•This presentation provides an overview of tools recently developed as part of TxDOT research studies on schools.

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TxDOT Project 0-5470
Product 0-5470-P1
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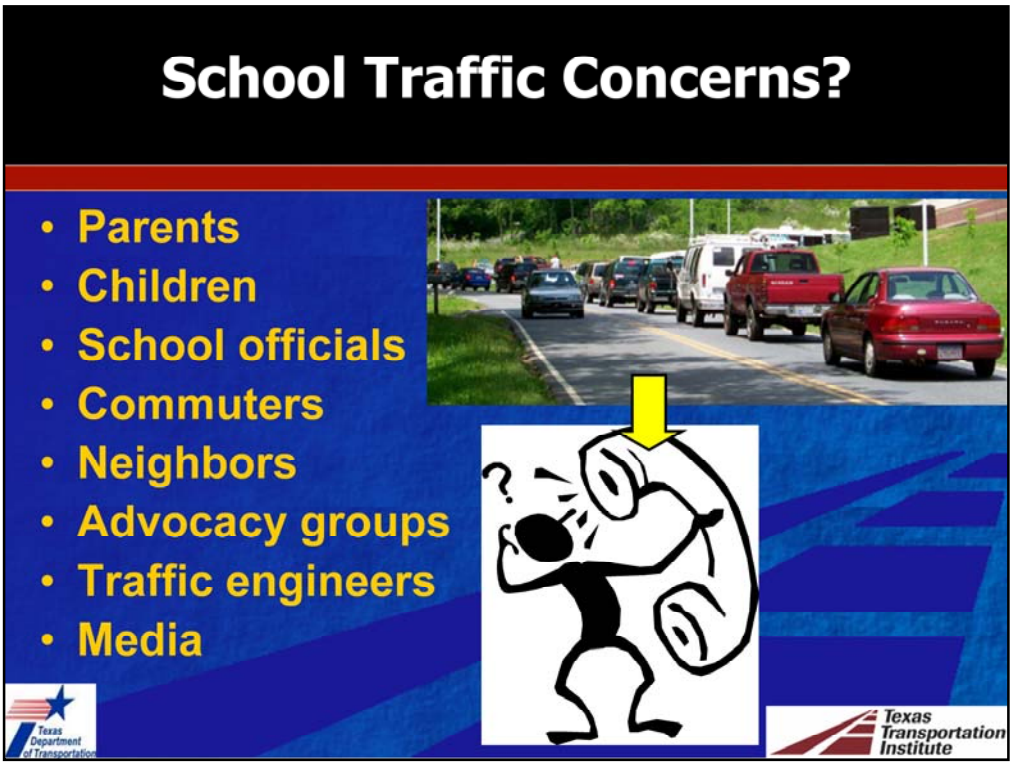
http://tti.tamu.edu/documents/0-5470-P1.pdf



Concerns on school traffic involve several stakeholders:

•parents,

•children,

•school officials,

•commuters,

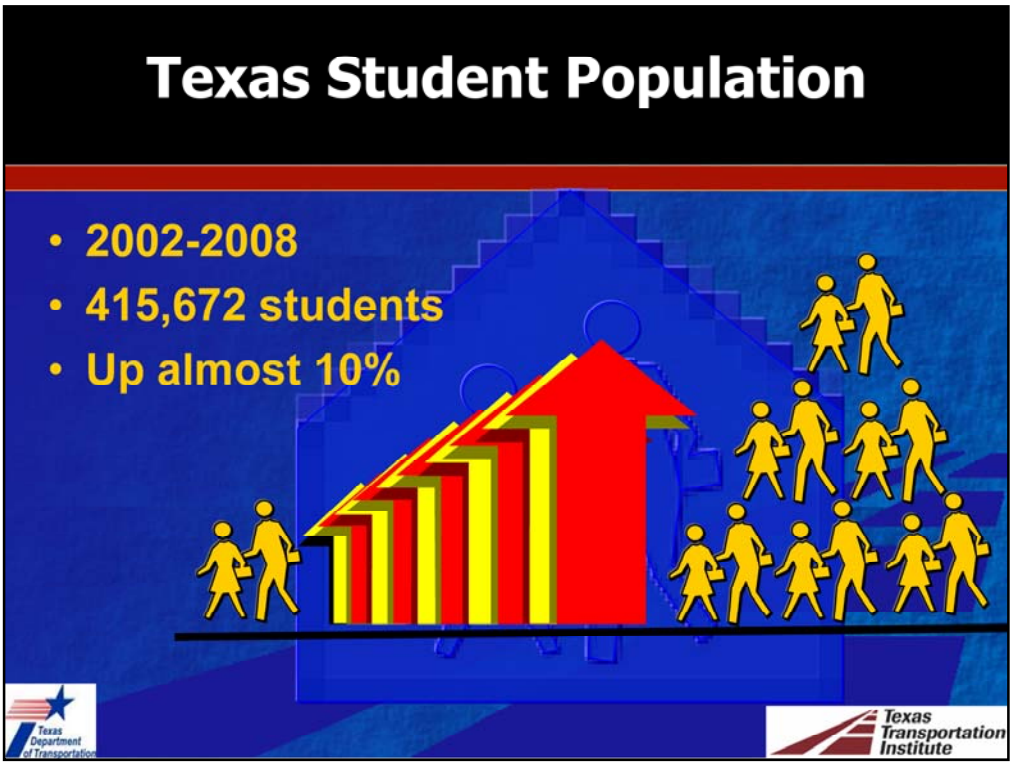
•neighbors,

•advocacy groups,

•traffic engineers, and

•media.

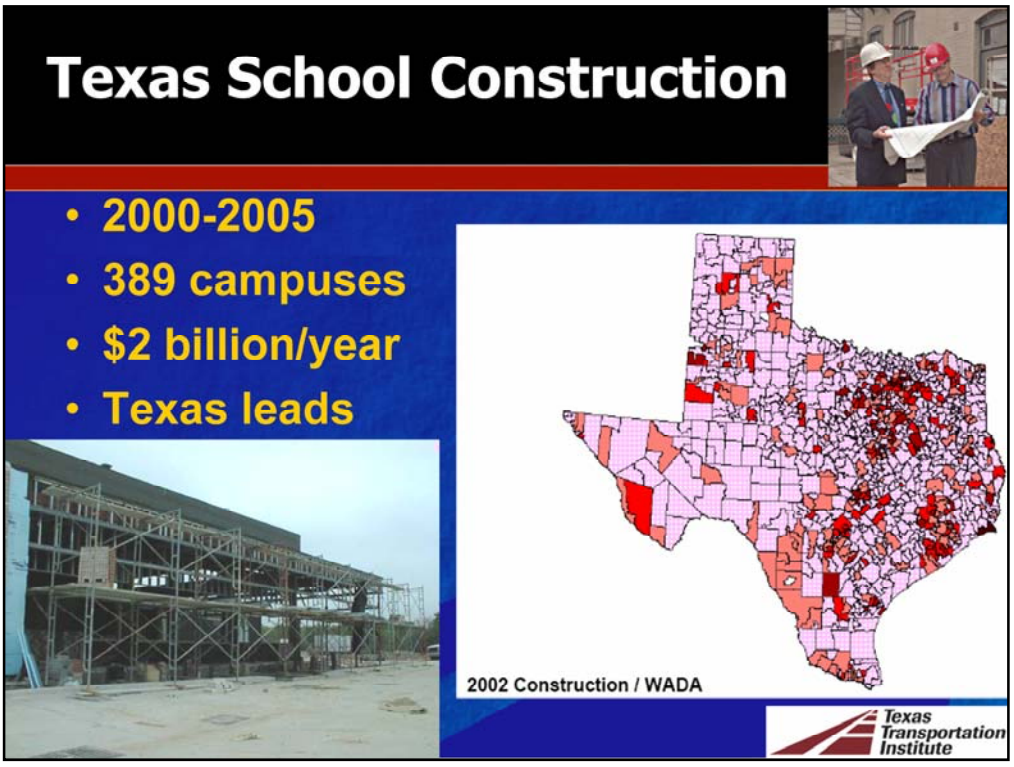
Plenty of press (e.g., newspaper articles) keeps the issue at the forefront.



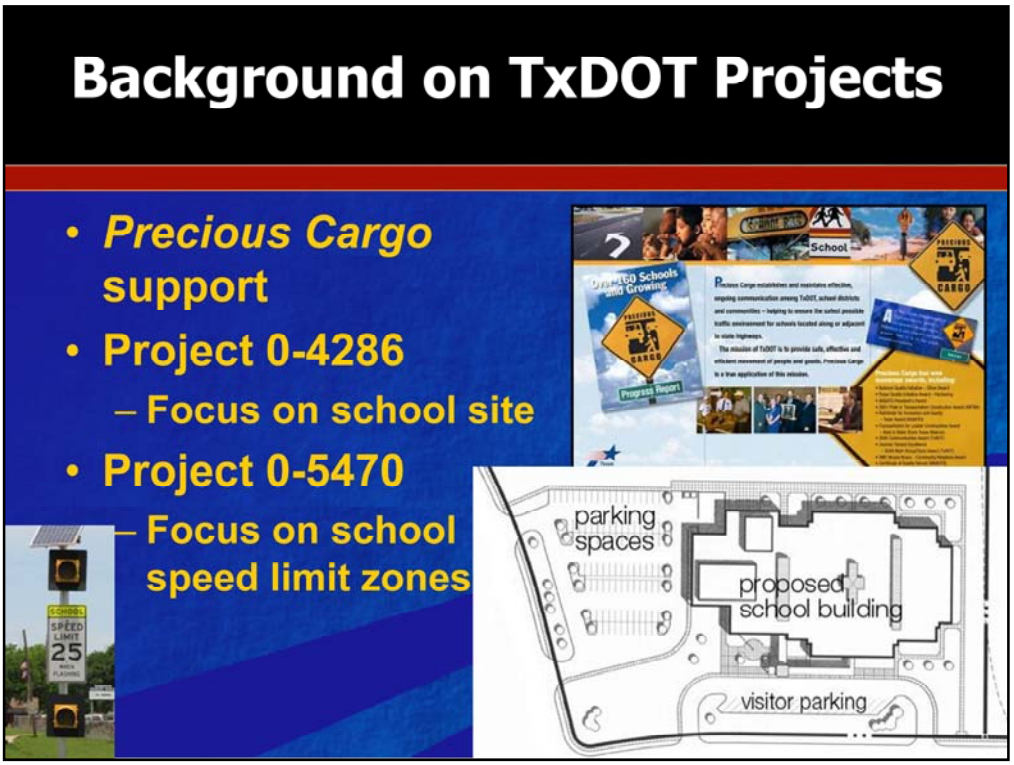
Student population is growing, and with it grows the need for more schools in developing areas.

From the 2002-03 school year to the 2007-08 school year, Texas has seen an increased school enrollment of almost 416,000 students, an increase of nearly 10% over the 5-year period.

(Numbers shown are from the Texas Education Agency (TEA) website.)



Construction is attempting to keep up with demand.



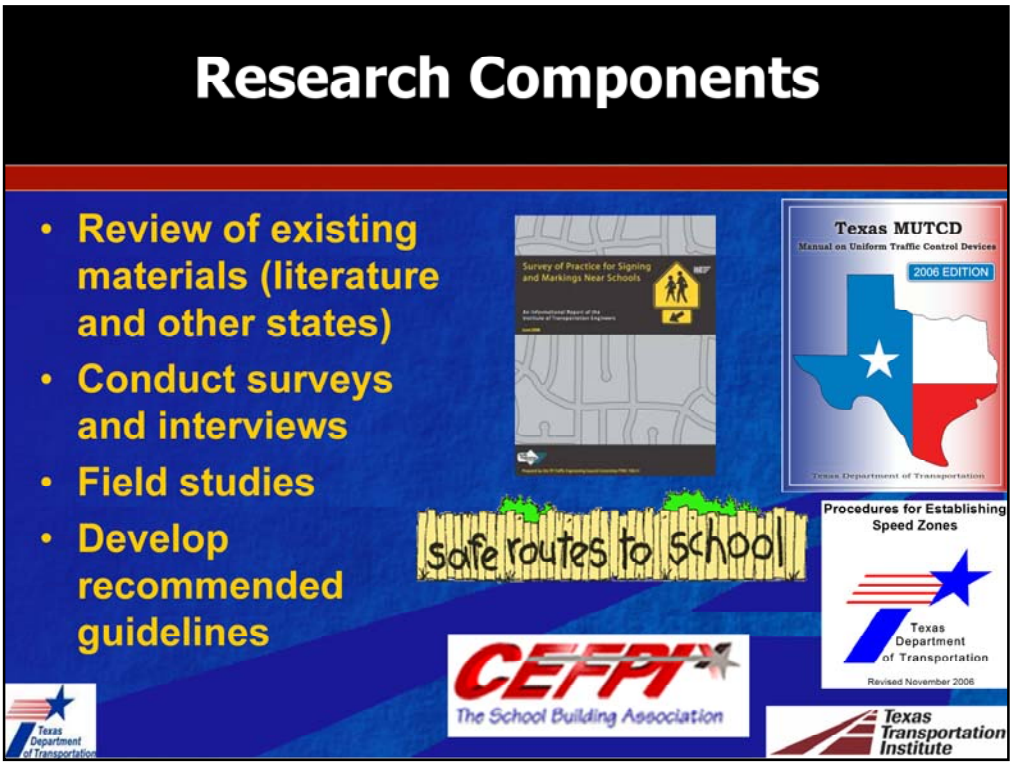
•Two recent TxDOT projects focused on schools: Project 0-4286 was done to support the award-winning Precious Cargo program. Project 0-5470 continued the support and had a focus on school speed limit zones.

•One unique aspect of the initial project (0-4286) was the involvement of many different entities with ties to school transportation including TxDOT, school district staff, a consultant, an architect and a city manager.

•The overall objective of the 0-4286 project was to develop guidelines and good examples for the design and operation of roadways within and around schools. The focus of the research was on transportation elements within school sites such as the length of driveway for stacking of vehicles in the pick-up/drop-off zone, driveway spacing and parking layout. The research also focused on elementary and middle school facilities.

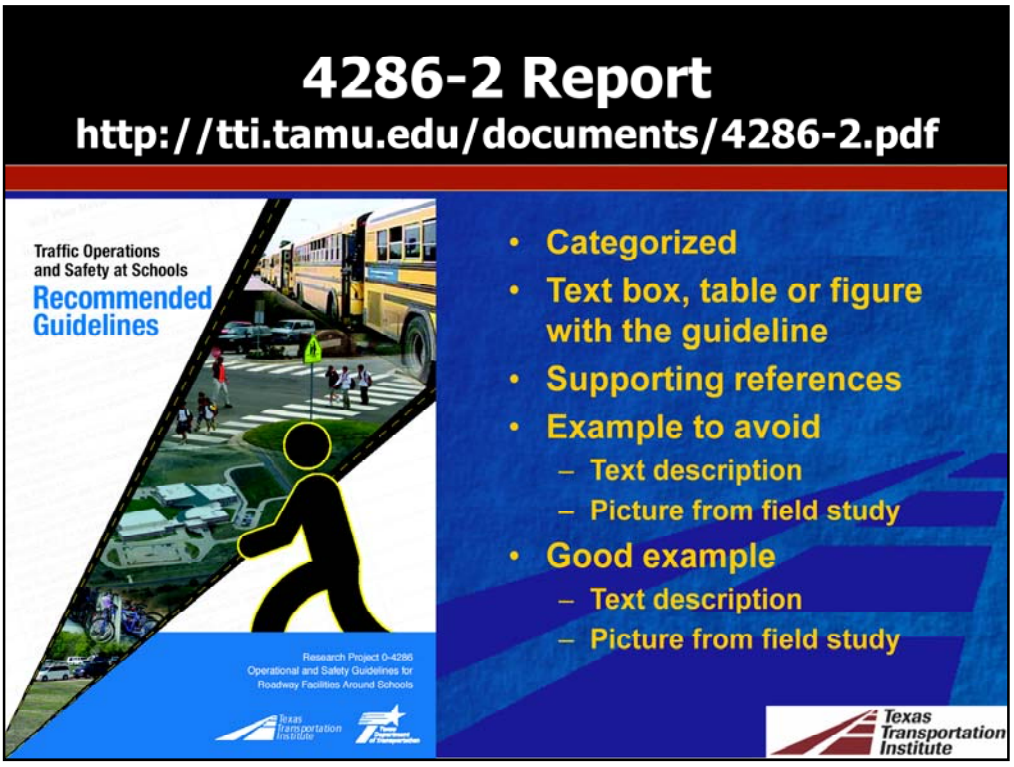
•Reduced-speed school zones are frequently requested traffic controls for school areas, based on the common belief that if the transportation agency would only install a reduced speed limit then drivers would no longer speed through the area. Research project 0-5470 was tasked with reviewing existing practices and developing guidelines regarding:

- establishment of school zones, and
- traffic control devices for school zones.



•Research used several methods to accomplish objectives:

- •review existing literature,
- •conduct practitioner surveys,
- •review state/city guidelines and warrants,
- •perform field studies, and
- •develop recommendations and guidelines.



•The first product of the 0-4286 research was the 4286-2 report, which contains the recommended guidelines.

•The guidelines were formatted to be easy to read and use for all audiences. They were categorized and included supporting references, examples to avoid, and good examples of situations observed during the field studies.

•The key product from project 0-5470 was guidelines on school zones (the guidelines were included as Appendix A of the research report).

•The guidelines are intended to serve as a supplement to:

- *TMUTCD*, and
- TxDOT manual on *Procedures for Establishing Speed Zones.*

•Parts of the guidelines can be incorporated into the *Procedures* manual or other TxDOT documents. (Note: The research team just makes suggestions; TxDOT makes decisions regarding implementation.)

This presentation will provide an appreciation of the material contained in these two tools.

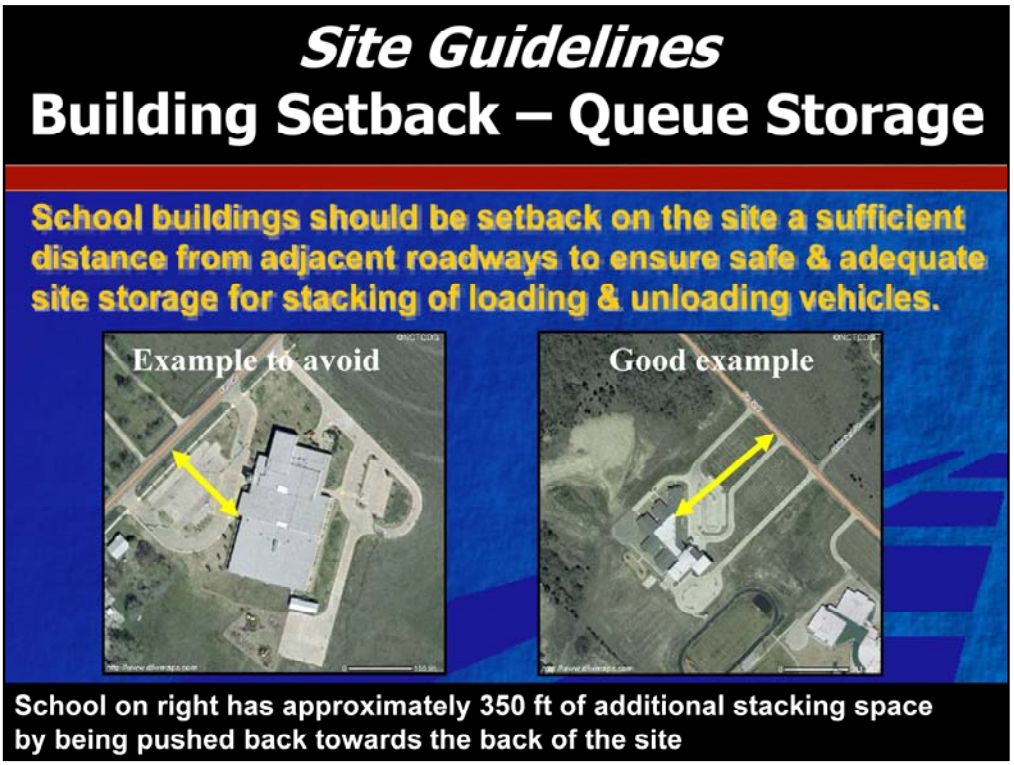
Since the titles of each document is rather lengthy, the term SITE *Guidelines* will be used to describe the document that includes guidelines on the school site.

The term ZONE *Guidelines* will be used to describe the document that focuses on the school speed zone.

The SITE guidelines were divided into these 9 categories (listed on the slide). This presentation will give some examples of selected guidelines from the report in several of these categories.

Avoid locations with direct access to high-speed roadways (e.g., trunk highways and frontage roads). Locations should be chosen on roadways with the lowest speed limit and/or lowest average daily traffic.

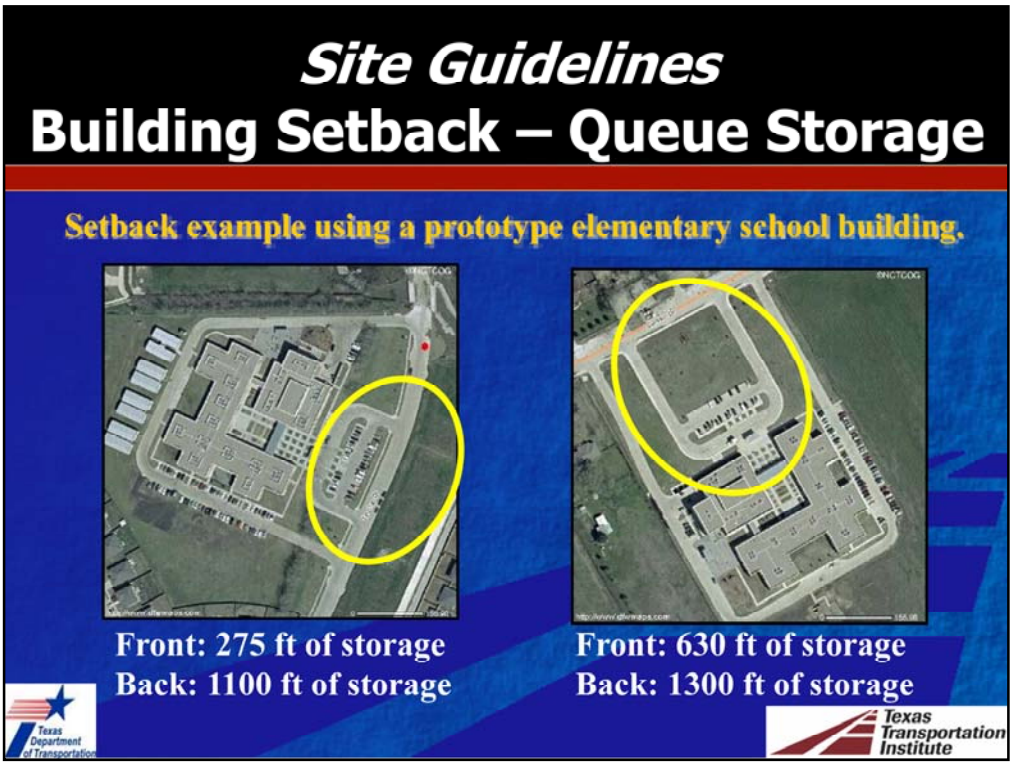
Also suggested is to locate a school so that students approaching on foot should not have to cross main traffic routes and to consider locating schools adjacent to other community facilities where there is potential for shared-use parking (e.g., parks, churches, etc.).



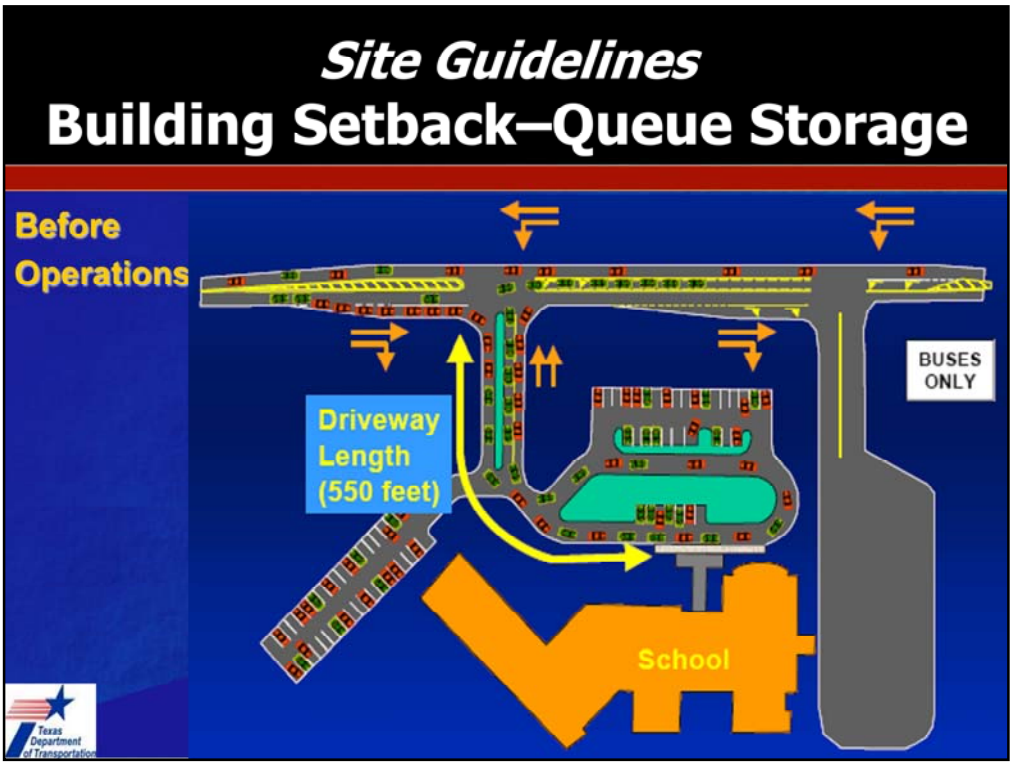
The first example guideline is in the site selection category and relates to how far back the school building is placed on the site.

The guidelines state that school buildings should be placed back enough on the site from adjacent roadways to ensure safe and adequate site storage for stacking of loading and unloading vehicles.

In the example to the left, the school is near the front. The same building is pushed back on the site in the picture on the right, which provides approximately 350 ft of additional storage space – enough for 15 more vehicles.

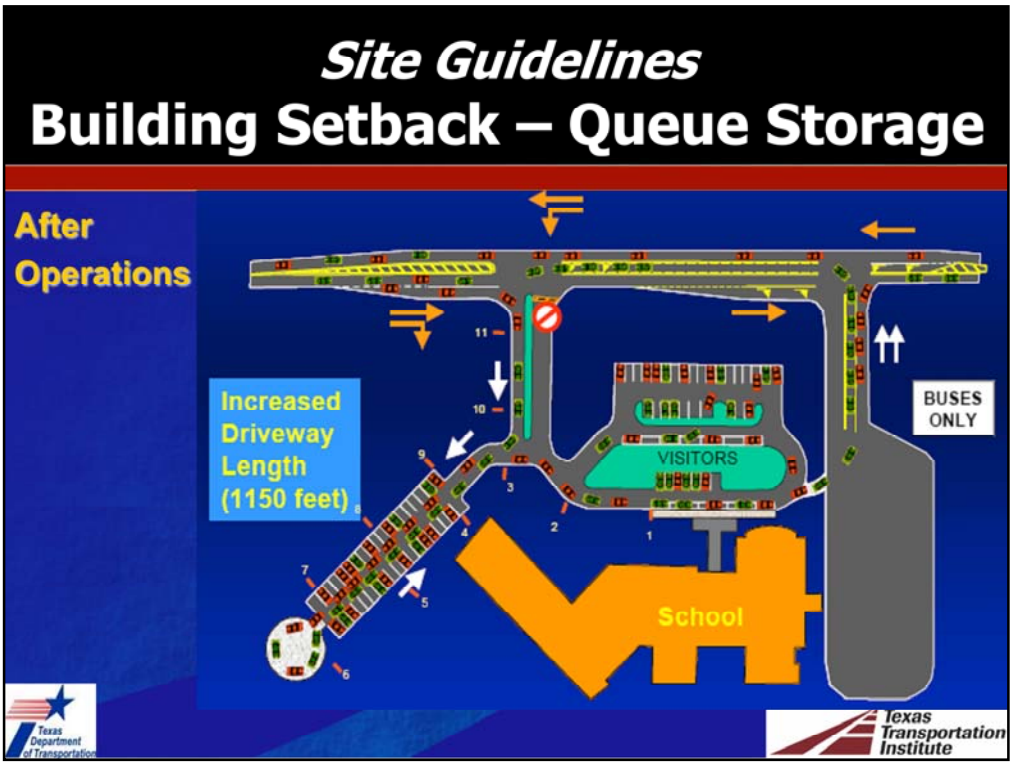


This slide further reinforces the building setback guideline with a prototype elementary school building used in a Dallas-area school district. The building is placed near the front of the site in the aerial photo on the left and pushed toward the back of the site in the aerial photo on the right. The amount of stacking space in the front loading zone is more than doubled by pushing the building back on the site.



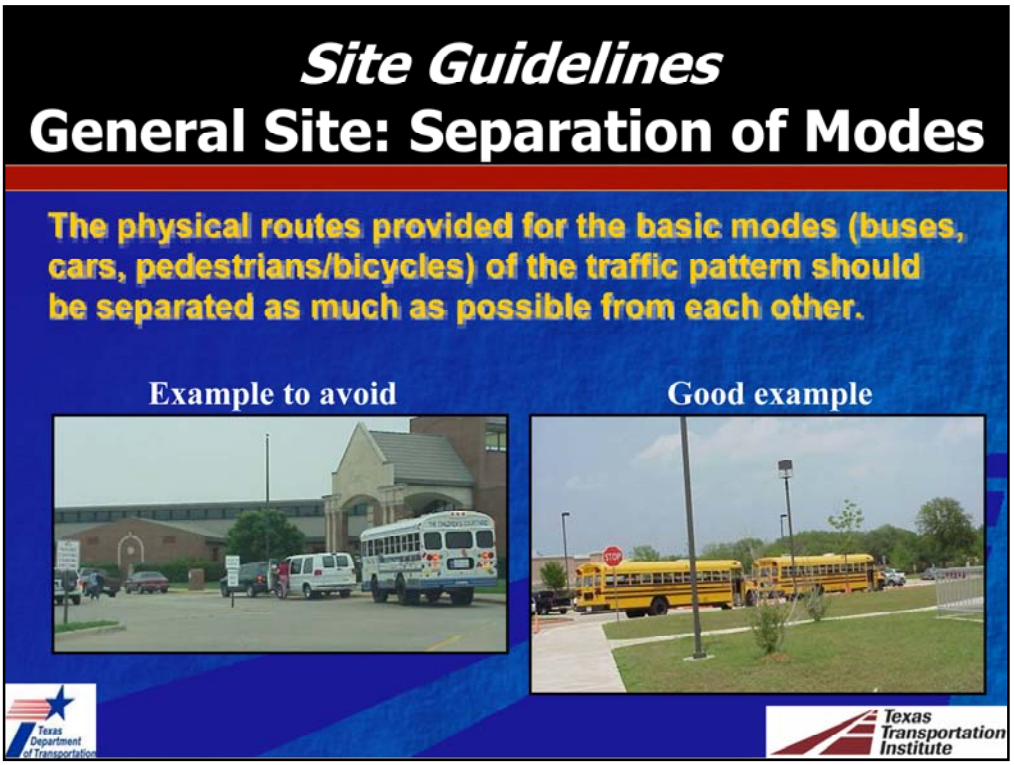
Here is another slide regarding queue storage.

The current arrangement provides only 550 ft of off-roadway storage.



By altering the location available for queue storage, the stacking area increases to 1150 ft. Drivers now queue within the side parking lot rather than on the roadway.

The school also modified the exit from the drop-off area to the driveway on the east side of the school. The relocation of the exiting traffic eliminated some of the conflicts along with decreasing congestion at the west-side driveway.

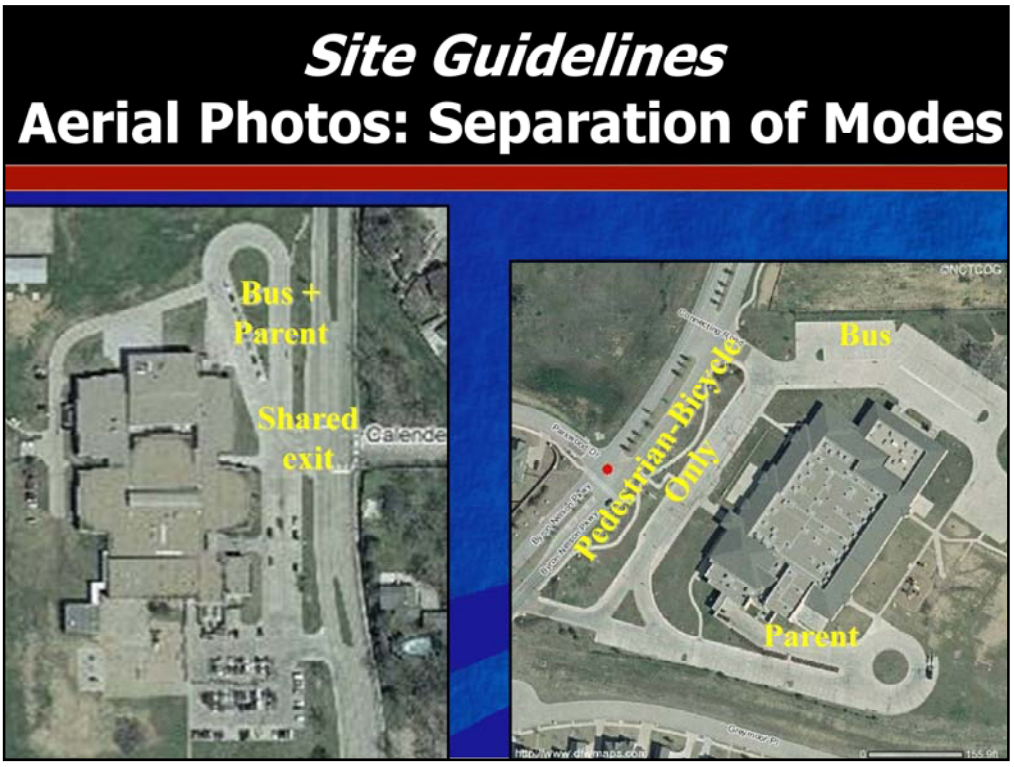


The next guideline is in the general site category and relates to the separation of modes.

The guideline states that the physical routes for the basic modes (buses, vehicles, pedestrians, and bicycles) should be separated as much as possible from each other.

The picture on the left gives an example to avoid, where buses and vehicles are mixed together in the same loading zone.

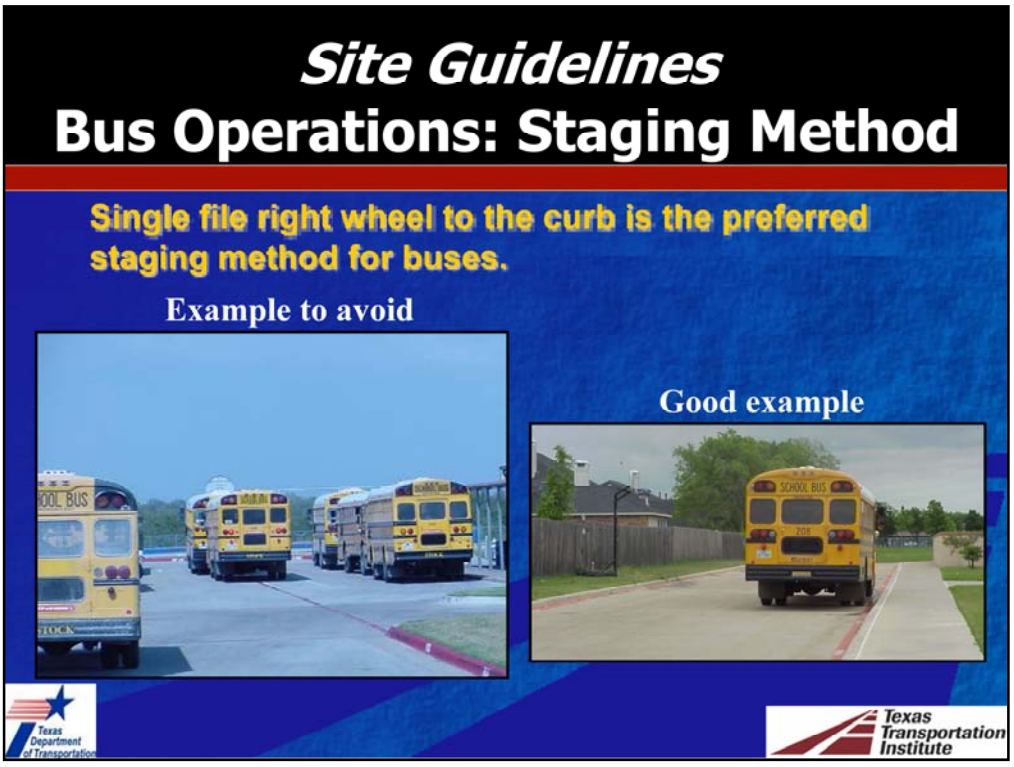
The picture on the right shows an example of a bus-only zone.



This slide also reinforces the separation of modes guideline.

The school on the left does not provide good separation and has a zone where both buses and vehicles interact.

The school on the right has good modal separation between buses, parent vehicles, bicycles, and pedestrians.



The next guideline is in the bus operations category and relates to the staging method of buses.

The guideline states that buses should be staged single file right wheel to the curb.

The photo on the left shows buses staged three abreast, which promotes children walking in between buses.

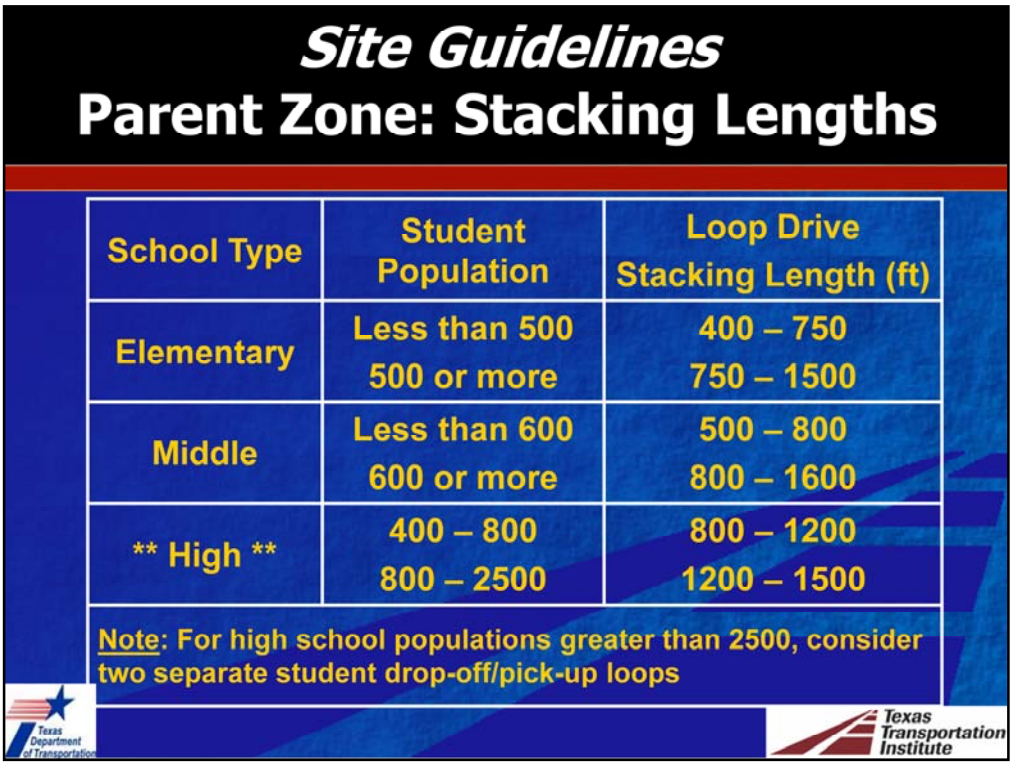
The photo on the right is a good example of the preferred staging method.

The next guideline is in the parent loading zone category and relates to the loading method.

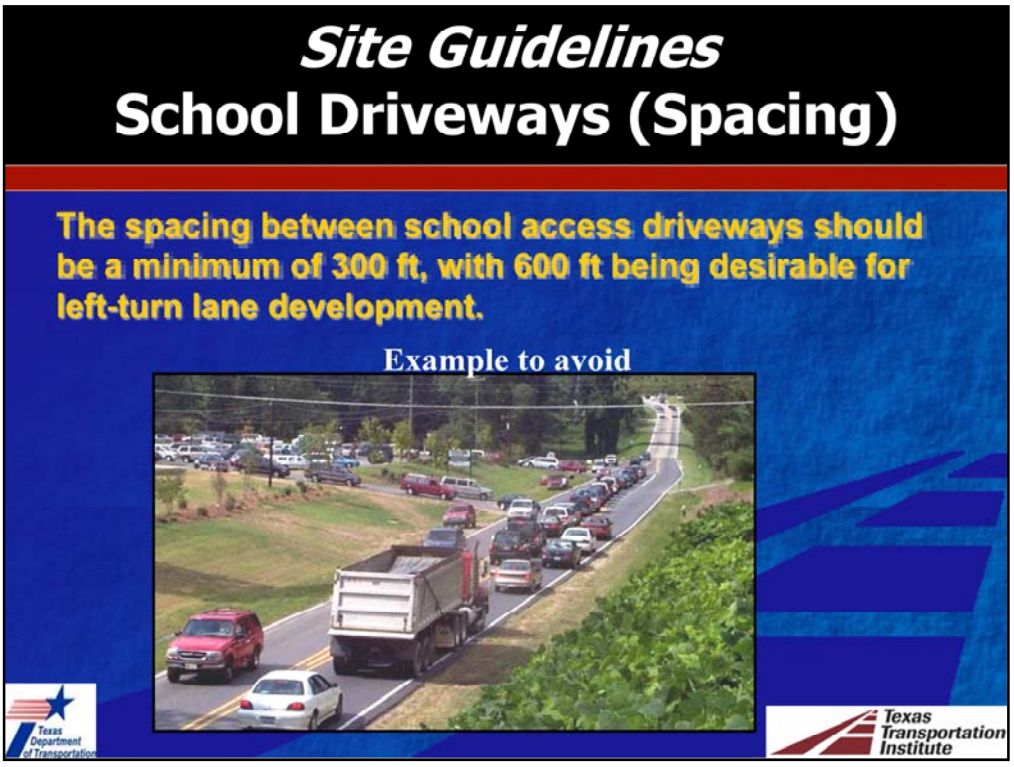
The guideline states that single lane loading minimizes pedestrian/vehicle conflicts.

In the left photo, the multiple-lane queue produces more potential conflicts.

In the right photo, traffic cones are placed to create a single-lane loading area to enhance loading safety.



This table shows the recommended distances for on-site stacking lengths by school type. The data from the field studies were used to develop the elementary and middle school values. Because we collected data at only one high school in Texas, the values for the high school were based on South Carolina DOT guidelines.

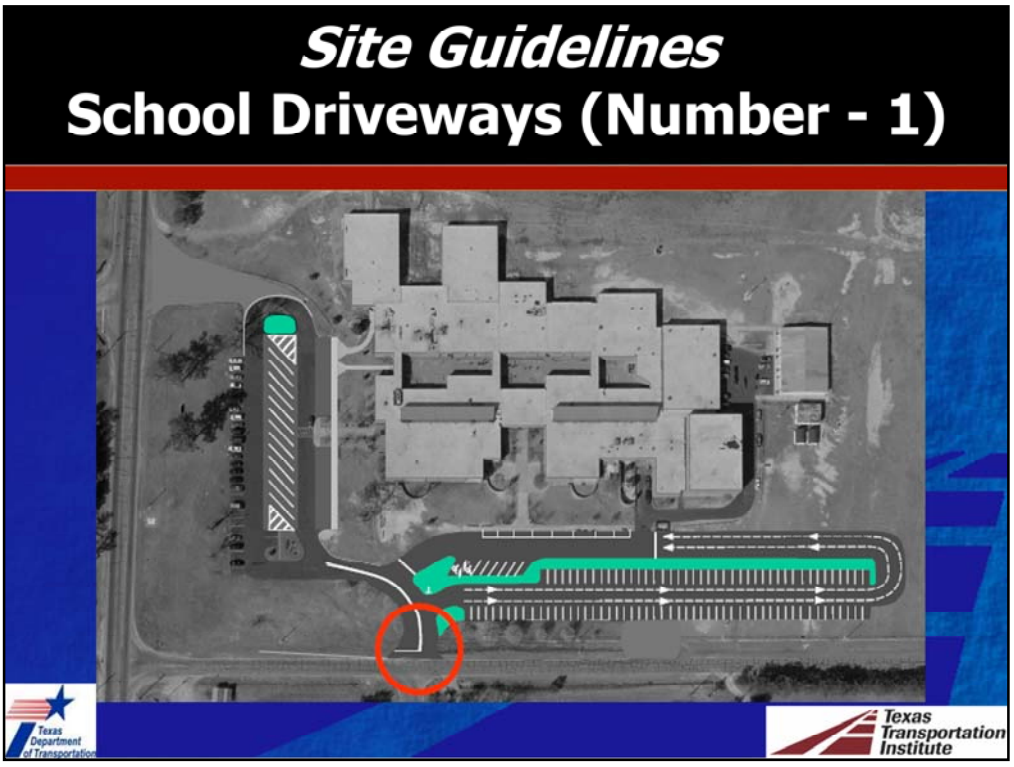


The next guideline is in the school driveway category and relates to the spacing between successive driveways.

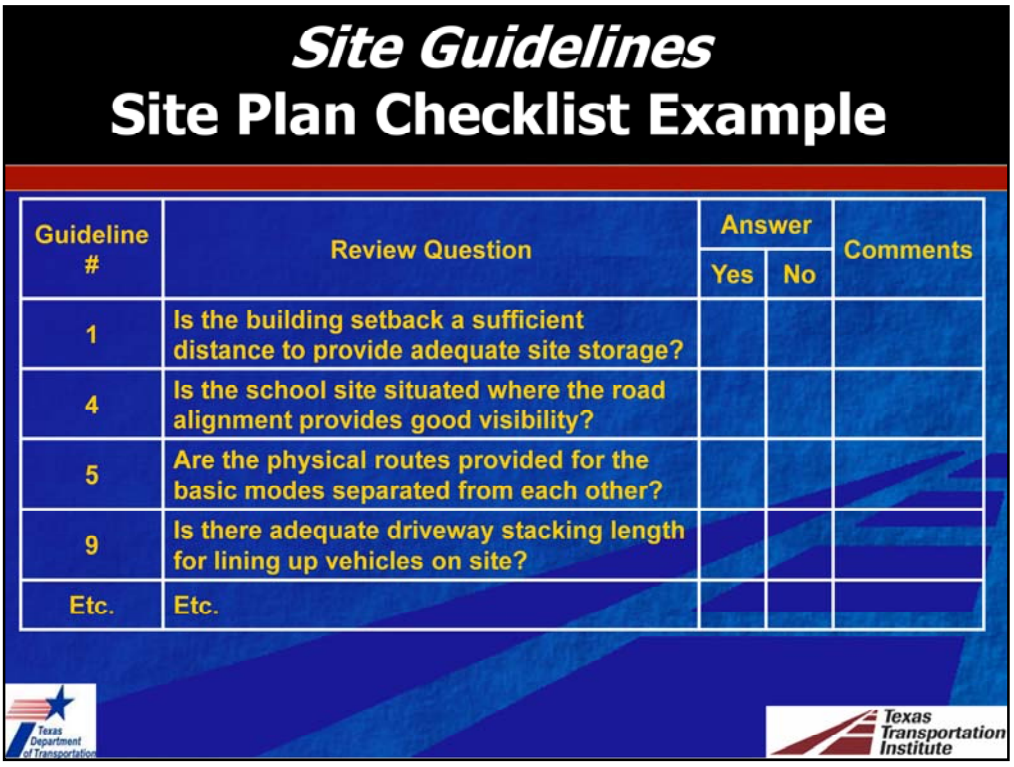
The guideline states that the minimum spacing should be 300 ft, with 600 ft being desirable for left-turn lane development.

The photo shows a site where inadequate spacing promotes chaos during the afternoon pick-up operations.

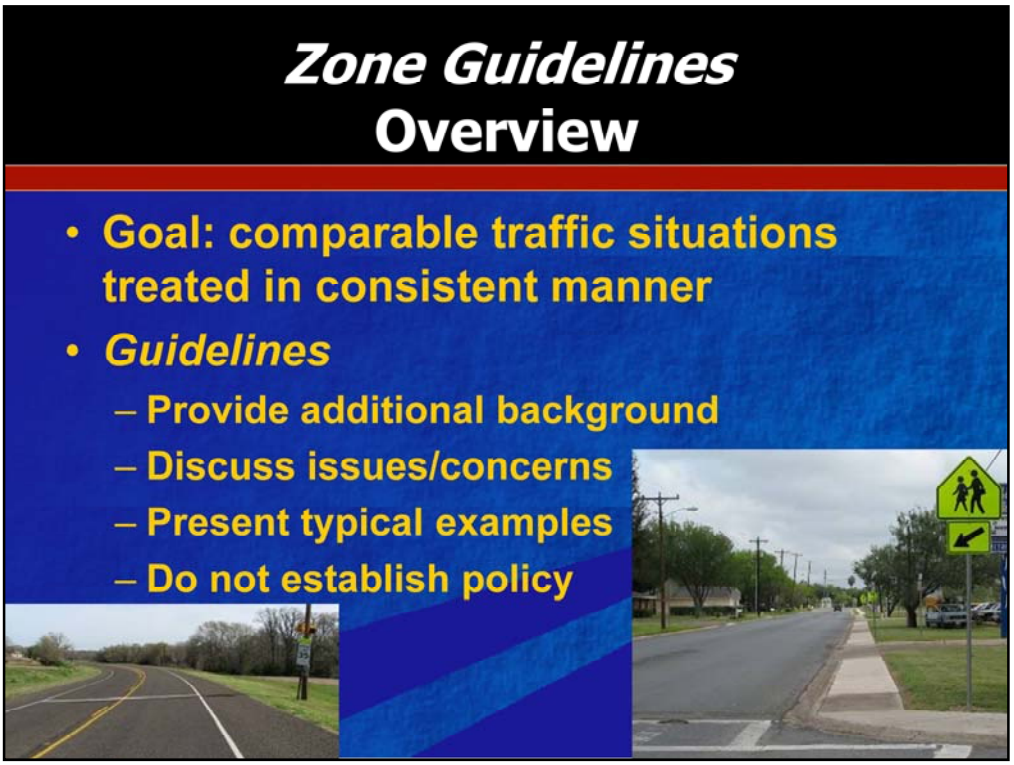
In this example, the school has multiple driveways. While this solution may be appropriate in some locations, the roadways bordering the school may experience high numbers of conflicts from the turning patterns.



If the school redesigned the driveways and parking lots to one major driveway, the location may warrant a signal, which could address turning conflicts. The needs for left and/or right turn bays (along with the lengths of the bays) would also need to be considered.



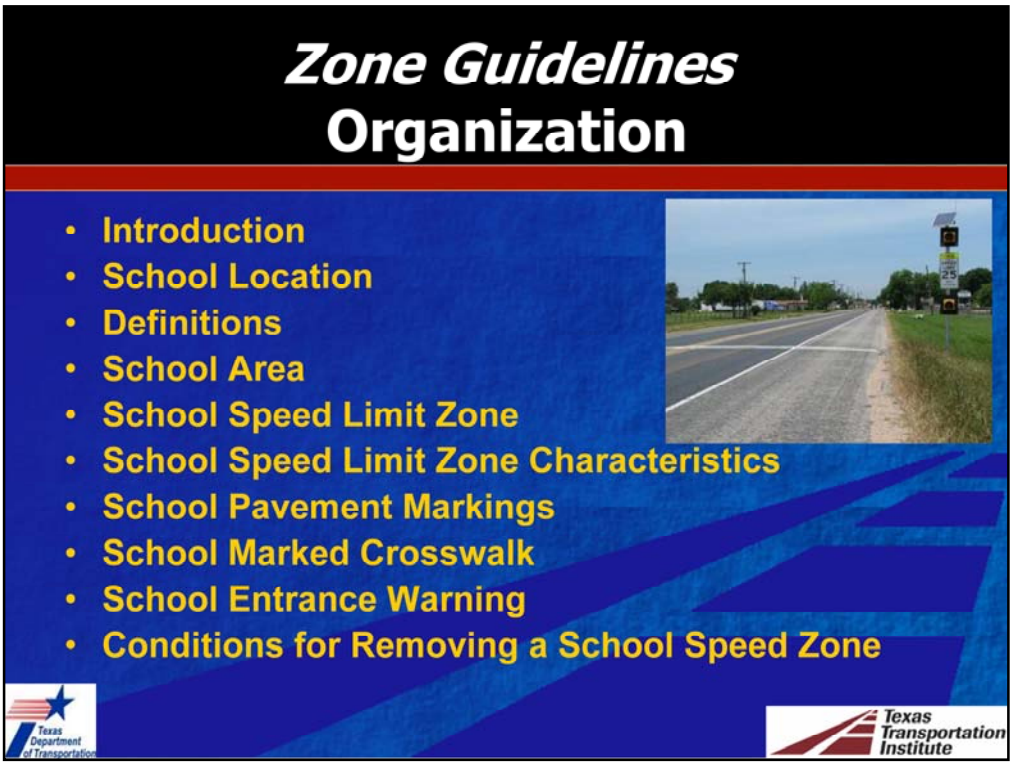
The second product developed during the 0-4286 project was a site plan review checklist that TxDOT engineers can use in the Precious Cargo site plan review program. The checklist was formatted to turn the recommended guidelines into questions that the reviewer would answer and comment on in order to have consistent reviews. This slide illustrates part of the checklist and includes a sample of the guidelines.



•The *Zone Guidelines* are intended to serve as a supplement to:

- *TMUTCD*, and
- TxDOT manual on *Procedures for Establishing Speed Zones.*

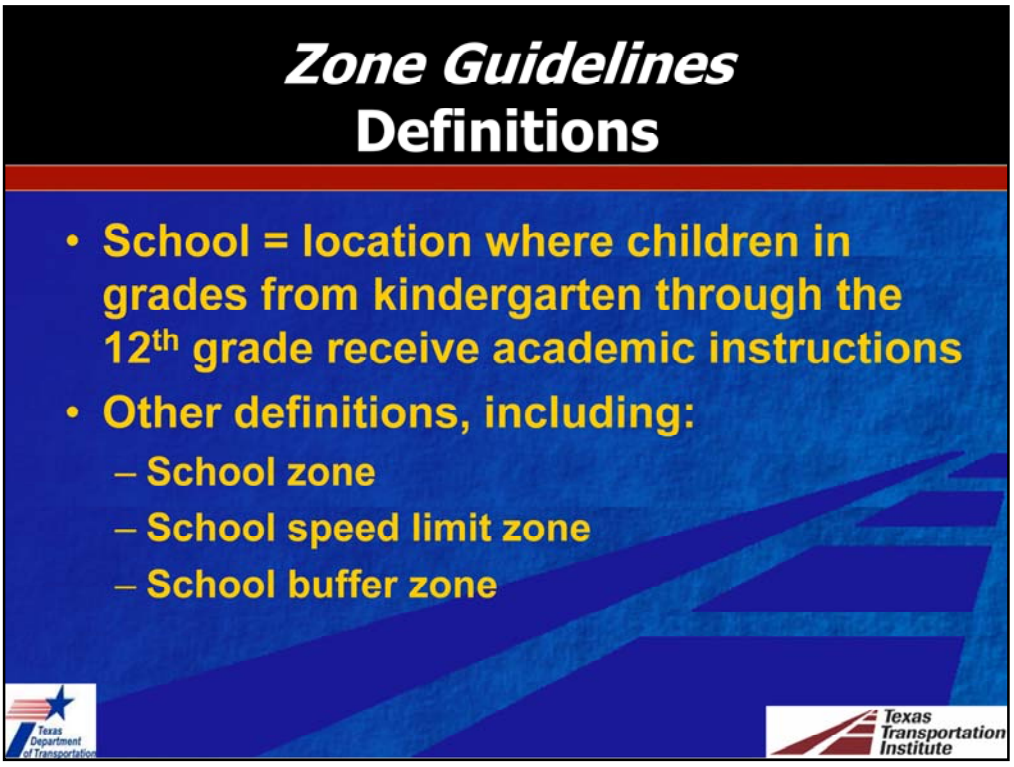
•Parts of the guidelines can be incorporated into the *Procedures* manual or other TxDOT documents. (Note: The research team just makes suggestions; TxDOT makes decisions regarding implementation.)



Slide shows major sections of *Guidelines.*

Emphasis is that *Guidelines* are to provide information on:

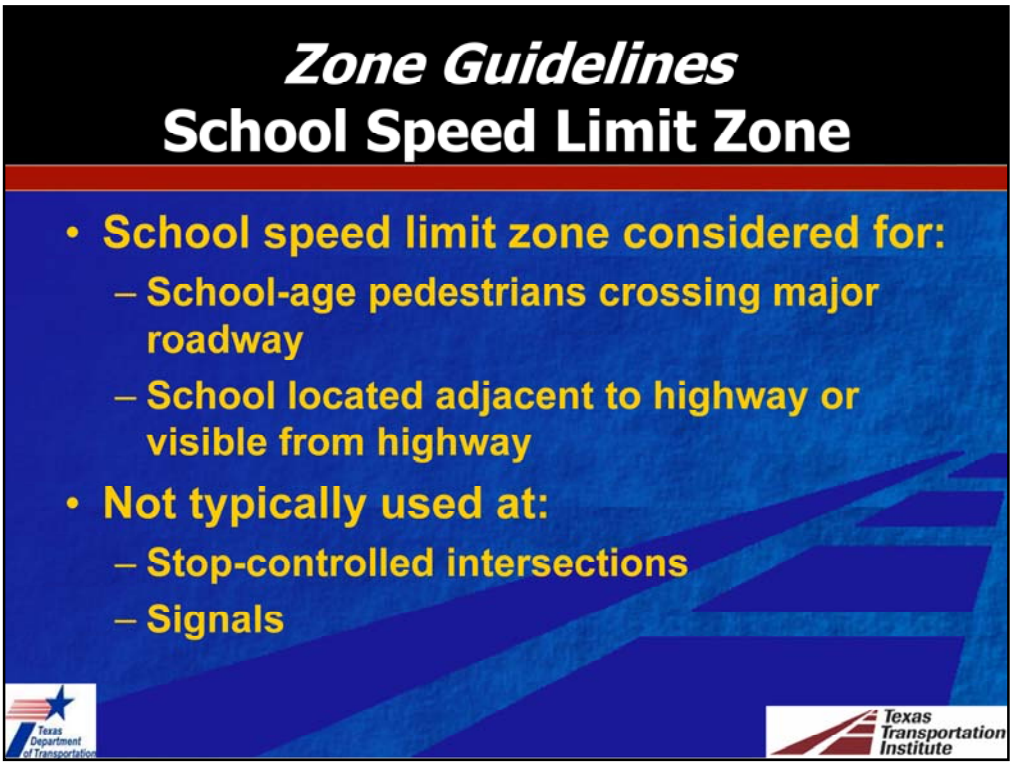
- when to install a school zone,
- characteristics of a school zone, and
- appropriate traffic control devices around schools.



Guidelines include several definitions.

School definition emphasizes:

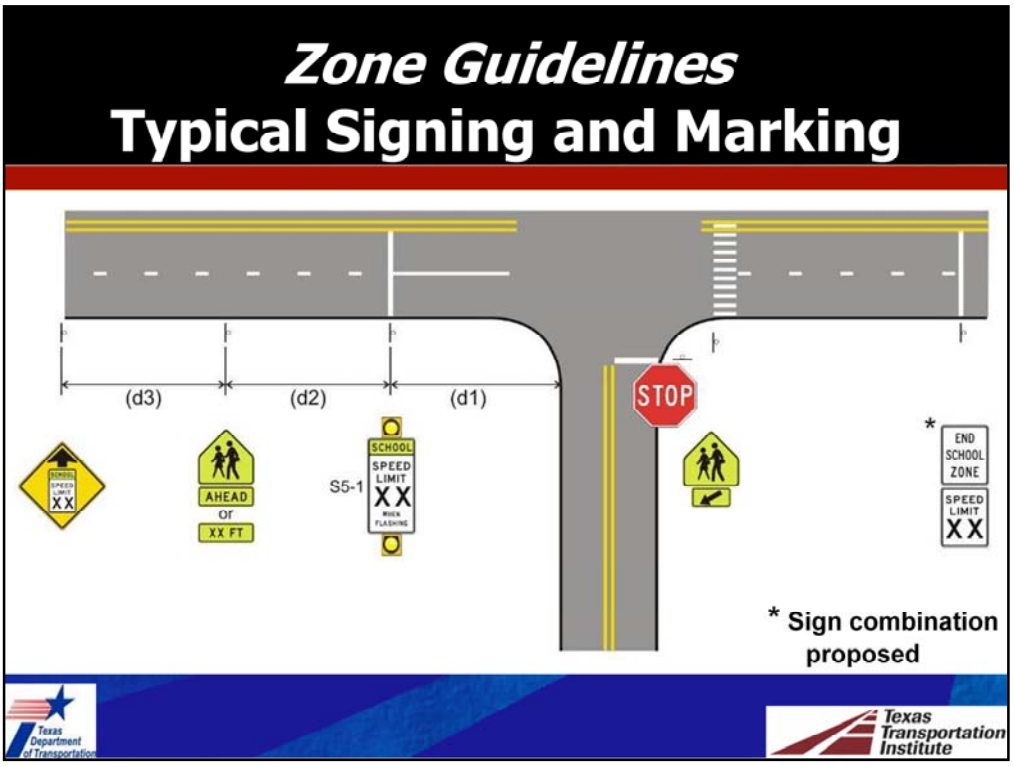
- "academic instruction" (not dance studios, etc.),
- "kindergarten" (not preschool where children would not be walking), and
- "12th grade" (some states limit to 8th grade; TxDOT decided on 12th grade).



Material regarding the decision to install a school speed limit zone was developed as a result of:

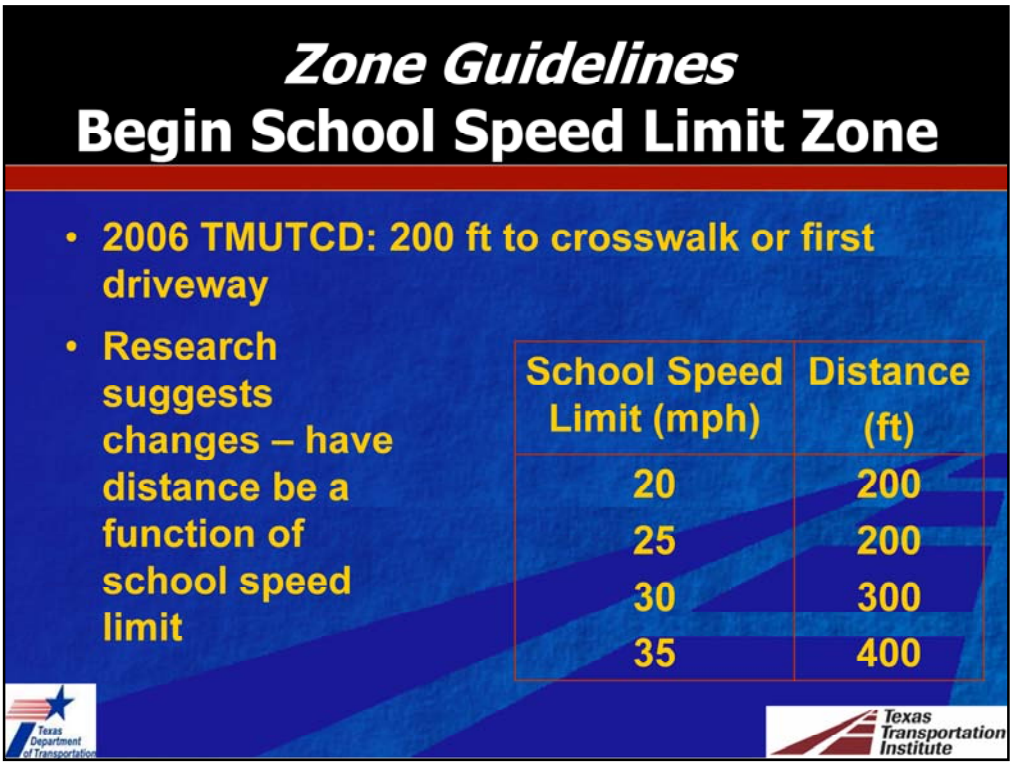
- reviews of existing state and local guidelines,
- discussions with the project advisory committee, and
- workshops held as part of professional society meetings.

Zones are not typically used at stop-controlled intersections or signals because those types of traffic control CREATE GAPS that the pedestrian can use to cross the street.



This slide shows an example of a portion of a typical signing and marking schematic included in the *Guidelines.*

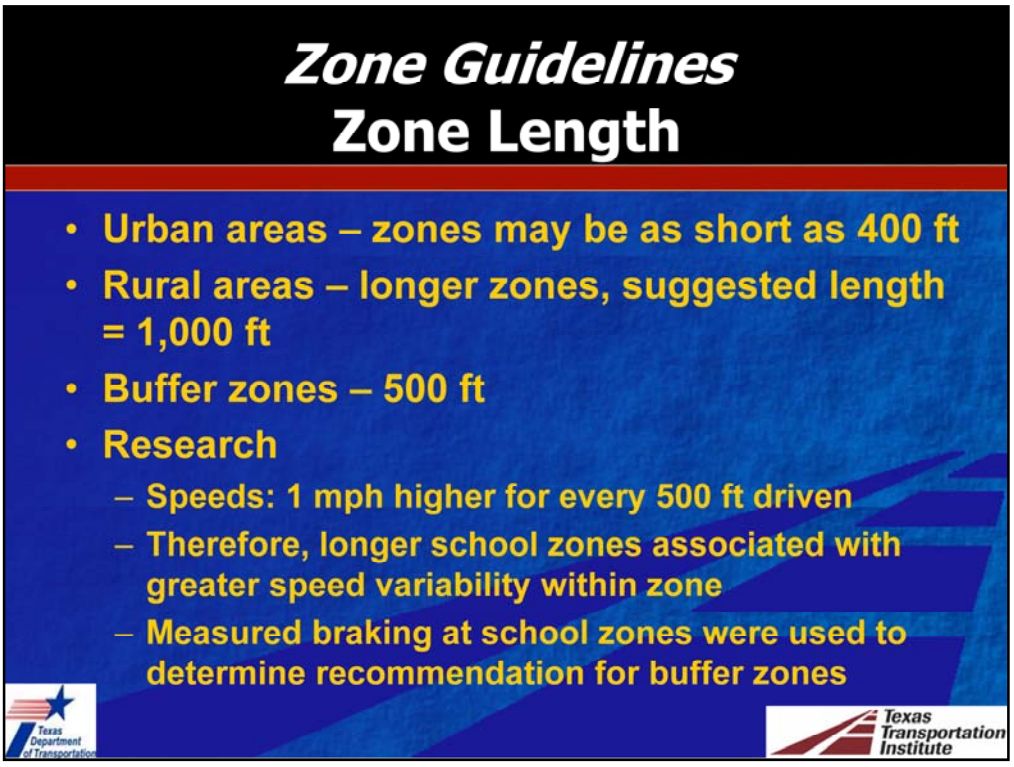
Note: The figure shows an END SCHOOL ZONE sign because the use of the two signs (END SCHOOL ZONE plus Speed Limit sign) is PROPOSED for the next edition of the MUTCD. The END SCHOOL ZONE sign is not currently used as a standard in Texas. The sign is displayed by local jurisdictions.



The research team recommends that the distance from the crosswalk or 1st driveway be sensitive to speed rather than having a single value.

Distances were based on:

- typical 85th percentile speed measured in the field studies for a given school speed limit;
- rounded stopping sight distance values for the measured 85th percentile speed; and
- consideration that speeds within a school zone have a “bowl” shape, with the minimum speed occurring between 100 and 500 ft beyond the school speed limit sign.



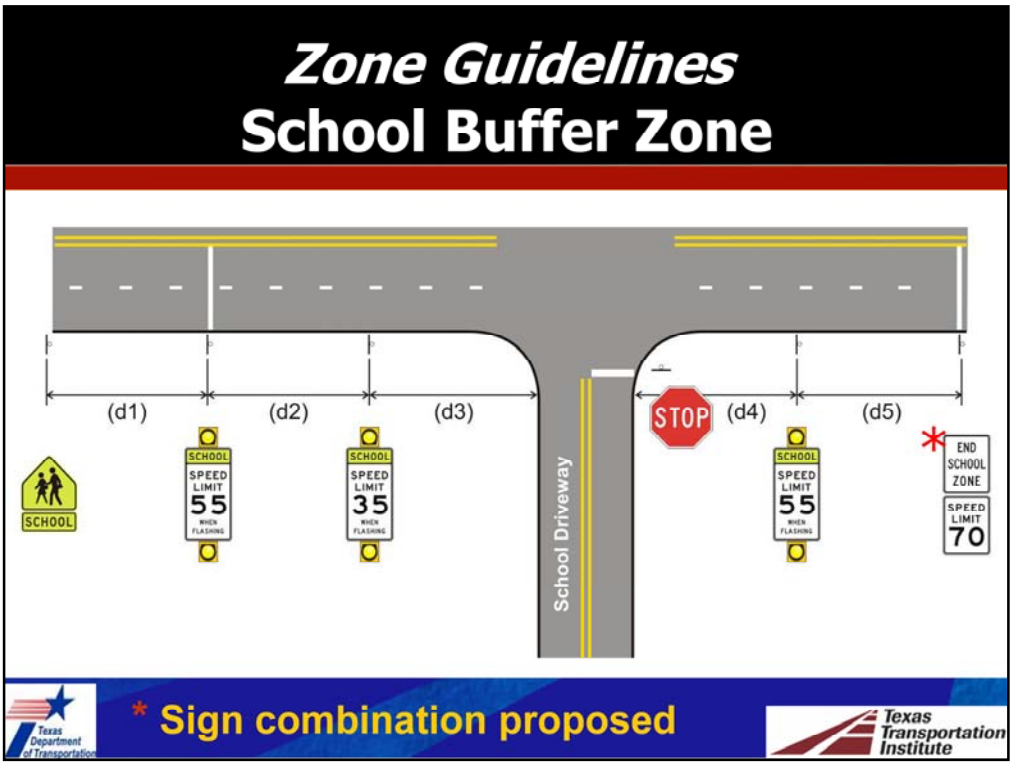
The minimum urban school speed zone length was modified from 200/300 ft to 400 ft to match two times the minimum distance between the School Speed Limit sign and a crosswalk or school driveway (200 ft).

The development of typical speed zone lengths was more complex. Researchers examined:

- typical deceleration rates,
- other states' suggestions,
- difference in speeds between the start and end of the school zone at field study sites,
- discussions with the project monitoring committee, and
- discussions at workshops.

Final recommendations for typical lengths:

- school speed limit zone = 1000 ft.
- school buffer zone = 500 ft (based on consideration of deceleration rates observed during braking maneuvers at the field study sites).



Any roadway with an 85th percentile speed greater than 55 mph is to have a buffer zone to transition to a 35-mph school speed limit.

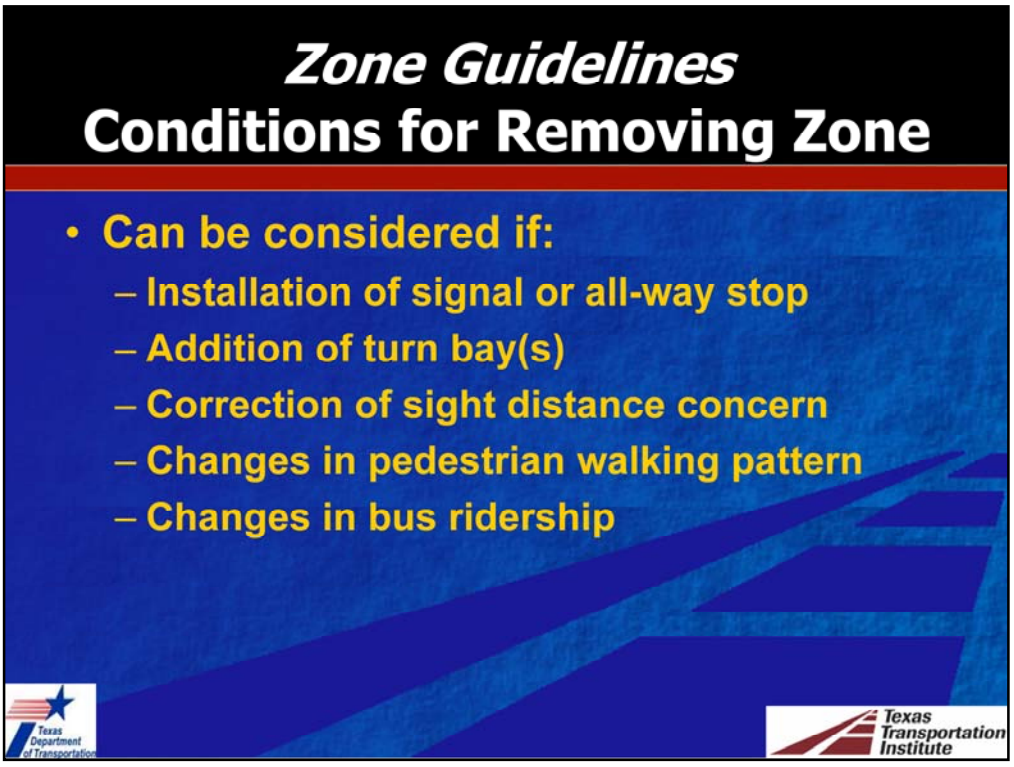
Buffer zones permit motorists to travel at the higher posted speeds through both zones when slower speeds are not necessary.

An example of a buffer zone is where the regulatory posted speed limit is 70 mph and the school speed limit is 35 mph. In this case, a buffer zone of 55 mph can be used on the approach and departure sides of the 35-mph school speed limit zone (example shown on this slide).

The basic design for a school buffer zone sign is the same as for a regular school speed limit sign. The SCHOOL SPEED LIMIT XX WHEN FLASHING sign should be used where TxDOT is responsible for signing school speed limit zones and school buffer zones.

The buffer zone beacons can be activated slightly in advance of the school speed limit zone to eliminate drivers seeing active beacons only in the lower speed zone.

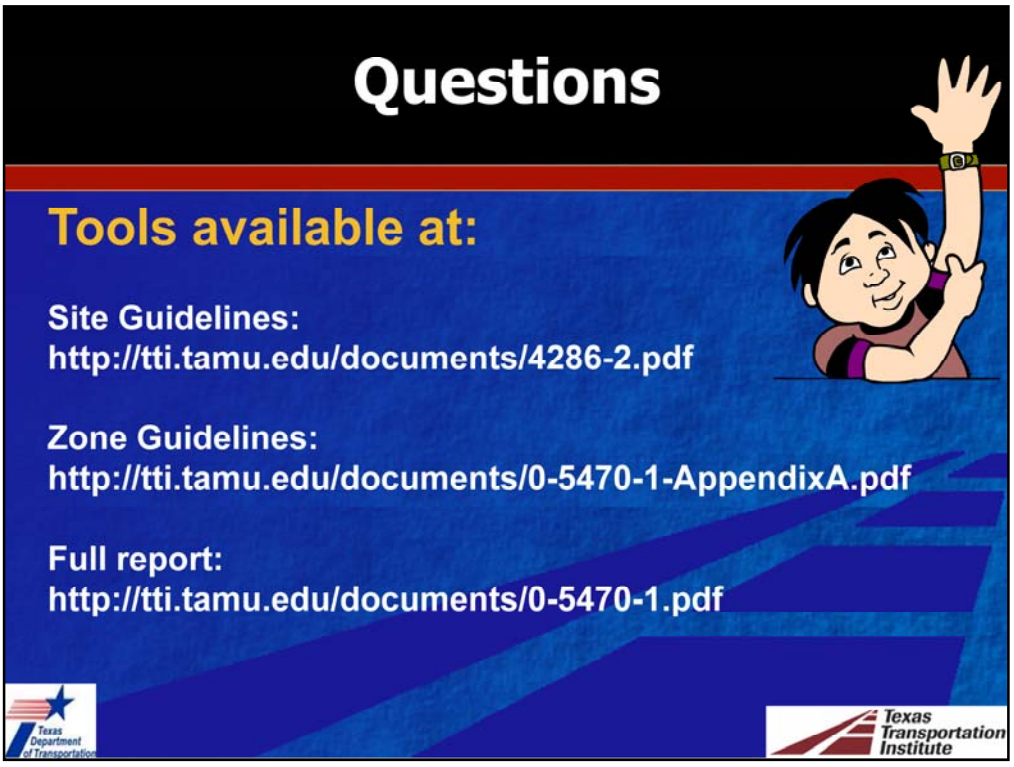
Note: The figure shows an END SCHOOL ZONE sign because the use of the two signs (END SCHOOL ZONE plus Speed Limit sign) is PROPOSED for the next edition of the MUTCD. The END SCHOOL ZONE sign is not currently used as a standard in Texas. The sign is displayed by local jurisdictions.



TEXT FROM *GUIDELINES*

Conditions when removing a school speed zone is to be considered:

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



The tools are available on-line at the addresses shown on the slide.