Quick Guide on Factors to Consider for Speed Studies

This document outlines the factors identified in the draft Speed Limit Determination Worksheet and any literature findings on how the factor may be used selecting a speed limit. These are not standards or policy on how to select a speed limit.

Road Classification and Area Type

In North Carolina, the statutory speed for rural areas is 55 MPH and in incorporated municipalities is 35 MPH. Additionally, the *NCDOT Complete Streets Planning and Design Guidelines* identifies additional area types as well as provides basic guidance based on the characteristics of these area types and typical roadway designs. In general roadways in denser area types supports a lower posted speed.

Driveways

Increased presence of driveways is correlated to lower speeds as they operate as unsignalized intersections. In the HCM 6th Edition, access points are considered active if it has an entering flow rate of 10 veh/h or more.

HCM Urban Streets Speed Adjustment for Access Points (Exhibit 18-11)

Access Density D_a (points/mi)	Adjustment for Access Points f_A by Lanes N_{th} (mi/h)[c]		
	1 Lane	2 Lanes	3 Lanes
0	0.0	0.0	0.0
2	-0.2	-0.1	-0.1
4	-0.3	-0.2	-0.1
10	-0.8	-0.4	-0.3
20	-1.6	-0.8	-0.5
40	-3.1	-1.6	-1.0
60	-4.7	-2.3	-1.6

HCM Two Lane and Multilane Highway Speed Adjustment for Access Points (Exhibit 15-8/12-24)

Access Points per Mile (Both Sides)	Reduction in FFS (mi/h)
0	0.0
10	2.5
20	5.0
30	7.5
40	10.0

Note: Interpolation to the nearest 0.1 is recommended.

Traffic Composition

Research in this area is not conclusive, but unfamiliar drivers have no learned experience on the safe speed for new roadway segments. Basing the speed solely on 85th percentile of commuters or local drivers may not account for issues that would affect unfamiliar drivers. A combination of lower posted speed and signage considerations may be appropriate on routes with a large amount of unfamiliar drivers.

Multimodal Facilities

Research indicates that the presence of pedestrians, bicyclists and transit has safety and operational impacts. The impacts are mitigated by good design of multimodal facilities such as sidewalks, shared use paths, bicycle lanes, and separated bus lanes or stops. In general, the presence of significant volumes of pedestrians, bicyclists and transit supports a lower posted speed.

As an example of significant pedestrian volume thresholds, the NCDOT Project Report 2014-15 "North Carolina Pedestrian Crossing Guidance" recommends the following thresholds for when marked crosswalks are not necessary:

Because existing pedestrian volume data is limited, the evaluator must use engineering judgment to choose the appropriate low volume threshold from the following considerations:

- *The crossing area has less than 25 pedestrians per pedestrian peak hour OR less than 100 pedestrians per day.*
- *At mid-block locations only: crossing area has less than 25 pedestrians per pedestrian peak hour for at least four hours. (NCDOT, 2008)*
- *The crossing area is not near high pedestrian trip generators.*
- *The crossing area does not connect complementary land uses.*

Crashes

A significant crash history, especially with speed as a contributing factor supports a lower posted speed.

Neighborhood Petition

A neighborhood petition alone does not support a change in posted speed but may be used to identify issues for the engineer to further investigate.

Pavement Condition

While safe travel speeds are lower when pavement is in poor condition, it is important to consider that resurfacing will affect the safe speed. Lower posted speeds primarily due to pavement condition should be reevaluated once resurfacing is complete.

Lanes

Research shows that in general lanes narrower than 12 ft in width support lower speeds. Below are the adjustments to free flow speed used in the Highway Capacity Manual. It is important to note that lanes wider than 12 ft do not support higher speeds.

HCM Two-lane Highway Free Flow Speed Adjustment for Lane and Shoulder Width

Exhibit 15-7
Adjustment Factor for Lane and Shoulder Width (f_{LS})

Lane Width (ft)	Shoulder Width (ft)			
	≥0 <2	≥2 <4	≥4 <6	≥6
≥9 <10	6.4	4.8	3.5	2.2
≥10 <11	5.3	3.7	2.4	1.1
≥ 11 <12	4.7	3.0	1.7	0.4
≥12	4.2	2.6	1.3	0.0

Average Lane Width (ft)	Reduction in FFS, f_{LW} (mi/h)
≥12	0.0
≥11–12	1.9
≥10–11	6.6

Exhibit 12-20
Adjustment to FFS for Average Lane Width for Basic Freeway and Multilane Highway Segments

Additionally, the Highway Capacity Manual notes that the total number of lanes lowers the impact of access points on urban street segments as shown below.

Adjustment for Access Points f_A by Lanes N_{th} (mi/h)[c]		
1 Lane	2 Lanes	3 Lanes
0.0	0.0	0.0
-0.2	-0.1	-0.1
-0.3	-0.2	-0.1
-0.8	-0.4	-0.3
-1.6	-0.8	-0.5
-3.1	-1.6	-1.0
-4.7	-2.3	-1.6

Shoulders

In general, hard shoulders narrower than 6 ft support a lower posted speed. The two-lane highway HCM method is shown in the lane section, and the freeway and multilane highway adjustment for shoulders is shown below.

Right-Side Lateral Clearance (ft)	Lanes in One Direction			
	2	3	4	≥5
≥6	0.0	0.0	0.0	0.0
5	0.6	0.4	0.2	0.1
4	1.2	0.8	0.4	0.2
3	1.8	1.2	0.6	0.3
2	2.4	1.6	0.8	0.4
1	3.0	2.0	1.0	0.5
0	3.6	2.4	1.2	0.6

Note: Interpolate for non-integer values of right-side lateral clearance.

Exhibit 12-21
Adjustment to FFS for Right-Side Lateral Clearance, f_{RLC} (mi/h) for Basic Freeway Segments

Exhibit 12-22
Adjustment to FFS for Lateral Clearances for Multilane Highways

Four-Lane Highways		Six-Lane Highways	
TLC (ft)	Reduction in FFS (mi/h)	TLC (ft)	Reduction in FFS (mi/h)
12	0.0	12	0.0
10	0.4	10	0.4
8	0.9	8	0.9
6	1.3	6	1.3
4	1.8	4	1.7
2	3.6	2	2.8
0	5.4	0	3.9

Note: Interpolation to the nearest 0.1 is recommended.

*TLC is sum of left and right clearance, where each side can account for up to 6 ft.

Additionally, Multilane highways with an undivided median have a reduction in FFS of 1.6 mi/h.

Horizontal Curves

In general, tighter (lower radius) horizontal curves support lower posted speeds. Design speeds are also impacted by the superelevation of the curve. Ball bank studies can be used to select an appropriate speed. Refer to *A Policy on Geometric Design of Highways and Streets* (Green Book) for design practices.

Vertical Curves

In general, steeper sag and crest vertical curves support lower speeds to provide sufficient sight distance. Refer to *A Policy on Geometric Design of Highways and Streets* (Green Book) for design practices.

Sight Distance

Issues in providing appropriate stopping sight distance including curvature and sight obstructions in the median and at access points support lower posted speeds. Refer to *A Policy on Geometric Design of Highways and Streets* (Green Book) for design practices.

85th Percentile Speed

Without compelling evidence from critical roadway and traffic elements, the 85th percentile speed is typically used as the standard practice to identify posted speed.