effective Roadway Width, which is calculated as:

\[
\text{Effective Roadway Width} = \frac{\text{Roadway Width} - \text{Median Width}}{2, \text{if Median Width} \geq 6 \text{ ft}}
\]

If the median width is less than 6 feet, then the Effective Roadway Width is equal to the roadway width. Roadway width is measured from edge of pavement to edge of pavement and median width is measured from front of curb to front of curb. The number of points increases at an increasing rate for roadways of greater width because the perception of comfort is significantly worse for wide roadways.

**Vehicle Crash Rate**

*15 Points Maximum*

There are 15 possible points available based on the number of vehicle crashes over 3 years. All crashes within 200 feet of the proposed treatment location should be included in the crash history. The number of points increases at a constant rate with increases in the number of crashes.

**Gap Availability**

*10 Points Maximum*

While vehicle speeds, volumes, and roadway width contribute to crossing risk, a safe crossing ultimately requires a gap in vehicle traffic of sufficient duration. This length of time is defined as the critical gap, which

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is calculated as:

\[
\text{Critical Gap (s)} = \text{Startup Time (s)} + \frac{\text{Effective Roadway Width (ft)}}{\text{Pedestrian Walking Speed (ft/s)}}
\]

NCDOT guidelines recommends the use of 3 seconds as a startup time and a pedestrian walking speed of 3 feet per second.\(^8\) The number of gaps in vehicle traffic greater than or equal to the duration of the critical gap should be observed and measured over the peak hour of student crossing traffic. If the roadway has a median of at least 6 feet in width, the gap availability should be measured separately for the two directions of traffic, and the direction with lower gap availability (i.e., higher score) should be used to compute the number of points awarded.

\(^8\) Institute of Transportation Research and Education (ITRE), North Carolina State University. (2015). North Carolina Pedestrian Guidance. Raleigh, NC.
Chapter 3
Design Application Toolkit
INTRODUCTION

This chapter provides guidance for the implementation of School Zones, School Speed Zones and School Crossing Treatments, when warranted.

Plans should be prepared and maintained by the City of Charlotte for approved school zone treatments. Plans should be signed and sealed by the Engineer of record.

SCHOOL AREA TREATMENTS

School Area Signage

The S1-1 sign can be used to warn motorists that they are approaching a School Area that might include school buildings or grounds, a school crossing, or a school-related activity adjacent to the highway (MUTCD Section 7B.08).

The S1-1 sign is used in conjunction with SCHOOL pavement markings in designated School Zones.

School Advance Crossing Assembly on Scaleybark Road
SCHOOL SPEED ZONE TREATMENTS

The decision process presented in Chapter 2 determines whether the location and conditions of a roadway segment warrant a School Speed Zone. This section provides further guidance on the implementation of school speed zones.

School speed zones are enforceable during each of the windows that encompass arrival and dismissal times. Specifically, these windows are typically 30 minutes before the arrival time until 10 minutes after, and 10 minutes before the dismissal time until 30 minutes after. Other times may be considered on a case by case basis.

School Speed Zone Purpose
- Reduce vehicle speeds to improve student pedestrian safety during times of high student pedestrian activity (i.e., arrival and dismissal)
- Increase motorist awareness of the presence of children
- Provide additional legal sanctions to further discourage speeding

Adjacent School Zones
When a new location is under review for a school speed zone, its proximity to other schools and all adjacent school zones should be identified. CDOT will determine if school zones should be combined. This evaluation will include several factors including bell schedules, distance between school zones, sidewalk connectivity, pedestrian crossing locations, and school boundaries.

Speed Reduction
- All School Speed Zones on City-maintained roadways should have posted speed limits of 25 mph.
- All School Speed Zones on State-maintained roadways are coordinated with NCDOT on a case-by-case basis.
- The reduced School Zone speed limit may not be less than 25 mph.

School Speed Zone Signing
Required signing considerations from the MUTCD are listed below.

Resources
- MUTCD Section 7B.15 School Speed Limit Assembly and END SCHOOL SPEED LIMIT Sign
- MUTCD Section 7B.16 Reduced School Speed Limit Ahead Sign

Required Considerations (MUTCD Section 7B.15)
- An S4-5 sign should be installed in advance of school speed zone reductions. An S4-4P or S4-1P plaque can be added to supplement the S4-5 sign.
- If flashing beacons are present, a School Speed Limit (S5-1) sign shall be used to indicate the speed limit where a reduced school speed limit zone has been established.
- If flashing beacons are not present, a School Speed Limit Assembly (S4-3P, R2-1,S4-1P) with the times of enforcement shall be used to indicate the speed limit where a reduced school
A School (S1-1) sign shall be installed in advance (see MUTCD Table 2C-4) of the first School Speed Limit sign assembly or S5-1 sign that is encountered in each direction as traffic approaches the reduced school speed limit zone.

A $250 FINE (R2-6bP) plaque may be installed as a supplement to the reduced school speed limit sign to notify road users.

An END SCHOOL ZONE (S5-2) sign shall be installed at each downstream end of the zone to notify road users of the termination of the increased fines zone.

Flashing Beacons

Flashing beacons should supplement School Speed Zone signage on thoroughfares wherever the speed limit is reduced to 25 mph.

Required Considerations if deployed

- If flashing beacons are present, a School Speed Limit (S5-1) sign shall be used to indicate the speed limit where a reduced school speed limit zone has been established (MUTCD Section 7B.15).
- Beacons shall be flashed at a rate of no less than 50 and no more than 60 times per minute. The illuminated period of each flash may be a minimum of 1/2 and a maximum of 2/3 of the total cycle (MUTCD Section 4L.01).
- A Speed Limit Sign Beacon shall consist of one or more signal sections of a standard traffic control signal face, with a flashing CIRCULAR YELLOW signal indication in each signal section. The signal indications shall have a nominal diameter of no less than 8 inches (CDOT uses 12 inch beacons). If two signal indications are used, they shall be vertically aligned, except that they shall be permitted to be horizontally aligned if the Speed Limit (R2-1) sign is longer horizontally than vertically. If two signal indications are used, they shall be alternately flashed (MUTCD Section 4L.04).

Additional Considerations

- A Speed Limit Sign Beacon may be used with a fixed or dynamic Speed Limit sign. If
applicable, a flashing Speed Limit Sign Beacon (with an appropriate accompanying sign) may be used to indicate that the displayed speed limit is in effect (MUTCD Section 4L.04).

- Flashing beacon programming should include the ability to make changes to the flash schedule to account for modifications under unforeseen circumstances (i.e. snow days, make up days).

Dynamic Speed Limit Sign

Dynamic Speed Limit Signs (also known as Changeable Message Signs) are recommended in cases where the approach speed is greater than 45 mph.

Required Considerations if Deployed (MUTCD Section 7B.15)

- Although it might not always be practical to make changeable message signs conform in all respects to the standards in the MUTCD for fixed-message signs, during the periods that the school speed limit is in effect, their basic shape, message, legend layout, and colors should comply with the standards for fixed-message signs.
- Fluorescent yellow-green pixels shall be used when the “SCHOOL” message is displayed on a changeable message sign for a school Dynamic Speed Limit Sign speed limit.

SCHOOL Pavement Marking

Required pavement marking considerations from the MUTCD are listed below.

Recommended Considerations (MUTCD Section 3B.19)

- SCHOOL Pavement markings should be used at the start of a School Speed Zone wherever possible
- If used, the SCHOOL word marking may extend to the width of two approach lanes
- If the two-lane SCHOOL word marking is used, the letters should be 10 feet or more in height.

SCHOOL Pavement Markings on Scaleybark Road

The signage and markings ultimately used in a school zone vary based on the roadway context. A diagram of typical signage and pavement markings along a school zone on a local street is provided in Figures 4. On thoroughfares and collector streets (30 mph or greater), the signage and pavement markings are enhanced with flashers and supplemental signage. A diagram of the typical signage and pavement markings along a school zone is provided in Figure 4. A diagram of the typical signage and pavement markings along a school speed zone is provided in Figure 5.
Figure 4. Signing and Markings for School Zones

LEGEND

* As directed by Engineer
Figure 5. Signing and Markings for School Speed Zones
SCHOOL CROSSING TREATMENTS

The following section discusses the type of treatments that can be implemented at locations where a school crossing is warranted based on the decision process outlined in Chapter 2. CDOT and school administrators should consider key characteristics (e.g., facility type, vehicle speeds, vehicle volumes, land use context, etc.) at proposed crossing locations and the potential list of crossing treatments prior to identifying any countermeasures to improve safety. A list of potential crossing treatments for uncontrolled crossing locations includes:

- High-visibility crosswalk markings
- Parking restrictions on crosswalk approach
- Adequate nighttime lighting levels
- Crossing warning signs
- Raised crosswalk
- Advance Yield Here To Pedestrians sign and yield (stop) line
- In-Street Pedestrian Crossing sign
- Curb extension
- Pedestrian refuge island
- Rectangular Rapid-Flashing Beacon (RRFB)
- Pedestrian Hybrid Beacon (PHB)

Subsequent sections provide additional information for each of the potential crossing treatments, including design and implementation guidance from Charlotte’s Pedestrian Crossing Guidelines, the MUTCD, AASHTO, and/or NACTO.

Accessibility Considerations

In accordance with the American Disability Act (ADA), accessibility for all users must be considered for crossings. Key guidance on ADA compliance and accessibility that is relevant to school crossings is summarized below.

Resources

- MUTCD Section 4E.09 – Accessible Pedestrian Signals and Detectors – General
- MUTCD Section 4E.10 – Accessible Pedestrian Signals and Detectors – Location
- MUTCD Section 4E.11 – Accessible Pedestrian Signals and Detectors – Walk Indications
- MUTCD Section 4E.12 – Accessible Pedestrian Signals and Detectors – Tactile Arrows and Locator Tones
- MUTCD Section 4E.13 – Accessible Pedestrian Signals and Detectors – Extended Pushbutton Press Features
- PROWAG Sections R208 and R305 – Detectable Warnings
- PROWAG Section R304 – Curb Ramps and Blended Transitions

Purpose

All pedestrian crossings shall comply with the Americans with Disabilities Act (ADA), United States Access Board Proposed Rights-of-Way Guidelines (PROWAG), and MUTCD to ensure the safety and accessibility of crossings for those with disabilities. The Charlotte Land Development Standards Manual (CLDSM) is based upon the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG), a proposed rule which is recommended as a best practice by the Federal Highway Association (FHWA).

Required Considerations (MUTCD Section 4E.09 – Accessible Pedestrian Signals and Detectors – General)

- When utilized, accessible pedestrian signals shall be used in combination with pedestrian signal timing. The information provided by an accessible pedestrian signal shall clearly indicate which pedestrian crossing is served by each device.
- Under stop-and-go operation, accessible pedestrian signals shall not be limited in
operation by the time of day or day of week.

- At accessible pedestrian signal locations where pedestrian pushbuttons are used, each pushbutton shall activate both the walk interval and the accessible pedestrian signals.

**Required Considerations (MUTCD Section 4E.10 – Accessible Pedestrian Signals and Detectors – Location)**

- If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with the following features (see MUTCD Sections 4E.11 through 4E.13):
  - A pushbutton locator tone
  - A tactile arrow
  - A speech walk message for the WALKING PERSON (symbolizing WALK) indication, and
  - A speech pushbutton information message
- If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait and accessible pedestrian pushbuttons are used, additional accessible pedestrian push buttons shall be provided in the median.

**Required Considerations (MUTCD Section 4E.11 – Accessible Pedestrian Signals and Detectors – Walk Indications)**

- Accessible pedestrian signals shall have both audible and vibrotactile walk indications.
- Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton (see MUTCD Section 4E.12) that vibrates during the walk interval.
- Accessible pedestrian signals shall have an audible walk indication during the walk interval only. This indication shall be audible from the beginning of the associated crosswalk. The accessible walk indication shall have the same duration as the pedestrian walk signal except when the pedestrian signal rests in walk.
- Where two accessible pedestrian signals are separated by a distance of at least 10 feet, the audible walk indication shall be a percussive tone. Where two accessible pedestrian signals on one corner are not separated by a distance of at least 10 feet, the audible walk indication shall be a speech walk message.
- Audible tone walk indications shall repeat at eight to ten ticks per second. Audible tones used as walk indications shall consist of multiple frequencies with a dominant component at 880 Hz.
- Automatic volume adjustment in response to ambient traffic sound level shall be provided up to a maximum volume of 100 dBA.
- If speech walk messages are used to communicate the walk interval, they shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. Speech walk messages shall be used only at intersections where it is technically infeasible to install two accessible pedestrian signals at one corner separated by a distance of at least 10 feet.
- Speech walk messages that are used at intersections having pedestrian phasing that is concurrent with vehicular phasing shall be patterned after the model: "Broadway. Walk sign is on to cross Broadway."
- Speech walk messages that are used at intersections having exclusive pedestrian phasing shall be patterned after the model: "Walk sign is on for all crossings."
- Speech walk messages shall not contain any additional information, except for designations such as "Street" or "Avenue" where this information is necessary to avoid ambiguity at a particular location.
- A speech walk message is not required at
times when the walk interval is not timing, but, if provided:
  o It shall begin with the term "wait."
  o It need not be repeated for the entire time that the walk interval is not timing.
• If a pilot light (see MUTCD Section 4E.08) is used at an accessible pedestrian signal location, each actuation shall be accompanied by the speech message "wait."
• Following the audible walk indication, accessible pedestrian signals shall revert to the pushbutton locator tone (see MUTCD Section 4E.12) during the pedestrian change interval.

Required Considerations (MUTCD Section 4E.12 – Accessible Pedestrian Signals and Detectors – Tactile Arrows and Locator Tones)
• To enable pedestrians with visual disabilities to distinguish and locate the appropriate pushbutton at an accessible pedestrian signal location, pushbuttons shall clearly indicate which crosswalk signal is actuated by each pushbutton by means of tactile arrows. Tactile arrows shall be located on the pushbutton, have high visual contrast (light on dark or dark on light), and be aligned parallel to the direction of travel on the associated crosswalk.
• An accessible pedestrian pushbutton shall incorporate a locator tone.
• Pushbutton locator tones shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals.
• Pushbutton locator tones shall be deactivated when the traffic control signal is operating in a flashing mode. This requirement shall not apply to traffic control signals or pedestrian hybrid beacons that are activated from a flashing or dark mode to a stop-and-go mode by pedestrian actuations.
• Pushbutton locator tones shall be intensity responsive to ambient sound and be audible 6 to 12 feet from the pushbutton, or to the building line—whichever is less.

Required Considerations (MUTCD Section 4E.13 – Accessible Pedestrian Signals and Detectors – Extended Pushbutton Press Features)
• If an extended pushbutton press is used to provide any additional feature(s), a pushbutton press of less than one second shall actuate only the pedestrian timing and any associated accessible walk indication. A pushbutton press of one second or more shall actuate the pedestrian timing, any associated accessible walk indication, and any additional feature(s).
• If additional crossing time is provided by means of an extended pushbutton press, a push button for 2 seconds of extra crossing time (R10-32P) plaque (see MUTCD Figure 2B-26) shall be mounted adjacent to or integral with the pedestrian pushbutton.
• If audible beaconing is used, the volume of the pushbutton locator tone during the pedestrian change interval of the called pedestrian phase shall be increased and operated in one of the following ways:
  o The louder audible walk indication and louder locator tone comes from the far end of the crosswalk, as pedestrians cross the street
  o The louder locator tone comes from both ends of the crosswalk
  o The louder locator tone comes from an additional speaker that is aimed at the center of the crosswalk and that is mounted on a pedestrian signal head.
• If speech pushbutton information messages are made available by actuating the accessible pedestrian signal detector, they
shall only be actuated when the walk interval is not timing. They shall begin with the term "Wait," followed by intersection identification information modeled after: "Wait to cross Broadway at Grand." If information on intersection signalization or geometry is also given, it shall follow the intersection identification information.

**Required Considerations (PROWAG Sections R208 and R305 and CLDSM – Detectable Warnings)**

- Detectable warning surfaces complying with PROWAG Section R305 shall be provided at the following locations on pedestrian access routes:
  - Curb ramps and blended transitions at pedestrian street crossings;
  - Pedestrian refuge islands
- Detectable warning surfaces shall consist of truncated domes aligned in a square or radial grid pattern and shall comply with PROWAG Section R305. The placement of detectable warning surfaces shall comply with PROWAG Section R305.2.
- The CLDSM provides guidelines on various ramp types (Standard # 10.31A-B, 10.33, 10.35A, 10.40A-C) as well as details for truncated domes (Standard # 10.35B).

**Required Considerations (PROWAG Section R304 – Curb Ramps and Blended Transitions)**

- Curb ramps and blended transitions shall comply with PROWAG Section R304.
- Curb ramps and blended transitions shall comply with PROWAG Section R304.5.
- Perpendicular curb ramps shall comply with PROWAG Sections R304.2 and R304.5.
- Parallel curb ramps shall comply with PROWAG Sections R304.3 and R304.5.
- Blended transitions shall comply with PROWAG Sections R304.4 and R304.5.

**Crosswalk Visibility Enhancements**

**Resource**
MUTCD Section 3B.18 – Crosswalk Markings

**Purpose**
Crosswalk markings guide pedestrians who are crossing roadways. High-visibility crosswalk markings can provide more notice to motorists, giving motorists sufficient time to yield to pedestrians, than the traditional parallel lines. The City’s standard high visibility crossing installation is a piano key marking. Required considerations from the MUTCD are listed below.

**Required Consideration**
When crosswalk lines are used, they shall consist of solid white lines that mark the crosswalk. They shall not be less than 6 inches or greater than 24 inches in width.

**Raised Crosswalks**

**Resources**
- MUTCD Section 3B.25 – Speed Hump Markings
- NACTO Urban Street Design Guide – Vertical Speed Control
Raised crosswalks are a traffic calming measure that serve as an extension of the sidewalk and allow a pedestrian to cross the street at a constant grade. They help reduce vehicle speeds in locations where this cannot be achieved using conventional traffic calming elements. Required considerations from the MUTCD are listed below. Reference the resources mentioned above for additional guidance and information.

**Required Considerations (MUTCD Section 3B.25)**

- If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location.
- If markings are used for a speed hump that does not also function as a crosswalk or speed table, the markings shall comply with Option A, B, or C, shown in MUTCD Figure 3B-29.
- If markings are used for a speed hump that also functions as a crosswalk or speed table, the markings shall comply with Option A or B, shown in MUTCD Figure 3B-30.

**Recommended Considerations (NACTO and PBIC)**

- Speed tables should not be applied on streets wider than 50 feet.
- Visually impaired pedestrians need warning strips at edges to indicate the beginning of the crosswalk.
- Raised crosswalks on emergency access routes and bike routes should include appropriately-sized wheel cutouts that allow these vehicles to pass unaffected.

**Advance Yield Here Pedestrians Sign and Yield Line**

**Resources**

- MUTCD Section 2B.11 – Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs
- MUTCD Section 3B.16 – Stop lines

**Purpose**

According to NC General Statute § 20-173, a driver must yield the right-of-way, by slowing down or stopping, if need be, to yield to a pedestrian crossing the roadway within any marked crosswalk or within any unmarked crosswalk at or near an intersection.
Advance Yield Here To Pedestrians signs can improve visibility at crossing locations and improve motorist complying with yielding to pedestrian right-of-way. The signs are placed 20 to 50 feet in advance of the marked crosswalk. The Advanced Yield Here to Pedestrian Signs should be installed along with the shark teeth yield markings. Required considerations from the MUTCD are listed below.

**Required Considerations (MUTCD Section 2B.11)**
- Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs (see MUTCD Figure 2B-2) shall be used if yield (stop) lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach. The Stop Here for Pedestrians signs shall only be used where the law specifically requires that a driver must stop for a pedestrian in a crosswalk. The legend STATE LAW may be displayed at the top of the R1-5, R1-5a, R1-5b, and R1-5c signs, if applicable.
- If a W11-2 sign has been post-mounted at the crosswalk location where a Yield Here To (Stop Here For) Pedestrians sign is used on the approach, the Yield Here To (Stop Here For) Pedestrians sign shall not be placed on the same post or block the road user’s view of the W11-2 sign.

**Required Considerations (MUTCD Section 3B.16)**
- Except as provided in Section 8B.28, stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here To Pedestrians (R1-5 or R1-5a) sign, nor at locations on uncontrolled approaches where drivers are required by State law to yield to pedestrians.
- Yield lines shall not be used at locations where drivers are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, a traffic control signal, or some other traffic control device.
- Stop lines shall consist of solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.
- Yield lines (see MUTCD Figure 3B-16) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles and extending across approach lanes to indicate the point at which the yield is intended or required to be made.
- If yield (stop) lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Yield Here To [Stop Here For] Pedestrians (R1-5 series) signs (see Section 2B.11) shall be used.

**In-street Pedestrian Crossing Sign**

**Purpose**
In-Street Pedestrian Crossing signs can improve visibility at crossing locations, reduce excessive vehicle speeds on roads with speed limits of 30 mph or less, and increase motorist yielding to pedestrians. In-street signs are placed in the middle of the roadway at a crossing and are often used in conjunction with refuge islands. Required considerations from the MUTCD are listed below.

**Resource**
- MUTCD Section 2B.12 – In-Street and Overhead Pedestrian Crossing Signs

**Required Considerations**
- If used, the In-Street Pedestrian Crossing sign shall be placed in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. The In-Street Pedestrian Crossing sign shall not be post-mounted on the left-hand or right-hand side.
of the roadway.  
• If used, the Overhead Pedestrian Crossing sign shall be placed over the roadway at the crosswalk location.  
• An In-Street or Overhead Pedestrian Crossing sign shall not be placed in advance of the crosswalk to educate road users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk.  
• The In-Street Pedestrian Crossing sign and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.  
• The STOP FOR legend shall only be used in States where the State law specifically requires a driver to stop for a pedestrian in a crosswalk.  
• The In-Street Pedestrian Crossing sign shall have a black legend (except for the red STOP or YIELD sign symbols) and border on a white background, surrounded by an outer yellow or fluorescent yellow-green background area (see MUTCD Figure 2B-2). The Overhead Pedestrian Crossing sign shall have a black legend and border on a yellow or fluorescent yellow-green background at the top of the sign and a black legend and border on a white background at the bottom of the sign (see MUTCD Figure 2B-2).  
• Unless the In-Street Pedestrian Crossing sign is placed on a physical island, the sign support shall be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle.  
• The top of an In-Street Pedestrian Crossing sign shall be a maximum of 4 feet above the pavement surface. The top of an In-Street Pedestrian Crossing sign placed in an island shall be a maximum of 4 feet above the island surface.  

Pedestrian Refuge Island  

Resources  
• MUTCD Section 3B.10—Approach Markings for Obstructions  
• MUTCD Section 3B.18—Crosswalk Markings  
• MUTCD Section 3B.23—Curb Markings  

Purpose  
On two-way streets, a pedestrian refuge island enables pedestrians to complete a two-stage crossing by providing a place to stand and wait for motorists to stop or yield. In addition, the pedestrian refuge island can facilitate two-stage crossings where pedestrians cross one direction of traffic at a time and look towards oncoming traffic before completing the second part of the crossing. The minimum pedestrian refuge island width is 6 feet for vertical curb and 9 feet for curb and gutter. Standard drawings for a pedestrian refuge is provided in the CLDSM (Drawings 1041A, 1041B). Required considerations for Pedestrian Refuge Islands from the MUTCD are listed below.
Required Considerations (MUTCD Section 3B.10)

- Pavement markings shall be used to guide traffic away from fixed obstructions within a paved roadway. Approach markings for bridge supports, refuge islands, median islands, toll plaza islands, and raised channelization islands shall consist of a tapered line or lines extending from the center line or the lane line to a point 1 to 2 feet to the right-hand side, or to both sides, of the approach end of the obstruction (see MUTCD Figure 3B-15).

- If traffic is required to pass only to the right of the obstruction, the markings shall consist of a two-direction no-passing zone marking at least twice the length of the diagonal portion determined by the appropriate taper formula (see Drawing A of MUTCD Figure 3B-15).

- If traffic can pass either to the right or to the left of the obstruction, the markings shall consist of two channelizing lines diverging from the lane line, with one to each side of the obstruction. In advance of the point of divergence, a wide solid white line or normal solid double white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines (see Drawing C of MUTCD Figure 3B-15).

Required Considerations (MUTCD Section 3B.18)

- When crosswalk lines are used, they shall consist of solid white lines that mark the crosswalk. They shall not be less than 6 inches or greater than 24 inches in width.

Required Considerations (MUTCD Section 3B.23)

- Where curbs are marked to convey parking regulations in areas where curb markings are frequently obscured by snow and ice accumulation, signs shall be used with the curb markings, except as provided in Paragraph 4.

- Where curbs are marked for delineation or visibility purposes, the colors shall comply with the general principles of markings (see Section 3A.05).

Curb Extension

**Purpose**

Curb extensions reduce the overall street width and increase the visibility of pedestrians by extending the sidewalk into the street or parking lane. A curb extension is a candidate treatment for any uncontrolled pedestrian crossing, particularly where parking lanes exist. Reference the “Pinchpoints, Gateways, and Chicanes” section below.

Pedestrian Hybrid Beacon (PHB)

**Purpose**

Formerly known as a High-Intensity Activated crossWalk (HAWK) beacon, PHBs are activated by pedestrians and display a sequence of yellow and red indications to vehicles and standard walk/don’t walk indications and audible tones for pedestrians. The PHB shall meet the installation guidelines—based on speed, pedestrian volume, vehicular volume, and crossing length—as provided in Section 4F.01 of the MUTCD.
Required considerations from the MUTCD are listed below.

Resource
- MUTCD Chapter 4F – Pedestrian Hybrid Beacons

Required Considerations (MUTCD Section 4F.01)
- If used, pedestrian hybrid beacons shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon shall only be installed at a marked crosswalk.

Required Considerations (MUTCD Section 4F.02)
- Except as otherwise provided in this Section, a pedestrian hybrid beacon shall meet the provisions of Chapters 4D and 4E.
- A pedestrian hybrid beacon face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4F-3).
- When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:
  o At least two pedestrian hybrid beacon faces shall be installed for each approach of the major street
  o A stop line shall be installed for each approach to the crosswalk
  o A pedestrian signal head conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and
  o The pedestrian hybrid beacon shall be pedestrian actuated.
- A CROSSWALK STOP ON RED (symbolic circular red) R10-23 sign (see MUTCD Section 2B.53) shall be mounted adjacent to a pedestrian hybrid beacon face on each major street approach. If an overhead pedestrian hybrid beacon face is provided, the sign shall be mounted adjacent to the overhead signal face.
- If a warning beacon is installed to supplement the W11-2 sign, the design and location of the warning beacon shall comply with the provisions of Sections 4L.01 and 4L.03.

Required Considerations (MUTCD Section 4F.03)
- Pedestrian hybrid beacon indications shall be dark (not illuminated) during periods between actuations.
- Upon actuation by a pedestrian, a pedestrian hybrid beacon face shall display a flashing CIRCULAR yellow signal indication, followed by a steady CIRCULAR yellow signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see MUTCD Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid beacon faces shall revert to a dark (not illuminated) condition.
- Except where a pedestrian hybrid beacon is installed adjacent to a roundabout, the pedestrian signal heads shall continue to display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid beacon faces are either dark or displaying flashing or steady CIRCULAR yellow signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid beacon faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication
when the pedestrian hybrid beacon faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DON'T WALK) signal indication.

- The duration of the steady yellow change interval shall be determined using engineering practices.

### Rectangular Rapid Flashing Beacon (RRFB)

**Purpose**

A RRFB is a pedestrian-
acted conspicuity enhancement used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks. The RRFB is significantly different from the PHB in that it does not display either a red indication to the motorist or a Walk indication to the pedestrian. Rather, it is a visually enhanced warning device that is activated by the pedestrian. The device includes two rectangular-shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

**Considerations**

RRFBs are currently not included in the MUTCD, but FHWA has issued Interim Approval 21 (IA-21) for the use of the device. NCDOT has received permission for interim use of the RRFB and this permission extends to City streets. IA-21 provides additional information about the conditions of use, including dimensions, placement, and flashing requirements. IA-21 does not provide guidance or criteria based on number of lanes, speed, or traffic volumes.

### ADDITIONAL SCHOOL AREA CONSIDERATIONS

**Compliance**

It is recommended that School Speed Zones and School Crossing Treatments are observed on an ongoing basis by CDOT personnel to assess overall compliance. At locations where compliance is an issue, additional levels of treatment and traffic calming measures should be considered.

Furthermore, citizens can report reoccurring issues of driver non-compliance in school zones and at school crossings to CharMeck’s 311 system.

**Street Lighting**

Street lighting is an essential measure in pedestrian safety. In 2016, 75 percent of U.S. pedestrian traffic fatalities occurred during dark times of day. Students may be walking in dark conditions at arrival time or for after-school activities; thus, it is essential to design features to be navigable in the dark. Ample, pedestrian-scale street lighting should be provided wherever possible.

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School Flashers on Thoroughfares
School flashers should be installed as a supplement to school speed signage on thoroughfares. The flashers serve as enhancements in school speed zones to alert drivers of the lower speed limit.

Crossing Guards
School crossing guards provide an important enhanced safety benefit at school crossings. Crossing guards shall use a STOP paddle as the primary hand-signaling device to stop traffic at a marked crosswalk in conformance with MUTCD Section 7D.04 and 05. Crossing guards are also required to wear high-visibility retroreflective safety apparel in conformance with MUTCD Section 6E.02. CDOT will determine crossing guard locations. The schools, public, charter, or private, are responsible for providing the crossing guard. Crossing guards are only considered at schools that serve elementary and middle school students.
Appendix 1
Review of Relevant Local and State Plans
City of Charlotte School Speed Zone and School Crossing Program

In 2004, the City of Charlotte Department of Transportation (CDOT) adopted the School Speed Zone and School Crossing Program to provide technical guidance for the establishment of school zones and school crossings. The policy identified eligible schools as any educational institutions with enrollment of 200 or more students in grade 12 and under. In 2014, CDOT adopted an addendum to the school zone policy to reflect the latest version of the Manual of Uniform Traffic Control Devices (MUTCD), including updates to the types of signs used for school speed zones. Refer to the complete School Speed Zone and School Crossing Program policy for additional information.

School Speed Zones

School speed zones in Charlotte are set at 25 miles per hour (mph). The school speed zones operate from 45 minutes before the beginning of classes in the morning until 15 minutes after, and again 15 minutes before students are dismissed in the afternoon until 30 minutes after, unless otherwise determined by CDOT. The policy designates school speed zones into four categories, as follows:

- **On local streets**, the school speed zones are designated as "background" speed zones. The roadway’s base speed limit is reduced to 25 mph on the entire street or reasonable portion thereof.
- **On non-local streets on which elementary and middle schools are located**, the school speed zones are designated as "standard" school speed zones. A standard school speed zone is established along the entire property frontage of elementary and middle schools on non-local streets. The speed zones begin 100 feet in advance of each property line. When an elementary or middle school has no street frontage but has a driveway directly onto a non-local street, the standard school speed zone will begin at the projection of the property line.
- **“Reduced” school speed zones** are designated 200 feet in advance of all Type I school crossings on non-local streets outside the standard zones. Type I schools are described in greater detail in a subsequent section.
- **Typically, high schools do not warrant school speed zones. However, if an engineering evaluation reveals the need for a school speed zone**, then a school speed zone may be installed along the frontage of high schools with any of the following characteristics:
  - School fronts a street with six or more through lanes,
  - School fronts a street with a speed limit in excess of 35 mph, or
  - More than 40 students use a non-local street to walk to and from the school and/or to wait for a City bus.

However, if a school traffic signal is in place along the frontage of the school in question, every effort should be made to address all issues with that method of traffic control before installing a school speed zone.
**School Crossing**

Schools that are located along roadways with high vehicular volumes, excessive speeds, and/or wide streets may require more than a 25 mph school speed zone to aid pedestrians in safely crossing the roadway. In order for a school crossing to be warranted, a minimum of five school-age pedestrians would need to use the crossing. If fewer than five school-age pedestrians would be expected, the policy recommends consideration of other measures. The three types of school crossing designations used by the City of Charlotte are listed below:

- Type 1 – School crossing with speed zone,
- Type 2 – School crossing without speed zone, and
- Type 3 – School crossing with pedestrian traffic signal.

**Charlotte Transportation Action Plan (TAP)**

Charlotte City Council adopted the TAP in February 2017. It includes the following goals:

- Increase access to employment, education, parks, shopping, and other key destinations
- Promote transportation choices for all users
- Provide a safe, balanced, and efficient multimodal transportation system
- Enhance quality of life in neighborhoods
- Foster the efficient of people and goods through a connected network of local and regional routes
- Support and complement the City’s land use vision

The TAP allocates $120 million to neighborhood livability projects, which include an estimated 150 traffic calming projects, and an additional $20 million for Safe Routes to School projects at an estimated 20 schools. It calls for collaboration with the Charlotte-Mecklenburg School system in order to “provide children with more opportunities to walk or bicycle to school in an effort to reduce VMT, reduce energy consumption, and create more livable neighborhoods.”

**Charlotte BIKES Plan**

Charlotte City Council adopted the updated Charlotte BIKES Bicycle Plan in May 2017. The plan sets goals such as a Silver Bicycle Friendly Community designation from The League of American Bicyclists by 2020, 10 new miles of bicycle facilities per year, and additionally prescribes a wide variety of other equity, engineering, education, encouragement, enforcement, and evaluation programs. The plan is supported by $4 million per year in funding from TAP. Charlotte BIKES includes a renewed commitment to “work with government and community partners to support Safe Routes to School initiatives.”
**Charlotte WALKS Plan**

Charlotte City Council adopted Charlotte WALKS in February 2017 as Charlotte’s first Pedestrian Plan. The Plan strives to create safe and inviting settings for pedestrians where walking is a useful activity, and it focuses on the key issues of eliminating back-of-curb sidewalks, closing gaps in the City sidewalk network, and providing more frequent pedestrian crossings (particularly on busy thoroughfares).

Charlotte WALKS addresses access to schools specifically, noting the importance of walking to school as a physical and mental health benefit for students. The Plan aims to complete at least 4 school zone upgrades each year and to prioritize sidewalk and pedestrian crossing projects based on proximity to schools, specifically stating the importance of installing sidewalks and crossings within a ¼ mile radius of schools. Finally, it encourages coordination with Charlotte-Mecklenburg Schools, Mecklenburg County Greenways, and Mecklenburg County’s Safe Routes to School program in efforts to improve pedestrian and bicycle access to schools.

**Charlotte Vision Zero Plan**

Charlotte created a Vision Zero program in 2018 that aims to eliminate traffic-related deaths and serious injuries by 2030. A Vision Zero Task force comprised of local organizations as well as governmental departments at the City, County, and State level is meeting six times in 2018 to provide input as the City drafts a Vision Zero Action Plan. The following five principles will guide the development of the Action Plan:

1. Protecting human lives takes priority over all other objectives of the road system.
2. The transportation system should be designed so mistakes are not fatal.
3. Solutions must be collaborative, equitable and data-driven.
4. Safety on our streets is everyone’s responsibility.

**Mecklenburg County Safe Routes to School Initiatives**

Mecklenburg County Safe Routes to School is a program of the County Public Health Department. The program primarily provides schools with resources with which they may encourage students to walk and bike to school. These include Infrastructure Grants, which reimburse local agencies within the County for safety projects within two miles of public, private, and charter schools (with pre-K and high schools excluded).

**Mecklenburg County Greenways Master Plan**

The Greenways Master Plan was updated in 2014 as part of the Comprehensive Mecklenburg County Park and Recreation Master Plan Update. It prescribed the construction of 33.4 miles of greenway in
by 2024, as well as an additional 27.1 miles by 2034 and 26.7 miles by 2039. Greenway projects receive prioritization points for connections to any public or private school, pre-K through 12.

According to Mecklenburg County Parks and Recreation, as of May 2018, there are 48.85 miles of existing greenway in the County and 44.41 additional miles are planned for construction by 2027.
Appendix 2
NCDOT Typical Plans for School Zones
NOTES:

1. USE TABLES 2B-1, 2C-2 AND 7B-1 IN MUTCD FOR SIGN SIZES.

2. WHEN GEOMETRIC DOES NOT PERMIT THE USE OF ALL
REQUIRED SIGNS AN ENGINEERING STUDY WILL DETERMINE
APPROPRIATE SIGNING.
NOTES:

1. USE TABLES 2B-1, 2C-2 AND 7B-1 IN MUTCD FOR SIGN SIZES.

2. WHEN GEOMETRIC DOES NOT PERMIT THE USE OF ALL REQUIRED SIGNS AN ENGINEERING STUDY WILL DETERMINE APPROPRIATE SIGNING.
WHERE SPEED REDUCTION IS REQUIRED

NOTES:

1. USE TABLES 2B-1, 2C-2 AND 7B-1 IN MUTCD FOR SIGN SIZES.

2. WHEN GEOMETRIC DOES NOT PERMIT THE USE OF ALL REQUIRED SIGNS AN ENGINEERING STUDY WILL DETERMINE APPROPRIATE SIGNING.
NOTES:

1. USE TABLES 2B-1, 2C-2 AND 7B-1 IN MUTCD FOR SIGN SIZES.

2. WHEN GEOMETRIC DOES NOT PERMIT THE USE OF ALL REQUIRED SIGNS AN ENGINEERING STUDY WILL DETERMINE APPROPRIATE SIGNING.
Appendix 3
Peer Municipality Review and Literature Review Memo
INTRODUCTION

In 2004, the City of Charlotte adopted a school zone policy that included technical guidance for school speed zone and school zone crossing implementation. In 2014, an updated memo was adopted to reflect MUTCD updates and that update is set to expire in 2018. The Charlotte Department of Transportation (CDOT) now seeks to update the school zone policy and design guidance based on best practices in the industry and across the country. This memorandum is a summary of the methodology and findings from the literature review of school zone guidelines from four (4) peer municipalities (Seattle, WA; Orlando, FL; Houston, TX; Cary, NC) and the existing guidelines for Charlotte, NC. The memorandum synthesizes these findings with the information collected from interviewing transportation officials from each of these peer municipalities and provides direct comparison among the guidelines from each municipality.

The purpose of this review is to inform the questions, themes, and best practices that will guide the development of CDOT’s updated school zone policy and design guidance.
PEER CITY SELECTION

An initial review of peer municipality policies and guides was conducted to identify the optimum peer municipalities and then conduct a thorough review of their policies and design guidance and conduct interviews. This initial review developed a list of eleven municipalities for further exploration:

- Seattle, WA
- Orlando, FL
- Madison, WI
- Colorado Springs, CO
- San Diego, CA
- Raleigh, NC
- Houston, TX
- Cary, NC
- Tampa, FL
- Anchorage, AK
- Billing, MT

Further information on these peer municipalities and the value from review of their policies are presented in Table 1.

From this initial list, CDOT selected Seattle, Orlando, Houston, and Cary for further review and interview. Each of the peer municipalities selected contained elements that were priorities for CDOT and stakeholders. The guidance in Seattle integrates elements of its Vision Zero plan and Safe Routes to School (SRTS) programs with its school zone policies and decision making. CDOT is developing a Vision Zero plan concurrently with the update of the school zone design guide.

Orlando provided a strong example of a Southeast city with development patterns around schools and weather considerations similar those in Charlotte. Orlando also very recently (2017) updated its school zone guidance and incorporated best practices from other similar cities.

Houston’s design guide offers its robust guidelines and integration with an SRTS program.

Finally, Cary was selected as a to represent one of the more updated policy examples in North Carolina.

Notes from the interviews with each peer municipality are attached as Appendix 1.
### Table 1  Criteria for Review of 11 Peer Municipalities

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<td>1</td>
<td>Seattle, WA</td>
<td>704,352</td>
<td>2015</td>
<td>Seattle's school zone policy is part of a larger Safe Routes to School Program and Vision Zero Plan. The document focuses on a wholistic approach to school zone implementation and design.</td>
<td>The guide/policy seems to have a robust, wholistic approach to handling school zones. It has also been crafted within their Vision Zero program, which seems consistent with Charlotte's goals.</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Orlando, FL</td>
<td>277,173</td>
<td>2017</td>
<td>Recently established policy that references Florida Speed Zone manual. For designating a school zone, the City has an excel spreadsheet tool that includes 6-7 data inputs. These data inputs follow a decision tree on whether a school zone should be installed. If a school zone qualifies, the policy follows the Florida Speed Zone Manual for design.</td>
<td>The policy references a state manual for design guidance and focuses on a simplified flow chart tool for deciding whether a school zone is warranted. The flow chart has low thresholds that need to be met for a school zone but seems to have a logical approach that is easy to understand.</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Madison, WI</td>
<td>255,214</td>
<td>2016</td>
<td>Madison has a similar point system to Charlotte and Orlando. Focuses on a &quot;Hazard Rating System&quot; where points are assigned based on volume of pedestrians, speed, sight distance, gap availability and crashes. Gives specific design guidance on crossings based on hazard ratings.</td>
<td>Madison has a simple point system but focuses on the need of a problem (hazard) before anything is implemented. Also seems to have high pedestrian volume threshold (25 children) to mark a school crossing.</td>
<td>No</td>
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<tr>
<td>4</td>
<td>Colorado Springs, CO</td>
<td>465,101</td>
<td>2009</td>
<td>Provides a detailed package of safety techniques to be used and best practice policies. The manual intertwines policies specific to Colorado Springs with specific references to the MUTCD for design standards and best practices.</td>
<td>The technical elements of the policy rely heavily on MUTCD references. This may be too redundant to a general review we will conduct of the relevant MUTCD chapters.</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>San Diego, CA</td>
<td>1,407,000</td>
<td>2002</td>
<td>Policy includes detailed design guidance that relies on the MUTCD. Also includes a point system dependent on 85th Percentile speeds, sight distance, pedestrian volumes and street width.</td>
<td>While the design guide provides ample details and is well laid out, its published date is older than CDOT’s current policy and it is uncertain whether the MUTCD references have been updated.</td>
<td>Yes</td>
</tr>
<tr>
<td>------</td>
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<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>6</td>
<td>Raleigh, NC</td>
<td>458,880</td>
<td></td>
<td>The City of Raleigh’s school zone policy is very similar to NCDOT’s since many of the schools in Raleigh are adjacent to both City and State Highway System roads. It follows an application protocol that is reviewed by the Public Works Committee.</td>
<td>The policy relies heavily on NCDOT policy, which we will review as part of the general literature review materials. This policy may be too redundant to the NCDOT policy to include in the review.</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Houston, TX</td>
<td>2,303,000</td>
<td>2012</td>
<td>Detailed policy and procedure for requesting a study and eligibility for school zones. The policy is intertwined with the Safe Route to School Plan (a school zone cannot be designated without being included in the plan). There is general best practices guidance on when certain treatments are appropriate.</td>
<td>This appears to be a good example best practices and flexible approach to the design and implementation of school zones. It also includes worksheet tools to help schools easily apply for designating a school zone and implementing crossing treatments. This document has also been in practice for some time and City staff may be able to provide some good input on what they like and what they would change.</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Cary, NC</td>
<td>162,320</td>
<td>2015</td>
<td>A succinct 3-page policy that lays out conditions where school zones are eligible (on frontage streets and on adjacent streets), time limits for school zone speed limits and type of school and enrollment criteria for eligibility.</td>
<td>This policy and guidance seems like a straightforward North Carolina example.</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>Tampa, FL</td>
<td>377,165</td>
<td>2006</td>
<td>This is a 5-page policy that focuses on eligibility and city-specific codes that are relevant. The implementation section references specific MUTCD design guidance.</td>
<td>This is a good example of a policy that references specific technical guidance in the MUTCD. However, the policy's multiple references to very specific Tampa-related code may make it irrelevant for Charlotte's needs.</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Anchorage, AK</td>
<td>298,192</td>
<td>2006</td>
<td>A 37-page document that references technical guidance in the MUTCD and Alaska MUTCD as well has Anchorage specific guidance. Is a mix of policies and detailed technical design guidance.</td>
<td>The detailed technical documentation is easy to follow and a good public-facing example. However, it intertwines policy and technical guidance in one document, which seems inconsistent with CDOT's vision.</td>
<td>In Process</td>
</tr>
<tr>
<td>11</td>
<td>Billings, MT</td>
<td>110,323</td>
<td>2001</td>
<td>The policy focuses on the placement of school crossings and serves as a supplement to the MUTCD, &quot;School trip Safety Program Guidelines,&quot; and best practices recommended from ITE’s “A Program for School Crossing protection.”</td>
<td>While detailed and easy to follow, it is very specific and prescriptive on the conditions necessary to warrant a school crossing and the type of treatments that will be used. This seems to go against CDOT's desire for more flexibility.</td>
<td>No</td>
</tr>
</tbody>
</table>
FINDINGS FROM LITERATURE REVIEW AND PEER CITY INTERVIEWS

Comparison of Peer Municipalities

In comparing policies between peer municipalities, the following trends emerged:

- **Eligibility**: Most municipalities allow eligibility for all schools, though often with special conditions for high schools or other age-based considerations.

- **Determination of Speed Zones**: Typical speed limits vary between 15 and 25 mph based on state and local regulations. Signing and marking adhere to MUTCD guidelines and the implementation of flashing beacons in speed zones has become an increasingly common practice.

- **Determination of Crossing Treatments**: Decision processes with specific quantitative criteria follow a decision tree format that incorporates a point system.

- **Design guidance**: Typical design guidance does not often exceed MUTCD-based signing and marking examples.

- **Safe Routes to School/Vision Zero**: These policies have the most variation between municipalities, with a great deal of dependence on availability of funding.

Table 2 provides a summary and comparison of these elements among the peer municipalities.
<table>
<thead>
<tr>
<th>Policy Element</th>
<th>City of Charlotte (2004)</th>
<th>City of Seattle</th>
<th>City of Orlando</th>
<th>City of Houston</th>
<th>Town of Cary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Streets adjacent to elementary and middle schools, as well as high schools under certain circumstances. Some school crosswalks on streets other than school frontage are also eligible for speed zones.</td>
<td>All public, private, and charter schools are eligible for projects under the Safe Routes to School Action Plan. School-based projects are prioritized based on collision data, race and ethnicity data, pedestrian comfort scores.</td>
<td>Speed zones can be adjacent to elementary or middle schools or placed on streets with school crossings or school-related activities.</td>
<td>Streets part of a Safe Route to School Plan or adjacent to an elementary or middle school are eligible for speed zones.</td>
<td>Streets adjacent to all public schools and some charter schools. Streets should have access school points and significant pedestrian activity.</td>
</tr>
<tr>
<td>Eligibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School speed zone limits of 25 mph on City-maintained streets (10 mph less than the posted background speed on State-maintained streets)</td>
<td>All school speed zones have posted speeds of 20 mph.</td>
<td>School zone speed limit of 20 mph for roadways with a posted speed of 35 mph or greater and speed limit of 15 mph for those with posted speeds less than 35 mph. All school zones have flashing beacons in addition to required signage*</td>
<td>All school speed zones have posted speeds of 20 mph. Flashing beacons are used on roadways with ADT ≥5000 vehicles.</td>
<td>Typically, 10 mph speed reduction from posted speed outside of school zone. School speed zone limits are no lower than 25 mph. All school zones have flashing beacons in addition to required signage.</td>
</tr>
<tr>
<td>Determination of Speed Zones</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Established based on tier- and point-based system with various quantitative evaluation criteria</td>
<td>Established based on tier- and point-based system with various quantitative evaluation criteria</td>
<td>Established based on tier- and point-based system with various quantitative evaluation criteria</td>
<td>Established based on a qualitative evaluation by Houston Public Works &amp; Engineering</td>
<td>Crosswalk policy is independent of school speed zone policy.</td>
</tr>
<tr>
<td>Determination of Crossing Treatments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Guidance</td>
<td>City of Charlotte (2004)</td>
<td>City of Seattle</td>
<td>City of Orlando</td>
<td>City of Houston</td>
<td>Town of Cary</td>
</tr>
<tr>
<td>------------------</td>
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<td>-------------</td>
</tr>
<tr>
<td>Based on MUTCD guidelines with diagrams for a variety of treatments</td>
<td>“Engineering Toolkit” provides purpose, general criteria, relative cost, and installation time information to public. Treatment diagrams provided as well.</td>
<td>Provided primarily in accompanying FDOT document. Based on MUTCD guidelines with diagrams for a variety of treatments</td>
<td>Based on TMUTCD and City of Houston Infrastructure Design Manual guidelines with diagrams for a variety of treatments</td>
<td>Based on MUTCD guidelines</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Safe Routes to School/Vision Zero</th>
<th>City of Orlando</th>
<th>City of Houston</th>
<th>Town of Cary</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Orange County has a Safe Routes to School program, but City of Orlando does not.</td>
<td>Safe Routes to School are established based on an inventory of routes, facilities, and users. <strong>Ongoing work to increase bike safety on SRTS in line with Houston Bike Plan</strong></td>
<td>Wake County as a Safe Routes to School program, but Town of Cary does not.</td>
</tr>
</tbody>
</table>

*Bold items indicate interview findings*
Charlotte, NC: Existing Policy

Background

CDOT’s current school zone policy, originally adopted in April 2004, is an 89-page document focused around point-based criteria that prescribe where school zones and school crossings can be established. It is attached as Appendix 2. The policy further prescribes the crossing treatments to use based on the crossing type that meets the criteria. In 2014, a memo was adopted as an addendum to reflect practices from more recent versions of MUTCD. The policy is set to expire at the end of 2018.

In practice, the policy has been described by stakeholders as too prescriptive, with a confusing point system that is difficult to explain to school faculty and parents. The policy also does not clearly address non-frontage streets adjacent to the school that may need school zone-specific treatments.

The policy also has gaps in the treatment applications appropriate and safe for school crossing guards. While the policy has criteria for a school crossing guard based on traffic speeds, volumes, and the number of children crossing, these conditions have sometimes led to uncomfortable conditions for a crossing guard to operate. In the past 5 years, multiple crossing guards have been hit by vehicles while working in crosswalks.

School Eligibility

CDOT’s policy applies to all schools with 200 or more students. However, high schools may only establish school speed zones when the school frontage road has at least six lanes or a posted speed greater than 35 miles per hour (mph), or “where more than 40 students must use a street other than a local street to walk to and from school or to wait for a City bus.” High schools are not eligible for crossing guards or crossing treatments; however, CDOT may install a signal operating from 6 AM to 11 PM when MUTCD warrant 1 or 2 is met during the school arrival or dismissal period at all schools, including high schools.

This eligibility criteria are fairly consistent with practices in similar cities. However, CDOT and stakeholders have noted unique challenges and issues at high schools that are not currently addressed in the policy. CDOT and CMS staff recognize high school students, while mature, are still children and may need school zone consideration in certain cases. The travel behavior is also different at many high schools; while elementary school dismissals tend to have more concentrated and predictable patterns, high school dismissals are spread out over a longer period of time and students travel in many directions for different after-school activities.

Determination of Speed Zones

School zones apply 45 minutes before the arrival time to 15 minutes after and 15 minutes before the dismissal time to 30 minutes after. All school speed zones have posted speeds of 25 mph on City-maintained streets and 10 mph less than the posted background speed on State-maintained streets. The extents of the speed zone depend on the roadway location and classification. When the school frontage...
is a local street, the speed limit reduction may apply on the whole street or a “reasonable portion thereof.” Additionally, school speed zones may apply on non-frontage streets with a Type 1 crossing (discussed below); these zones begin 200 feet in advance of the crossing.

**Determination of Crossing Treatments**

CDOT determines crossing treatments with a point system that incorporates gap availability, average pedestrian demand per gap, the age of the observed youngest student using the crossing, the volume of students using the crossing, base 85<sup>th</sup> percentile approach speed, and street width. There are 3 types of crossing treatments that may result from the input criteria:

- **Type 1 crossings** include a marked crosswalk, crossing guard, and reduced speed zone. CDOT may implement a Type 1 treatment when there is a minimum of 5 pedestrians use the crossing and a point total of at least 16.
- **Type 2 crossings** include a marked crosswalk and crossing guards in cases with children in 7<sup>th</sup> grade or younger, a minimum of 5 pedestrians using the crossing, and a point total of at least 10.
- **Type 3 crossings** consist of a marked crosswalk, crossing guard, and actuated pedestrian signal that operates during arrival and dismissal periods. CDOT implements Type 3 crossings in cases where there is a minimum of 5 pedestrians using the crossing and a base 85<sup>th</sup> percentile speed of at least 35 miles per hour, or in cases where there is less than one acceptable gap per minute. Additionally, the guidance states that Type 3 crossings should only be used “after all reasonable alternate methods of getting students safely across the street have been considered and found not to exist.”

The guidance includes other qualitative criteria, including notes on the presence of existing traffic control devices and adequate sight distance.

**Design Guidance**

CDOT provides MUTCD-compliant signage and marking designs for school speed zones, as illustrated in Figure 2. This guidance comes from the 2014 update memo and reflects the 2009 MUTCD update.
Figure 1. CDOT Signing and Marking for School Zones on Thoroughfares
Seattle, WA

Background

Seattle, located in King County, is the largest city in the state of Washington and one of the largest on the West Coast. Seattle Public Schools is the largest K-12 school system in Washington state, including over 50,000 students and 103 schools.

In Fall 2015, Seattle Department of Transportation (SDOT) published Safe Streets, Healthy Schools and Communities: A Safe Routes to School 5 Year Action Plan for Seattle as a vision for a wide-ranging SRTS program supported by growing revenues from the city’s speed camera program. Unlike other SDOT transportation policies, such as the Seattle Pedestrian and Bike Master Plans, SRTS is administered and updated through SDOT alone with a variety of underlying technical guidance documents:

- City of Seattle School and/or Neighborhood Greenway Crosswalk Review Guidelines for Consideration (2016)
- 2018 Seattle School Speed Zone & Crosswalk Signage Guidelines

Updates to these documents, as well as updates to the Action Plan itself, are neither mandated nor approved by City Council. Availability of both SDOT staff and funding has recently initiated a project to update the Action Plan in an effort to focus on the program’s strengths and reduce unnecessary or unsuccessful aspects of the plan in its next five years.

In an interview, SDOT staff expressed that they are very satisfied with the program and take pride in the fact that Seattle has not seen any student-pedestrian or student-bicyclist fatalities in several years.

Vision Zero

Seattle established a goal of zero traffic deaths and serious injuries by 2030, implemented through a Vision Zero program. Vision Zero’s goals largely align with those of SRTS, but the two programs largely work separately; the former focuses its efforts on arterials and commercial areas while the latter pursues only school-related projects. Also, Vision Zero projects are intended to improve safety for all roadway users while SRTS focuses on students walking or biking to school only. However, safety improvements implemented by one program will often benefit both, and occasionally the two programs will collaborate on safety improvements on the same roadway. Seattle’s Vision Zero Plan is included in the uploaded reference materials.

School Eligibility

All public, private, and charter schools are eligible for SRTS projects. However, projects are prioritized based on weighted criteria, as shown in Table 3.
### Table 3  Prioritization Criteria for SDOT SRTS Projects

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Relative Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Completeness</td>
<td>A prioritization score from Seattle’s Pedestrian Master Plan based on current and future demand, corridor function, and socioeconomic equity measures</td>
<td>50%</td>
</tr>
<tr>
<td>Equity</td>
<td>While Pedestrian Master Plan scores incorporate various equity concerns, SRTS specifically measures the percentage of students of color at the school impacted by the project.</td>
<td>40%</td>
</tr>
<tr>
<td>Safety</td>
<td>Measures bicycle and pedestrian collisions from the past three years within the school area</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Determination of Speed Zones**

In 2016, Seattle established a citywide speed limit of 20 mph on all local streets and 25 mph on arterials. According to SDOT staff, the already-low speeds on Seattle streets de-emphasize the importance of speed zones in SDOT’s practices. However, SDOT still provides guidance for school speed zones in its *Speed Zone & Crosswalk Signage Guidelines* document, which is largely adapted from MUTCD guidelines. SDOT establishes school speed zones on all streets adjacent to school property, except those where a barrier separates the school from the roadway as well as dead-end streets. School zones begin 100’ to 300’ from the school property line or, if present, 100’ to 300’ from any school crosswalk within 300’ of the school property line. SDOT assigns a speed limit of 20 mph to all school speed zones.

**Determination of Crossing Treatments**

SDOT determines whether to establish crossing treatments, and which type of treatment is appropriate, using a combination of context-based qualitative and quantitative criteria structured as a decision tree followed by a series of graphical plots of speed against vehicle volume. The *City of Seattle School and/or Neighborhood Greenway Crosswalk Review Guidelines for Consideration* document provides guidance for this process.

In summary, the process incorporates the following criteria:

- Presence of stop control
- Presence of a school within 300 feet
- Road classification (arterial or non-arterial)
- Pedestrian volume thresholds (10 students per hour or 8 per hour for two consecutive hours)
- Presence of other crosswalks within 200 feet
- Adequate stopping sight distance (8 times posted speed limit)
• Number and direction of lanes
• 85\textsuperscript{th} percentile speed
• Vehicle volume (ADT or AWDT)
• Compliance with posted speed limit

The guidance prescribes one of three outcomes:

• Crosswalk Improvements: Includes basic ladder-style crosswalk is present with high-visibility signs
  o Rectangular Rapid Flashing Beacon (RRFB): Includes ladder-style crosswalk with high-visibility signs and user-actuated RRFB
• Geometric Enhancements with RRFB or Signal. Includes:
  o Ladder-style crosswalk with high-visibility signs
  o User-actuated RRFB or half signal
  o Curb bulb-outs or pedestrian refuge islands

Furthermore, traffic calming or an enhanced signal is recommended when arterial 85\textsuperscript{th} percentile speed is observed to be greater than 35 mph.

Finally, the guidance states that engineering judgement supersedes these procedures “in all locations.”

Design Guidance

Beyond the decision tree model, Seattle provides MUTCD-compliant signage designs for school speed zones and crosswalks in its Speed Zone & Crosswalk Signage Guidelines document. SDOT’s Basic School Zone Sign Layout from the preceding document is provided in Figure 2.
Figure 2. Basic School Zone Sign Layout from SDOT Speed Zone & Crosswalk Signage Guidelines

SDOT’s generalizes its design guidance in a public-facing Engineering Toolkit. It provides basic guidelines for the implementation of the following treatments:

- Crossing islands
- Curb bulbs
- Curb ramps
- Marked crosswalks
- RRFB
- 20 mph speed zones
- Traffic signals
- Stop signs
• New sidewalks
• Radar speed signs
• Lane reductions
• Speed humps
• Neighborhood traffic circles
• Neighborhood greenways

For each treatment, SDOT provides a general description, purpose, basic decision process, relative cost, and time for implementation.
Orlando, FL

Background

Orlando is the third largest municipality in Florida. It is contained within Orange County and is served by the Orange County Public School system.

Florida’s school speed zones are largely governed by guidance from the Florida Department of Transportation (FDOT). However, Orlando updated its School Zone Crossing Guidance in 2017 and is currently in the process of implementation. Its previous guidance for crossing treatments was based on an outdated spreadsheet from Orange County. Stakeholders and the City found it difficult to communicate the spreadsheet’s methodology to the public, and often its prescribed result aligned with neither engineering judgement nor public expectation. For its update process, the City of Orlando Transportation Department reviewed existing crossing treatments and used data from the most effective crossings to “calibrate” a combination of quantitative and qualitative criteria.

Orlando staff see their incorporation of a wide range of criteria in crossing treatment decisions as a particularly strong point. Staff and decision makers from Orange County, Osceola County, and FDOT have expressed interest in incorporating Orlando’s guidelines into their own. Furthermore, city staff have found that the Orange County School Board has been more sympathetic to transportation concerns and more willing to collaborate on off-site school zone improvements since the implementation of the new policy.

School Eligibility

All elementary and middle schools are eligible for crossing treatments and speed zones, as well as federally-funded Head Start facilities. High schools may be eligible for speed zones based on FDOT guidance, but these requests are addressed on a case-by-case basis and projects must be justified by a further engineering study. The City of Orlando does not distinguish between students of different ages in the determination of crossing treatments.

Determination of Speed Zones

School speed zones largely follow FDOT guidelines from Chapter 15 of Speed Zoning for Highways, Roads, and Streets in Florida (2017). For urban areas, FDOT prescribes a school zone speed limit of 20 mph for roadways with a posted speed of 35 mph or greater and a speed limit of 15 mph for those with posted speeds less than 35 mph.

School speed zones are justified with engineering studies that include a vehicle spot speed study, gap study, and pedestrian and bicycle volumes. The decisions also incorporate the following criteria:

- Age of children
- Normal approach speed of traffic
- Sight distance
- Number of vehicles
- Width of roadway
- Presence of traffic control devices
- Use of adult crossing guards

FDOT recommends “SCHOOL” pavement markings in school speed zones as well as warning signage in compliance with MUTCD. FDOT also recommends flashing beacons to supplement signage and markings for approach speeds greater than 45 mph (though Orlando uses beacons in all speed zones) and allows dynamic speed limit signage when approach speed is greater than 45 mph. Signage and markings indicating the start and end of speed zones are placed at the school zone boundaries.

FDOT leaves determination of the boundaries of a speed zone to local jurisdictions. Orlando defines a school zone as the “portion of a street or highway located within a school area that includes an established school speed limit posted thereof with signs and flashing beacons.” The school area is simply defined as the area that includes “school buildings or grounds, a school crossing, or school related activity.” Orlando also allows for speed zones outside of school areas when justified by an additional engineering study.

**Determination of Crossing Treatments**

Orlando determines crossing treatments with a 3-stage decision tree that also incorporates a quantitative point system.

In the first tier, presence of traffic control, adjacency to school, and number of points determine the presence of a marked crosswalk. In the second tier, presence of traffic control and number of points determine the presence of a school crossing guard. In the third tier, presence of traffic control, adjacency to school, and 85\textsuperscript{th} percentile speed determine the presence of a school speed zone surrounding the crosswalk. The City determines that the location meets the criteria for the current tier before proceeding to the next tier; for example, the City would not establish a school speed zone at a crossing without first determining that there is the need for a marked crosswalk with crossing guard present.

However, the policy ultimately leaves decisions to engineering judgement, emphasizing that final determinations are “subject to engineering judgement and shall be approved by the City Transportation Engineer or his or her designee.”

In summary, the process incorporates the following criteria (bold items are incorporated into the point system):

- Presence of traffic control devices
- Adjacency to school property
- 85\textsuperscript{th} percentile speed
- Traffic volume (vehicles per hour per lane)
- Number of children crossing
- Length of crossing
- Sight distance in comparison to minimum stopping sight distance ("sight distance ratio")
- Gap availability
- 3-year crash history (with vehicle and pedestrian/bicycle crashes counted separately)

The City of Orlando’s policy and guidelines, including the decision tree and point system, are included in the uploaded reference materials.

**Design Guidance**

The FDOT speed zone guide provides a series of MUTCD-compliant signage examples based on roadway context. A typical speed zone in the guide is featured in Figure 3.

![Figure 3. FDOT guidance for “Typical School Zone Fronting the School Property Without a School Crossing”](image-url)
Houston, TX

Background

Houston is the fourth largest city (by population) in the United States. The city is contained within Harris County. Twenty-four school districts serve the City, the largest being Houston Independent School District (HISD) which alone contains 283 schools. Houston Public Works & Engineering (PWE) manages City school zones and SRTS.

PWE most recently revised its guidelines for school zones and SRTS in 2012. PWE staff expect another update in one to two years.

The Texas Department of Transportation (TxDOT) has jurisdiction over school speed zones on the state highway system. However, PWE staff feel that they retain a great deal of control over these speed zones within City limits.

School Eligibility

The guidelines apply to all elementary and middle schools. However, according to PWE staff, many citizens request school speed zones for high school and Pre-K facilities, particularly with the recent growth of HISD-operated Pre-K. PWE expects a decision on the inclusion of high schools and Pre-K facilities in its policy in the next one to two years.

The school principal must approve citizen requests for school zones, crosswalks, and school-related traffic controls before review by PWE.

Determination of Speed Zones

Much of Houston’s speed zone guidance derives from the Texas Manual on Uniform Traffic Control Devices (TMUTCD). TMUTCD calls for speed zones to start at least 200 feet in advance of school grounds, school crossings, or other school-related activities.

The City of Houston reduces speeds in all school speed zones to 20 mph. While TxDOT standards call for no more than a 15-mph reduction from posted speed in a school zone, PWE staff notice that TxDOT typically allows for City schools on state highways to reduce their speeds to 20 mph. Flashing beacons are used on roadways with ADT of 5000 vehicles or more.

Determination of Crossing Treatments

PWE evaluates the following criteria in assessing crossing treatment locations:

- Traffic volumes
- Pedestrian volumes
- Average vehicular speed
- Type of traffic (domestic, commercial, highway, etc.)
- Terrain
- Visibility available to motorists and pedestrians
- Type of traffic controls present
- Width of street
- Proximity to school and school walking route
- Location of adjacent crosswalks

While PWE suggests that engineering judgement incorporate these criteria, there are no specific quantitative guidelines that aid in the determination of crossing treatments.

**Design Guidance**

TMUTCD provides example signage and striping guides for school zones. An example is provided in Figure 4.

![Figure 4. TMUTCD Guidance for “Signing for a School Zone with a School Speed Limit and a School Crossing”](image-url)
Safe Routes to School

TMUTCD requires elementary, middle, and high schools to prepare school route plans in partnership with law enforcement and traffic officials. These plans are presented on maps that include walk routes, traffic controls, and crossings.

To determine school routes, Houston PWE surveys pedestrian volumes, roadway classification, surrounding land uses, and the presence of sidewalks. Once routes are determined, PWE performs additional surveys to note deficiencies. Traffic control warrants are required to implement signs, pavement markings, traffic signals, crossing guards, walkways, and grade separations on safe routes to school.

Houston PWE is currently working to implement high-comfort bike facilities on school routes as suggested by the Houston Bike Plan, which was adopted by City Council in 2017.
Cary, NC

Background

The Town of Cary is a suburban municipality located mostly in Wake County. It is the seventh largest municipality in North Carolina. Wake County Public schools serve the Town. Cary implemented its school zone policy in 2008 and updated it most recently in 2015.

School Eligibility

All public schools are eligible for school speed zones. The Town of Cary also allows school zone reviews for charter schools with at least 200 students. Cary only allows limited signage and pavement making for smaller charter schools and private schools.

Determination of Speed Zones

Speed zones begin 200 feet from the crosswalk adjacent to the school or 100 to 500 feet from the school property line. All Town schools have flashing beacons in their speed zones. The Town suggests speed limit reductions of no more than 10 mph from background speed (according to Town staff, the 2015 update to the guidance used more flexible language to allow for greater reductions). No school zones with speed zones lower than 25 mph are allowed, and no zones are placed along non-adjacent streets or along streets without school access, except in cases where at least one of the following conditions is found:

- Queuing during arrival and/or dismissal times
- Significant crash history
- A large percentage of school traffic using a stop-controlled intersection leading to school with safety and/or capacity concerns

The Town of Cary marks all school speed zones with flashing beacons.

Determination of Crossing Treatments

School crosswalks in Cary adhere to NCDOT’s Pedestrian Crossing Guidance, which prescribes MUTCD Warrants 4 and 5 (Pedestrian Volume and School Crossing, respectively) for school zones. Town of Cary also has a crosswalk policy independent of its school zone policy that focuses on environments in which crosswalks are inappropriate or unsafe rather than design guidelines or best practices.

NCDOT Pedestrian Crossing Guidance provides decision-making processes for crosswalk improvement and displays examples of crossings, but neither are directly related to school zones or school crossings.

Design Guidance

Town of Cary does not provide example diagrams of speed zones or other forms of design guidance.
CONSIDERATIONS FOR DEVELOPMENT OF CDOT GUIDELINES

Based on the literature review and interviews conducted with the four (4) selected municipalities, several themes and best practices emerged that seemed beneficial to consider for the new CDOT School Zone Policy and Design Guide. These key practices include:

- Identifying a pre-determined trigger or point in time in the policy at which an update to the guidance is required or encouraged. This can be when the MUTCD releases an update or on a regular review cycle (such as every 2 or 5 years).
- The seemingly most effective policies and technical guides from peer municipalities include:
  - A toolkit of context- and quantitative criteria-based treatments for application in school speed zones or along Safe Routes to School
  - A hybrid of a decision-making tree and point system. The point system, however, depends heavily on access to traffic data and the capacity to survey street conditions.
  - A holistic approach that includes a combined approach with Vision Zero and Safe Routes to School Plan.
- In determining designated school zones and school crossings, the following data points are used:
  - Presence of traffic control devices
  - Adjacency to school property or proximity to school and school walking routes
  - Posted speed
  - 85th percentile or average speed
  - Traffic volume (vehicles per hour per lane)
  - Number of children crossing
  - Length of crossing
  - Sight distance in comparison to minimum stopping sight distance ("sight distance ratio")
  - Gap availability
  - 3-year crash history (with vehicle and pedestrian/bicycle crashes counted separately)
  - Pedestrian volumes
  - Type of traffic (domestic, commercial, highway, etc.)
  - Terrain
  - Visibility available to motorists and pedestrians
  - Type of traffic controls present
  - Width of street
  - Location of adjacent crosswalks
- While the number of students crossing is a factor in determining whether a school zone crossing should be implemented in some guides, a crossing can still be justified for a low number of students (1-5) if certain traffic conditions are met.
- Many of these municipalities have success communicating the decision process due to the public-facing nature of their policy or design guide.
- Current practices show that a 200-student threshold for being eligible to apply for a school zone or crossing is consistent with other, similar municipalities.
• All policies and guidance qualified that any prescriptions in the policy or guidance may be overridden with engineering judgement.

These elements will shape the approach and framework for the updated CDOT’s School Zone Design Guide and Policy.
Appendix 1  Peer Municipality Interview Notes
Meeting Summary

CDOT School Zone Design Guide
Phone Interview with Ashley Rhead
August 21, 2018, 11 a.m. PDT

1. Participants
   a. Ashley Rhead, Safe Routes to School Program Manager, City of Seattle
   b. Zach Bugg, Senior Engineer, Kittelson & Associates, Inc.

2. Interview Questions
   • Background on action plan
     o Speed cameras implemented in school zones in 2012
     o New revenue led City Council to implement policy directing this revenue (all income beyond operating costs) to a Safe Routes to School Plan
     o The plan was developed with a very collaborative process (consultant, transit agency, advocacy organizations, health organizations, etc)
   • What is the relationship between the city, state, and other levels of government in implementing and enforcing your guidelines?
     o Federal Grants
     o State policy enables red light and speed cameras. Many of the technical standards are a combination of state policy and MUTCD standards
   • What is the process for updating your guide?
     o The initial action plan did not prescribe an update
     o Important to note that unlike Pedestrian/Bike Master Plan and other transportation policies, SRTS Action Plan is approved through SDOT internally
     o The Action Plan is currently undergoing an update, but this is due to availability of funding and staff initiative rather than legal imperative
   • What avenues exist for public input and citizen action?
     o Traditionally, SDOT relied on citizen feedback to drive action
       i. But marginalized communities had weaker connections, less opportunities for input
     o Now, SDOT proactively reaches out to collect feedback and input
     o School prioritization data is collected yearly. Speed data is collected every other year at all schools and every year at schools where there are issues
     o Walk audits – community events that identify concerns
For schools where it is harder to reach community, collaborate with existing community organizations or take proactive action

- What are some common concerns that you receive from the public/from schools? What is working well?
  - Haven’t had a child fatality on the way to school in several years
  - Right now, process for collecting input from students and parents at schools is working particularly well. SDOT gets permission from school to set up a table and solicit feedback/input

- Do you see any shortcomings with your guidelines, or things that the department is hoping to change?
  - Action Plan was found to attempt too many things at once
  - The update will include fewer actions and focus on what’s working well (particularly racial equity and collaboration with other community organizations)
  - Some encouragement programs were less successful than expected, discontinued
  - Initial focus on working with pedestrian advocacy and bike advocacy organizations faced challenges because those organizations tend to be based outside of predominantly-minority neighborhoods and have few connections with/faced pushback from predominantly-minority schools. The next action plan will reflect the changing nature/limitations of these collaboration strategies
  - Worked with a school to create “walking school buses” that walked kids in a group three days/week. A police officer worked with one volunteer (student teachers from University of Washington) each day. Provided a stipend to the walking school buses coordinator at the school. This was a success for part of the school year but will not continue next year

- What do you feel is the strongest or most important aspect of your policy?
  - Specific efforts to devote engineering funds towards projects in communities of color is unique (typically political pressure to invest in more affluent/whiter schools)
  - Strong education component (currently plans to spread bicycle/pedestrian education from elementary school to high school)
  - Kids 16-18 have free or assisted bike share access

- Many cities have separate policies for SRTS and the school zones themselves. This doesn’t seem to be the case in Seattle. Can you describe how you decided on this?
  - Prior to implementation of SRTS, Seattle established a 20 mph speed limit on local streets (and 25 mph on arterials) in 2016, which de-emphasizes the importance of school speed zones in general
  - Great emphasis/importance on tackling student safety holistically and inclusively
  - Often the greatest need for engineering improvements is not adjacent to school property
  - Project placement incorporates not only school location but student location

- Describe the relationship/coordination between SRTS and Vision Zero
  - Vision Zero’s efforts currently focus on lower speeds in “urban villages” (dense, commercial areas), while SRTS focuses on lower speeds on streets with students
  - Generally, Vision Zero targets more major streets (i.e. arterials)
• The programs tend to work separately but often share benefits from projects
  o The programs use similar tools for evaluation, analysis, and implementation
  o There will be collaboration when both programs happen to be working on the same street

• The Action Plan states that 83% of students live within a “walk zone” – how is this defined?
  o They are defined by school districts, not SDOT
    i. Area within 1 mile of an elementary school
    ii. Area within 2 miles of a middle or high school
    iii. These zones are also shaped by “hazard” streets. For example, a student within a 2-mile radius would not be expected to walk if that would involve a dangerous crossing
  o The zones are 40 years old and do not reflect recent efforts by SDOT to reduce hazards, for example. A collaborative project between SDOT and schools for an update created new zones that will go into effect next school year

• How did you decide on the weighting system for school prioritization criteria?
  o Pedestrian Master Plan data is not updated frequently, so it was intended to “double-count” many of the same criteria as the PMP
  o Again, focus attention on racial equity

• Is there a technical document/internal version of the engineering toolkit beyond the Policy on School Flashing Beacon Schedules?
  o Ashley will send the technical document used in determining crossing treatments
  o There is also a technical document for school speed zone signage/markings
  o Prescriptive policy is important, but always open to engineering/context-based judgement

• Ashley recommends National Safe Routes to School e-mail listserv
1. Participants
   a. Jeremy Crowe, Project Manager II, Transportation Engineering Division, City of Orlando Transportation Department
   b. Lauren Torres, Project Manager, Orange County Public Works, Traffic Engineering Division
   c. Zach Bugg, Senior Engineer, Kittelson & Associates, Inc.

2. Interview Questions
   • Are charter and private schools eligible for safety improvements?
     o The policy is applicable in any location where there is need
     o Even people going to private schools are using the public street network
     o Generally, charter, magnet, and private schools draw from a wider geographic area; thus, less walkers
   • What is the relationship between the city, state, and other levels of government in implementing and enforcing your guidelines?
     o Collaboration and interest from central Florida counties (Orange and Osceola in particular)
     o FDOT is thinking about adding Orlando policy to their speed zone design manual as an optional methodology for municipalities
     o Since policy implementation, Orange County school board has been more sympathetic to transportation concerns, more collaborative, more willing to provide/require off-site improvements including sidewalks
   • What is the process for updating your guide?
     o Strong relationship between Orange County and City allows for consensus on whether an update is warranted
     o No current plans for update
     o FDOT recently updated Speed Zoning manual (2016) to require beacons at all school speed zones
   • What avenues, if any, exist for public input and citizen action?
Incorporated school board, various levels of local government/jurisdiction, law enforcement, city planning, county planning into policy development

Policy is intended to make school crossing decisions more transparent and justifiable to the public

- Previous system was an outdated spreadsheet from Orange County
- Results did not align with public input or engineering judgement

- Primary public involvement is requests for school zones

- What are some common concerns that you receive from the public/from schools? What is working well?
  - Speeding, unsafe crossings, sidewalk deficiencies, right-turning vehicle conflicts

- Do you see any shortcomings with your guidelines, or things that the department is hoping to change?
  - Reduced speed zone requirements do not consider whether there is already a signalized crosswalk / traffic signal / stop control
  - Previously, reduced speed areas would not be required near traffic control, but City saw issues with red light/stop sign running

- What do you feel is the strongest or most important aspect of your policy?
  - Variety of considerations and factors – more holistic than before (switch to 85th percentile rather than posted speed, for example)
  - Easy to read and understand – often non-engineers end up performing calculations, so it’s important for them to be able to understand. Also, important to communicate with/justify decisions to public

- How was the guideline of not lowering the speed limit below 15 mph, or above 20 mph in an urban area, determined?
  - It’s an FDOT guideline, Jeremy and Lauren were not familiar with the history

- How did an internal consensus come about for the quantitative thresholds involved in crossing treatment decisions?
  - System was “calibrated” based on measures from school zones that are working well
  - Wanted to incorporate new criteria, including gap analysis and more comprehensive crash analysis (including crashes outside of school hours)

- How does new policy allow for engineering judgement in special cases?
  - Policy specifically states that it doesn’t supersede the judgement of engineers
  - MUTCD also allows room for engineering judgement

Other info:

- Existing traffic calming measures don’t play into decision, but it could have secondhand effects on the things that are measured (i.e. speed). Raised crosswalks are sometimes implemented

- Important to cover charter and private schools because students are users of the public street system. There are many of these schools that are boom/bust along with the patterns of the itinerant population
1. Participants
   a. Katherine Parker, Senior Project Manager & Manager of School Zone Group, Houston Public Works & Engineering (PWE)
   b. Janice Lakey, Assistant to Katherine Parker, Houston Public Works & Engineering (PWE)
   c. Zach Bugg, Senior Engineer, Kittelson & Associates, Inc.

2. Interview Questions
   • What is the relationship between the city, state, and other levels of government in implementing and enforcing your guidelines?
     o Coordinate with various agencies and even nearby jurisdictions for placement of school speed zones
     o Nearby jurisdictions will often take recommendations from City of Houston
     o Note: Houston only puts flashing beacons on major thoroughfares
   • What is the process for updating your guide?
     o Internal review based on past issues or investigation of trends
     o For example, currently only signage at elementary and middle schools
       ▪ Lots of requests from high schools and Pre-K, pressure to change that
       ▪ Volume of Pre-K students has been increased, Houston Independent School District (HISD) is building Pre-K facilities
       ▪ Ongoing discussion as to whether to include Pre-K and high schools, decision probably in next year or 2
   • What avenues, if any, exist for public input and citizen action?
     o Requests through 311 system – often includes notification of new schools and closed schools
     o Public hearing process for school zone updates
     o Work with school principals in evaluating requests for new speed zones
   • What are some common concerns that you receive from the public/from schools? What is working well?
     o Concerns about traffic volumes
Concerns about afternoon vehicle staging (some parents arrive 2 hours before dismissal)
Middle and High school jaywalking (complaints from drivers)
Concerns about blockage of driveways

Do you see any shortcomings with your guidelines, or things that the department is hoping to change?
Nothing besides pre-k/high school issue
Active school zone periods are currently 1 hr in morning (45 min before, 15 after), 45 mins in evening (15 mins before, 30 after)
HISD has many different start and end times, so flashing beacons are really only adjusted on major thoroughfares.
  - Usually only changed yearly and based on input from principals
But now HISD has gone to standardized times; PWE had to change all of the signs but things will be much easier from now on
School zones used to have a 2-hour period but complaints from public led to reduction to 1 hour

What do you feel is the strongest or most important aspect of your policy?
Uniform standards lead to minimal arguments about treating certain schools differently
Strong relationship with principals, law enforcement

Describe the process used in surveying possible routes to school and identifying users of these routes
Identify pedestrian volumes, roadway classification, land use, sidewalks present
Identify major crossing points
All school speed zones are 20 mph in Houston, regardless of posted speed
TxDOT is cooperative even though their standard is no more than a 15 mph reduction from posted speed
Requests for school zones on highway feeder roads go to TxDOT
  - There are 2 feeder road speed zones but they predate the policy
  - Requests for a speed zone on a feeder today would probably be denied

What are the safety criteria used in developing/improving safe routes to school? Is there a typical toolbox of solutions used in improving a safe route to school?
Bike storage
Sidewalk maintenance
Not really any traffic calming except for one example of posts to reduce curb radius,
  - Safety Division manages traffic calming
  - Posts had to be taken out because drivers kept running over them
High crash rate at one intersection near Westpark Tollway – PWE restricted left turns
  - This issue was not pedestrian- or bicycle-related

Are there specific quantitative guidelines used for determining if crosswalk installation is warranted?
Look to see if there is crossing activity, no specific threshold
Consider roadway classification
If PWE provides midblock crossing, school needs to provide crossing guard (particularly mid-block, when it happens)
- Mid-block crossings without guard not seen as sufficiently safe
- Must pass a warrant for implementation of HAWK

- What relationship, if any, exists between this policy and the Houston Bike Plan? Will the policy be updated to reflect the recommendations of the Houston Bike Plan?
  - Talks in progress about placing bike lanes in school zones
1. Participants
   a. David Spencer, Traffic Engineering Supervisor, Town of Cary
   b. Bradley Reynolds, Associate Engineer, Kittelson & Associates, Inc.

2. Interview Questions
   • What is the relationship between the city, state, and other levels of government in implementing and enforcing your guidelines?
     o Work with NCDOT regularly. Penny Road intersection is an example of collaboration
     o Work with Town police to enforce speed reduction
     o Work with Public Works on school zone flashing beacons
     o Public Information office notifies public of new speed zones
     o School Speed Zones are Town Council actions
     o Limited interaction with Wake County
     o Town hasn’t applied for SRTS funding
     o Input from schools mostly concerns timing of speed zones
   • What is the process for updating your guide?
     o 2011 superseded original 2008 policy
     o 2011 policy on speed reductions: “no more than 10 mph,”
     o 2015 policy: “typically no more than 10 mph” (major 2015 update)
     o 2015 policy also changed language to make only public schools (and some charter) eligible
     o No regular process for updates, but usually updated based on changes in industry or available equipment, engineering judgement, etc.
     o Updates are usually made in Town of Cary Specs and Details rather than edits to the policy itself, when possible (the two are separate)
       ▪ Recently moved standard drawings from policy to specs
   • What avenues, if any, exist for public input and citizen action?
     o No formal process
     o Effective windows for speed zones based on public input
       ▪ Change from 30 mins before to 30 mins after to “1 hour around arrival/dismissal time”
Feedback typically comes at town council meetings
- Also, regular contacts to Engineering Department through website with feedback
- Crossing guards informally collect feedback and provide their own, as well
- When Town makes a change or performs an installation, standard practice to notify school but not codified

- What are some common concerns that you receive from the public/from schools? What is working well?
  - Primarily, concern that speed zones are not obeyed
    - Enforcement is used as the primary remedy
  - Schools do not usually provide feedback themselves, but rather pass it on from parents to engineering dept (such as school queuing issues)
  - Generally, few complaints about the speed limits of school zones themselves
  - LPIs are general practice at signalized intersections (with ASE3 software), but also the Engineering Department has added them to a few intersections based on public feedback
  - Pedestrian-only phase at one downtown school
  - Traffic cameras at every intersection near schools to collect volumes

- Do you see any shortcomings with your guidelines, or things that the department is hoping to change?
  - Switching to a private crossing guard company that is better able to cover absences
  - Not currently considering adding Vision Zero language, there is already Town language stating safety is number one priority

- What do you feel is the strongest or most important aspect of your policy?
  - Uniformity: the policy alone covers every public school

- How do you determine speed limits in school zones?
  - Typically, nothing considered outside of the standard 10 mph reduction, although the policy was updated to allow flexibility

- Are there challenges with the policy only covering adjacent streets? Are there requests for speed zones on non-adjacent streets?
  - Hard to notify driver which school zone they are in on non-adjacent streets
  - Non-adjacent speed zones more appropriate in urban environment
  - Still, Engineering Department receives some requests for non-adjacent streets
  - Engineering Department doesn’t see much benefit in reducing speed limit below 25 mph and many local non-adjacent streets are at or near 25 mph anyhow

- Are there other safety programs for safe routes to school?
  - Annual funding for spot improvements and safety-related projects

- Are there Town-specific guidelines for installation of crossing and/or traffic calming treatments?
  - Policies for traffic calming and mid-block crossings but not school-specific
  - Traffic calming mainly applies to local streets, but schools are usually on arterials
  - Town recently retrofitted all 20 public schools in Cary with flashing beacons
  - New schools are responsible for purchase and installation of beacons, but Town maintains...