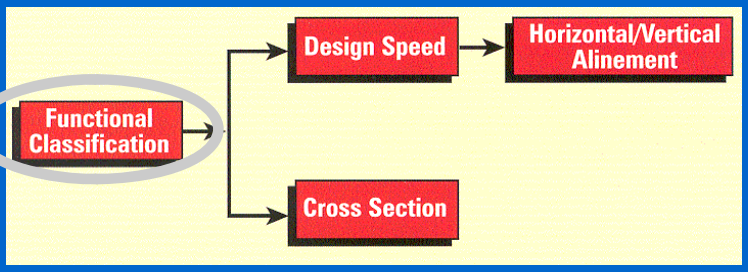
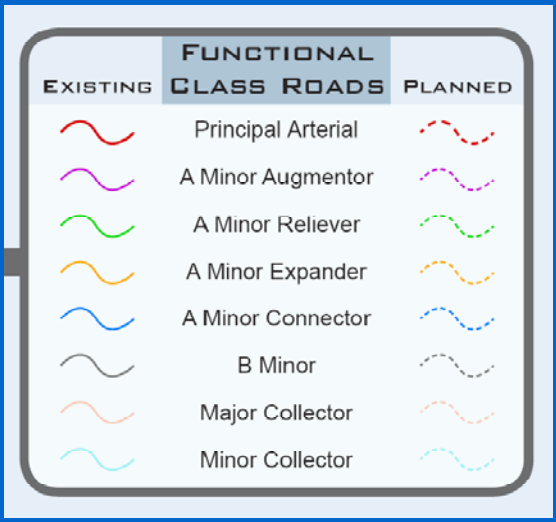
Conventional Approach



- Classification required by Federal law
- General Categories:
  - Arterial
  - Collector
  - Local

Metropolitan Council

Functional Classifications



Changing Road Classification

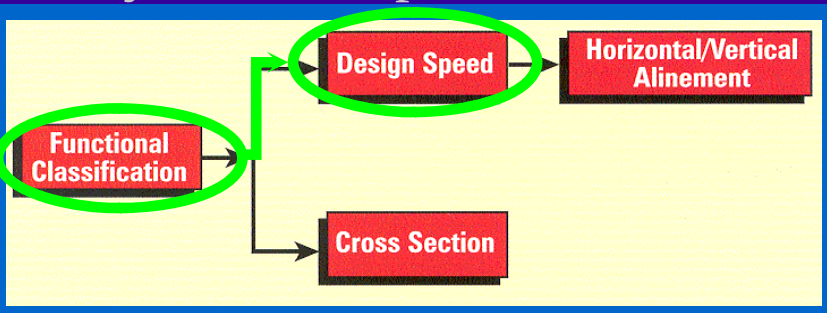
- Planning level exercise – not normally a project stage consideration
- Long-range implications for overall road network
- Normally subject to established review cycle

Keeping the Big Picture in Mind

The **"local"** network works only if there is a functioning **"regional"** network!

And vice versa!

Project Development Process



Once the function and ***context*** of the roadway has been systematically considered, the choice of Design Speed follows, which greatly influences subsequent design parameters

Role of Speed in Transportation

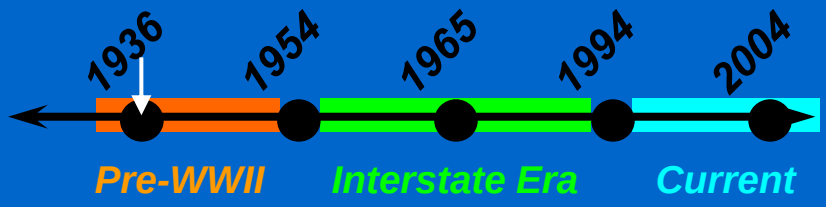
- Speaks to the convenience and economy of a facility in terms of time and cost
- Influenced by 5 general conditions:
  - Highway Physical Characteristics
  - Roadside Interference
  - Weather Conditions
  - Traffic Interaction
  - External Speed Limitations

2007 Speed-Safety Facts*

- 106 Fatal Crashes out of 463 Crashes
- 3727 Injury Crashes out of 24,978
- 7085 Property Damage Crashes out of 56,064
- 28% of Fatalities (2001-2005) - One of Mn/DOT's seven critical emphasis areas.

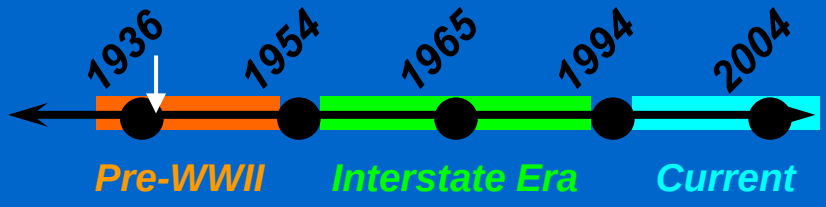
*From the Minnesota Department of Public Safety

Changes to Design Speed Concept



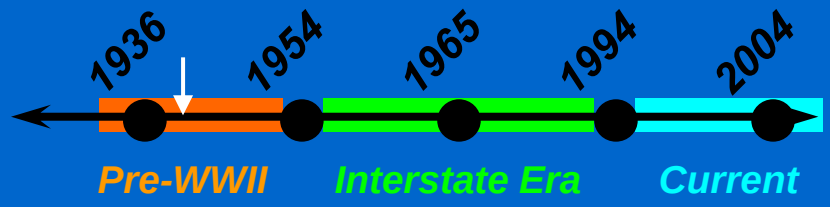
Assumed Design Speed (Barnett 1936):
"The ***maximum reasonably uniform*** speed which would be adopted by the faster driving group of vehicle operators, once clear of urban areas"

Changes to Design Speed Concept



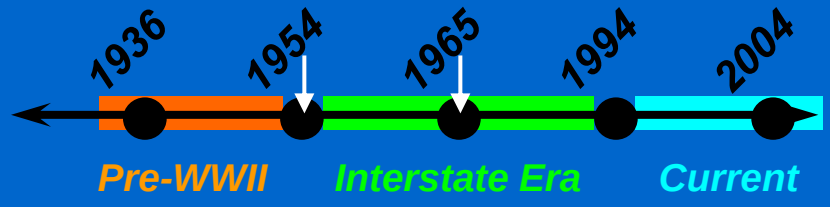
Design Speed (AASHO 1938):
"The ***maximum approximately uniform*** speed which ***probably*** will be adopted by the faster group of drivers but not, necessarily, by the ***small percentage of reckless ones***."

Changes to Design Speed Concept



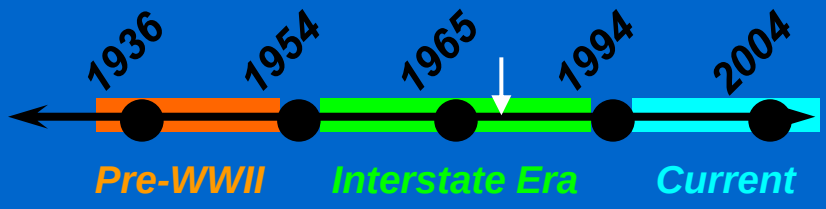
Assumed Design Speed (AASHO 1940):
"The Assumed Design Speed selected for a highway is determined by consideration of the topography of the area traversed, economic justification based on traffic volume, cost of right-of-way and other factors, traffic characteristics, and other pertinent factors such as aesthetic considerations."

Changes to Design Speed Concept



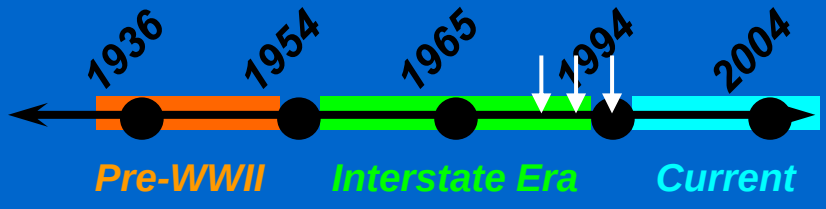
AASHO (1954, 1965):
"The speed determined for design and correlation of the physical features of a highway that influence vehicle operation. It is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern."

Changes to Design Speed Concept



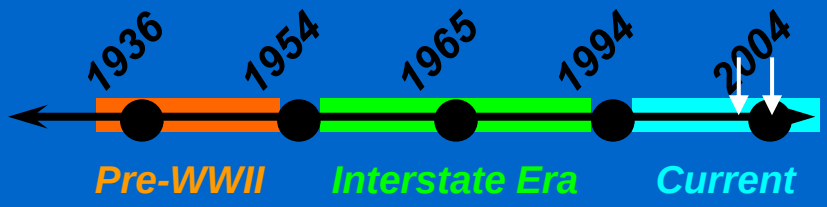
AASHO (1973):
"The maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern."

Changes to Design Speed Concept



AASHTO (1984, 1990, 1994):
"The maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern. The assumed design speed should be a logical one with respect to the topography, the adjacent land use, and the functional classification of highway."

Changes to Design Speed Concept

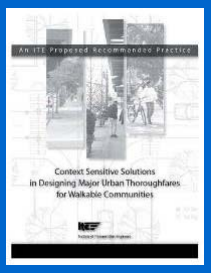


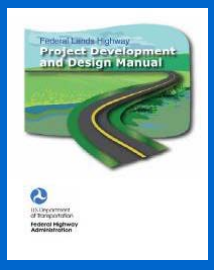
AASHTO (2001, 2004) and MUTCD (2000, 2003):
"Design Speed is a selected speed used to determine the various geometric design features of the roadway."

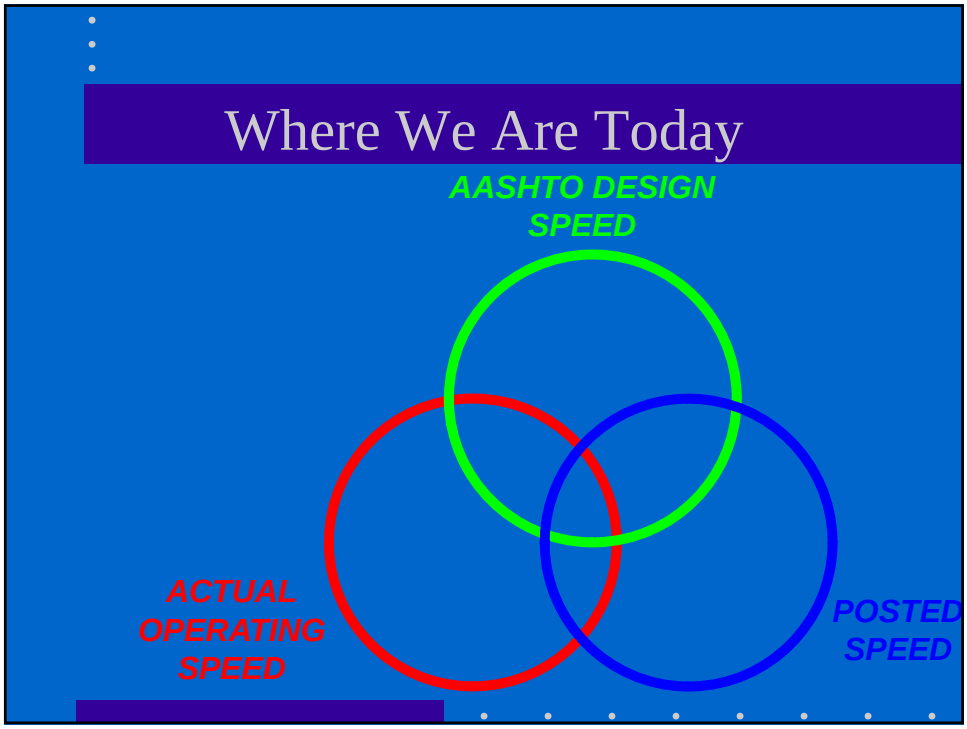
Concept of Desired/Target Speed

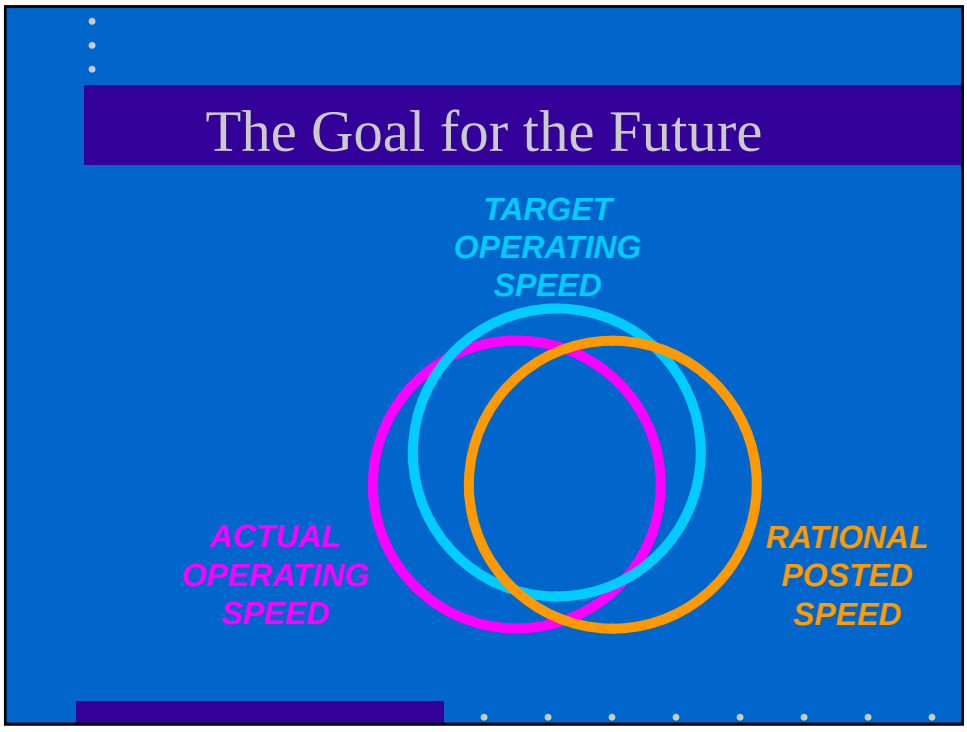
Target Operating Speed

- "…desirable speed at which vehicles should operate on a thoroughfare in a specific context." (ITE)
- "…the desired operating speed along a roadway. An appropriate target speed should be determined early in the project development process." (FHWA)






Where We Are Today
AASHTO DESIGN SPEED
ACTUAL OPERATING SPEED
POSTED SPEED


The Goal for the Future
TARGET OPERATING SPEED
ACTUAL OPERATING SPEED
RATIONAL POSTED SPEED

Chapter 3: Revised Design Speed Approach

- Design speed is a choice
- Choice of design speed needs to consider:
  - *Roadway context*
  - *Implications for pedestrian and bicycle safety and comfort*
  - *Implications for regional mobility*
- To ensure safety, the choice of design speed needs to be informed by existing operating speed and the likelihood of change associated with the design
- Flexibility is provided to allow design speeds lower, the same, or higher than existing operating speeds, depending on the project's purpose

From the MassHighway Guide

Making the Choice

- Read between the…Tables!

GB Chapter 3, Page 281:

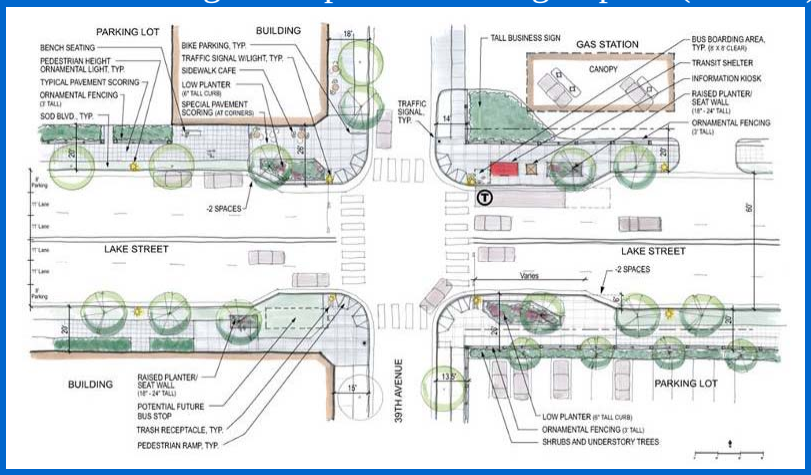
"The selected design speed serves to keep all elements of design in balance"

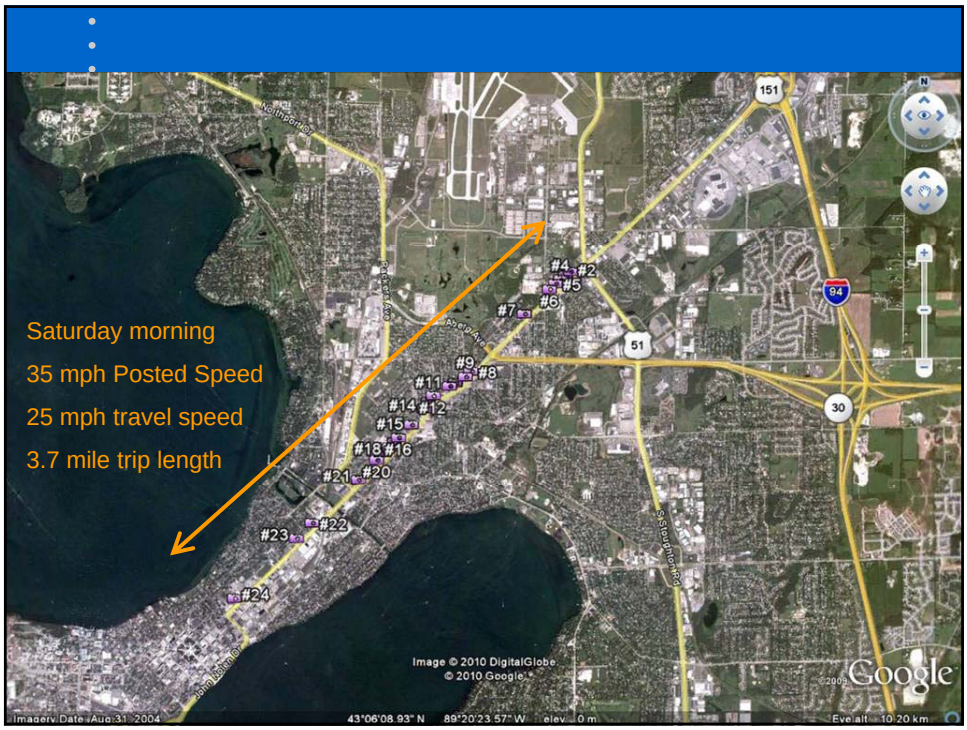
GB Chapter 5, Page 406:

"A decrease in design speed along the road should not be introduced abruptly, but be extended over a sufficient distance to allow the driver to adjust and make the transition to the slower speed."

Making the Choice: "A Minor" Arterial

Consider Design Exception for Design Speed (Lake St)



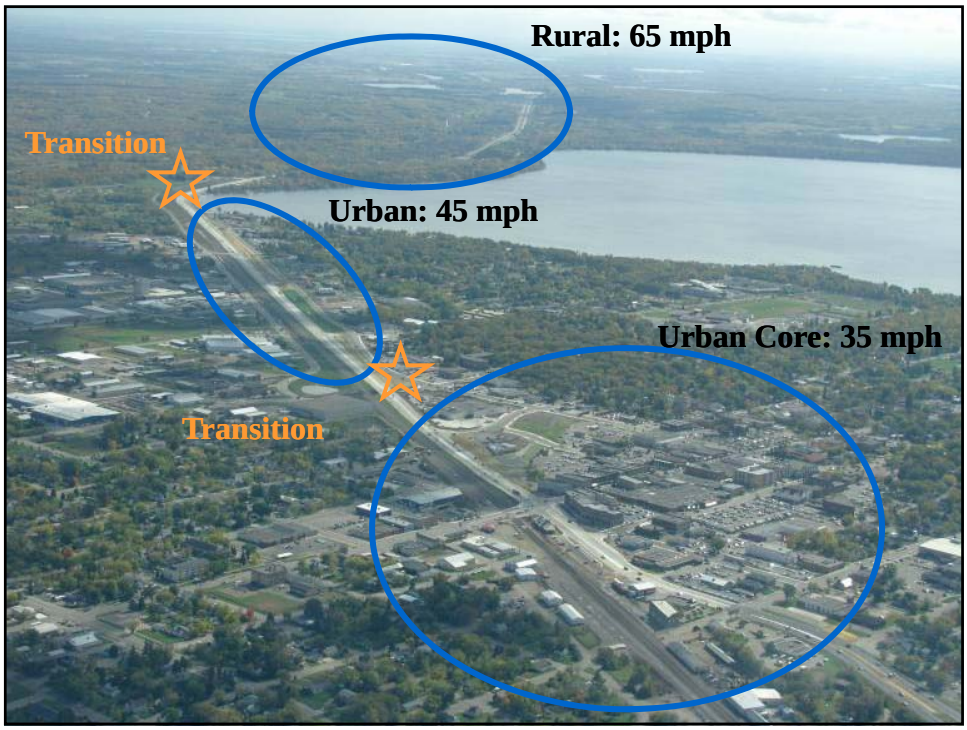


Engineering for Speed Management

- Criteria for setting speed limits
- Design of self-enforcing roads
- Speed control on curves
- Variable speed limits
- Onboard technology

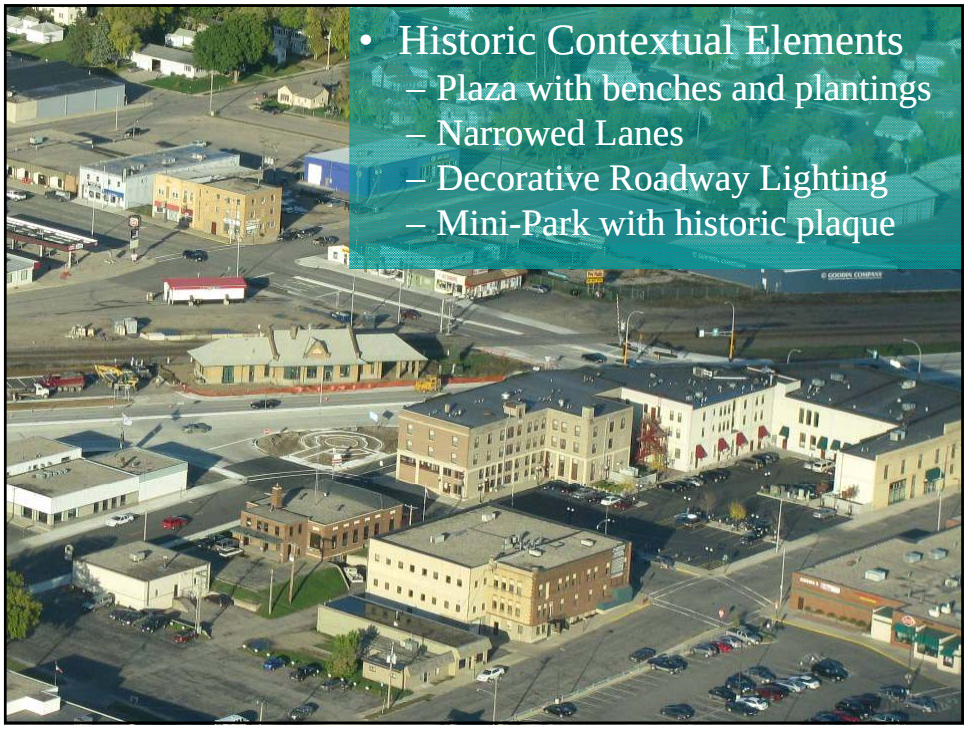
Self-Enforcing/Self-Explaining Roads

- Important Design Focus Areas
  - Rural Areas
    - Many types/functions of 2-lane rural roads
    - Make the effort to "get to know" the subject road
  - Transitions
    - Undeveloped to Developed
    - Developed to Urban Core
  - Curves
    - First curves after long tangents
    - Comparably more restrictive curves




• Transition elements
– Curb & Gutter
– 4’ Mountable Raised Median
– Roadway Lighting
– Community Gateway Signage


• Transition elements
– Drop Shoulders
– 4’ Non-Mountable Median
– Decorative Roadway Lighting



Major Geometric Elements Affected

Design Element	Relationship to Design Speed		
	Direct	Indirect	Other
Sight Distance	X		
Horiz Curvature	X		
Superelevation	X		
Grade		X	
Vert Curvature	X		
Clear Zone	X		
Road X-Section*	X	X	X

** 'Road X-Section' includes lane width, shoulder width, use of C&G, etc.*

Research on Design Speed Issues

- Sought correlation between Design Speed, Operating Speed and Posted Speed
- Provides equations to assist in predicting operating speeds
- Makes recommendations for best practice for selecting Design Speed

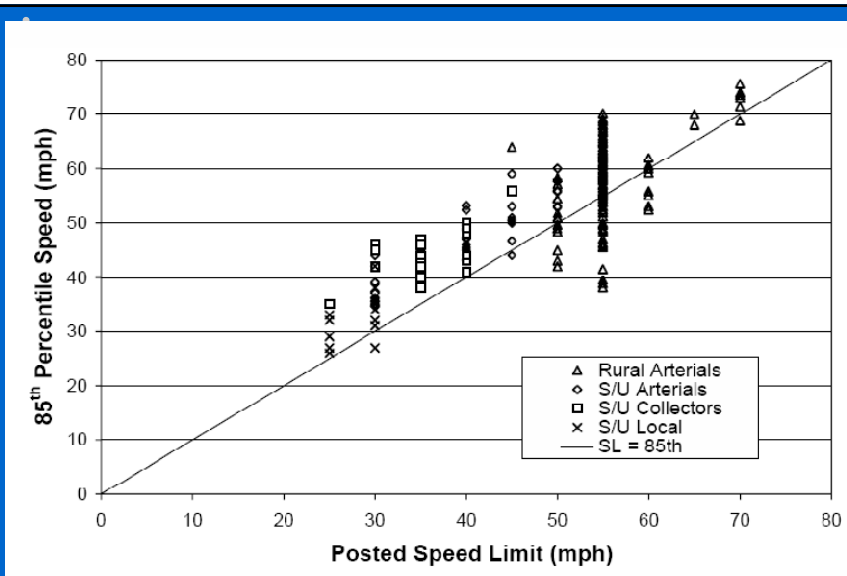


Figure 6. 85th percentile speed versus posted speed for NCHRP, Texas, and FHWA data.

Source: NCHRP Report 504

Suburban/ Urban Speeds

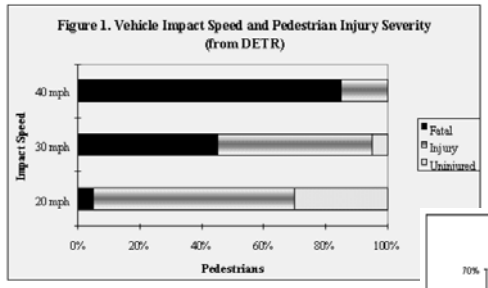
Table 24 Percentile speed that equals posted speed by area type and posted speed

How do you select Design Speed?

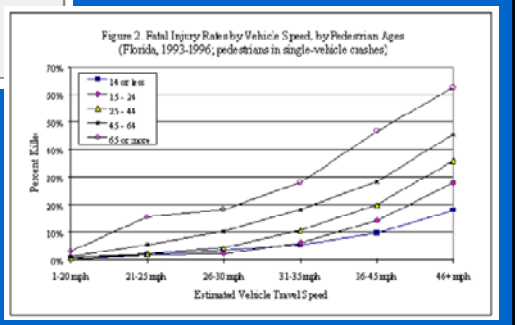
Area Type	Speed Limit (mph)	Percentile at or below Given Speed			Number of Sites
		Speed Limit	Speed Limit Plus 5 mph	Speed Limit Plus 10 mph	
Suburban/ Urban	25	42	77	94	7
	30	28	64	86	19
	35	22	62	90	23
	40	32	68	92	25
	45	37	70	90	15
	50	43	76	95	9
	55	48	80	95	6

Source: NCHRP Report 504

Vehicle Speeds and Pedestrians



UK: Department of Environment, Transport, and the Regions, (DETR)



Florida, 1993-1996; pedestrians in single-vehicle crashes

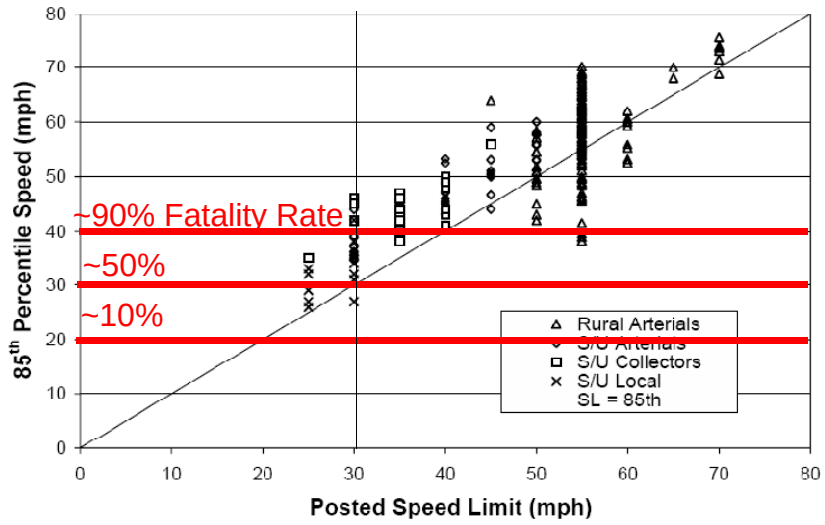


Figure 6. 85th percentile speed versus posted speed for NCHRP, Texas, and FHWA data.

Source: NCHRP Report 504

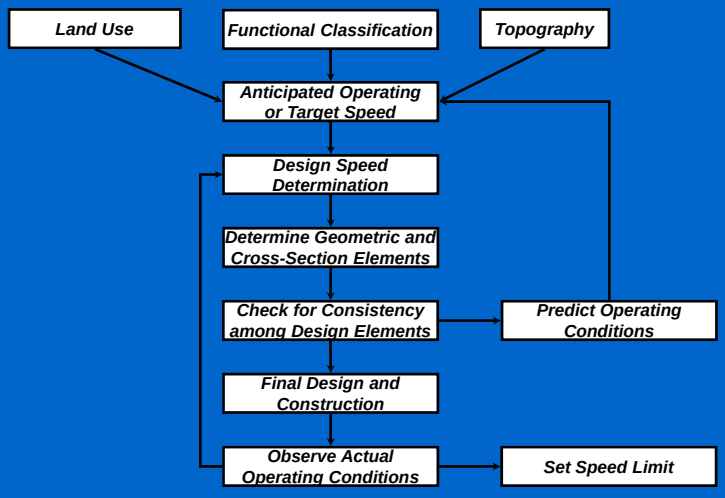
Noteworthy Report 504 Findings

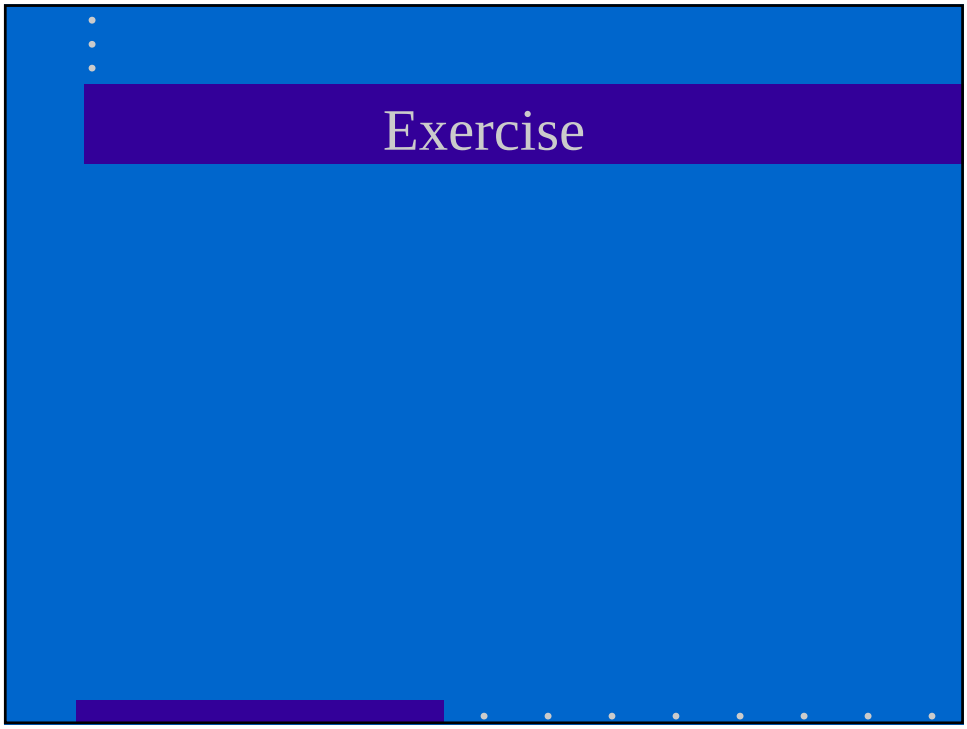
- Strongest relationship between Posted and Operating
- Little correlation between Design and Operating speeds *except* at tight horizontal curves or short vertical curves
- Other speed-influential variables
  - Access Density
  - Median (presence, type)
  - On-street Parking
  - Pedestrian Activity Level
- No evidence that presence of C&G results in lower Operating Speed

Process for Selecting Design Speed

- Speed Prediction Feedback Loop
  - Design a preliminary alignment based on a selected design speed
  - Estimate operating (85th percentile) speeds for the preliminary alignment
  - Check for large differences in operating speeds at curve locations and grade changes
  - Review against desired operating speed range
  - Revise the alignment to reduce these differences to acceptable levels

Engineering for Speed Management




Exercise